DESIGN OF
DOUBLE DECK RAIL CUM ROAD BRIDGE

Submitted in partial fulfillment of the Degree of

Bachelor of Technology

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DEPARTMENT OF CIVIL ENGINEERING

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WAKNAGHAT

TALBLE OF CONTENTS

(II)

CERTIFICATE

This is to certify that the work titled "**Design Of Double Deck Rail Cum Road Bridge**" submitted by "**Abhinav Bansal, Prafful Tripuri & Ankita Sharma**" in partial fulfillment for the award of degree of **Bachelors Of Technology** of Jaypee University of Information Technology, Waknaghat has been carried out under my supervision. This work has not been submitted partially or wholly to any other University or Institute for the award of this or any other degree or diploma.

Signature of Supervisor ……..

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Designation Assistant Professor, Dept. Of Civil Engineering

Date ……..

(III)

ACKNOWLEDGEMENT

We express our sincere gratitude to our respected project supervisor **Mr. Chandra Pal Gautam**, Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat under whose supervision and guidance this work has been carried out. His whole hearted involvement, advice, support and constant encouragement throughout, have been responsible for carrying out this project work with confidence. We are thankful to him for showing confidence in us to take up this project. It was due to his planning and guidance that we were able to complete this project in time.

We are sincerely grateful to **Dr. Ashok Kumar Gupta**, Professor and Head of Department of Civil Engineering, Jaypee University of Information Technology, Waknaghat for providing all the necessities for the successful completion of our project.

We would also like to thank the CAD laboratory staff of Department of Civil Engineering for their timely help and assistance.

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Dated…….

(IV)

SUMMARY

In today's world with the growing population and hence ever growing traffic, moving on the roads has become more and more congested. We will soon reach the stagnation stage when roads cannot be widen further, at that time the possible solution to this problem could only be either building underground or over the ground.

Figure 0.1: Well Planned Transportation Network

This need which is soon going to knock our door encouraged us to take this opportunity and make some contributions towards the community, serving the mankind by giving the valuable solution to the problem of growing traffic and hence congested transportation network by designing a Double Deck Rail cum Road Bridge.

(V)

SUMMARY

Design of the bridge includes design of highway deck slab, design of Railway deck slab, design of girders, cross girders and design of foundation i.e. deep foundation for the type of soil profile assumed. Design conforms to different Codes & Specifications.

_____ _____

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Date Date

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Date

List of Figures

Chapter 1

INTRODUCTION

1.1 Bridges

A bridge is a structure built to span physical obstacles such as a body of water, valley, or road, for the purpose of providing passage over the obstacle. There are many different designs that all serve unique purposes and apply to different situations. Designs of bridges vary depending on the function of the bridge, the nature of the terrain where the bridge is constructed and anchored, the material used to make it, and the funds available to build it.

We can also say that 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. In other words, bridge is a structure for carrying the road traffic or other moving loads over a depression or obstruction such as channel, road or railway. A bridge is an arrangement made to cross an obstacle in the form of a low ground or a stream or a river without closing the way beneath.

1.2 History

The first bridges were made by nature itself — as simple as a log fallen across a stream or stones in the river. The first bridges made by humans were probably spans of cut wooden logs or planks and eventually stones, using a simple support and crossbeam arrangement. Some early Americans used trees or bamboo poles to cross small caverns or wells to get from one place to another. A common form of lashing sticks, logs, and deciduous branches together involved the use of long reeds or other harvested fibers woven together to form a connective rope capable of binding and holding together the materials used in early bridges.

The Arkadiko Bridge is one of four Mycenaean corbel arch bridges part of a former network of roads, designed to accommodate chariots, between Tiryns to Epidauros in the Peloponnese, in Greece. Dating to the Greek Bronze Age (13th century BC), it is one of the oldest arch bridges still in existence and use. Several intact arched stone bridges from the Hellenistic era can be found in the Peloponnese in southern Greece.

The greatest bridge builders of antiquity were the ancient Romans. The Romans built arch bridges and aqueducts that could stand in conditions that would damage or destroy earlier designs. Some stand today. An example is the Alcántara Bridge, built over the river Tagus,

in Spain. The Romans also used cement, which reduced the variation of strength found in natural stone. One type of cement, called pozzolana, consisted of water, lime, sand, and volcanic rock. Brick and mortar bridges were built after the Roman era, as the technology for cement was lost then later rediscovered.

Figure 1.1: The Alcántara Bridge, Roman stone arch bridge built over the Tagus River at Alcántara, Spain constructed between 104 A.D. to 106 A.D.

The Arthashastra of Kautilya mentions the construction of dams and bridges. A Mauryan bridge near Girnar was surveyed by James Princep. The bridge was swept away during a flood, and later repaired by Puspagupta, the chief architect of Emperor Chandragupta I. The bridge also fell under the care of the Yavana Tushaspa, and the Satrap Rudra Daman. The use of stronger bridges using plaited bamboo and iron chain was visible in India by about the 4th century. A number of bridges, both for military and commercial purposes, were constructed by the Mughal administration in India.

Although large Chinese bridges of wooden construction existed at the time of the Warring States, the oldest surviving stone bridge in China is the Zhaozhou Bridge, built from 595 to

605 AD during the Sui Dynasty. This bridge is also historically significant as it is the world's oldest open-spandrel stone segmental arch bridge. European segmental arch bridges date back to at least the Alconétar Bridge (approximately 2nd century AD), while the enormous Roman era Trajan's Bridge (105 AD) featured open-spandrel segmental arches in wooden construction.

Rope bridges, a simple type of suspension bridge, were used by the Inca civilization in the Andes Mountains of South America, just prior to European colonization in the 16th century.

During the 18th century there were many innovations in the design of timber bridges by Hans Ulrich, Johannes Grubenmann, and others. The first book on bridge engineering was written by Hubert Gautier in 1716. A major breakthrough in bridge technology came with the erection of the Iron Bridge in Coalbrookdale, England in 1779. It used cast iron for the first time as arches to cross the river Severn.

With the Industrial Revolution in the 19th century, truss systems of wrought iron were developed for larger bridges, but iron did not have the tensile strength to support large loads. With the advent of steel, which has a high tensile strength, much larger bridges were built, many using the ideas of Gustave Eiffel.

In 1927 welding pioneer Stefan Bryła designed the first welded road bridge in the world, the Maurzyce Bridge which was later built across the river Słudwia at Maurzyce near Łowicz, Poland in 1929. In 1995, the American Welding Society presented the Historic Welded Structure Award for the bridge to Poland.

Other important developments came with the truss bridge and the suspension bridge designs. The truss is an old design, but it was improved when scientists and engineers knew enough about science and mathematics to work out the mechanics of the design. Covered bridges were usually built on the truss design. Truss bridges were improved even more when metal was used. The suspension bridge was another basic design that was changed by the use of metal. The Brooklyn Bridge is one famous suspension bridge built during that time. It uses steel wires for the suspension cables.

About a hundred years ago, engineers began using concrete for bridges. A new method called “prestressing” helps prevent concrete from cracking after a structure is built. Today, most new bridges are made of prestressed concrete and steel.

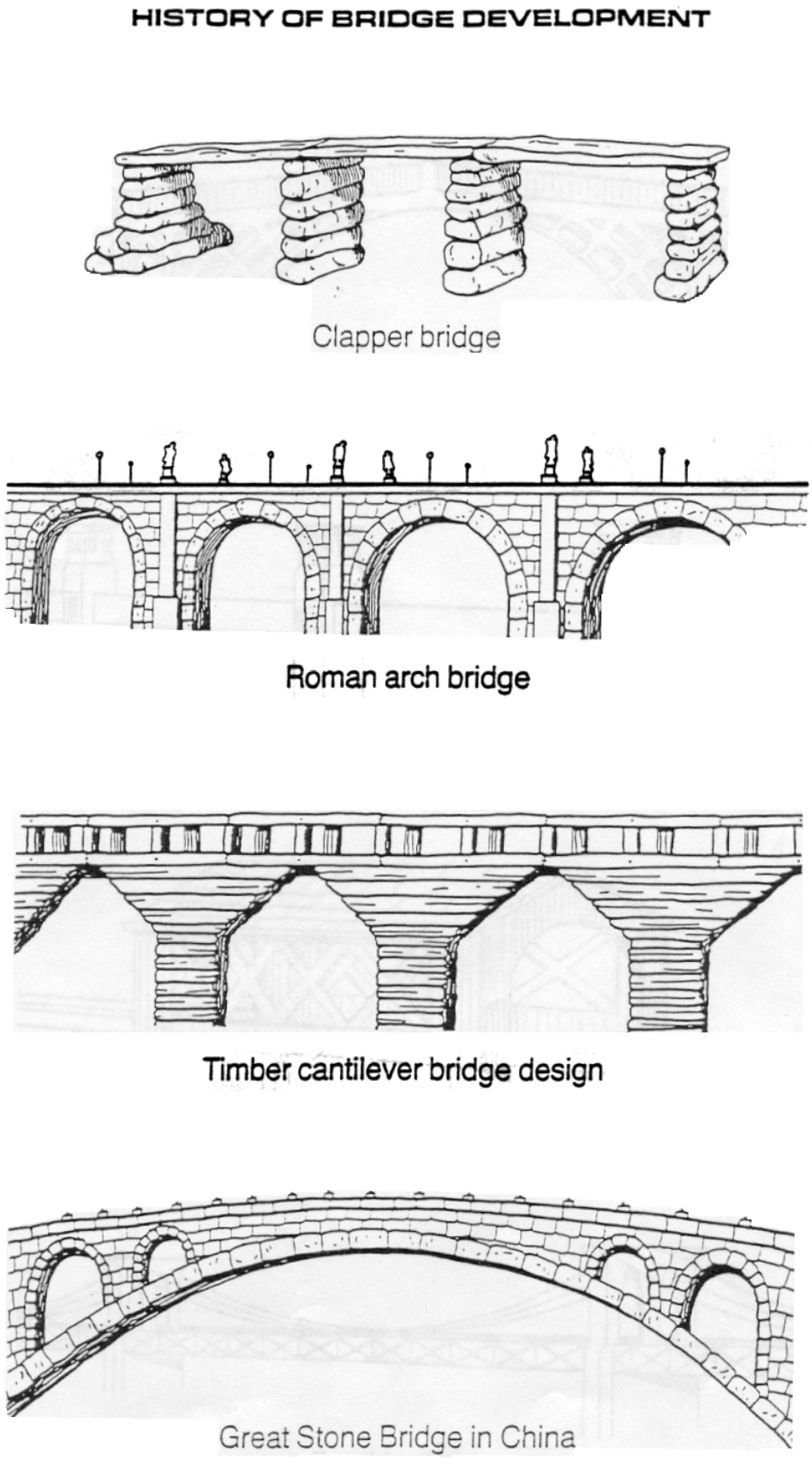
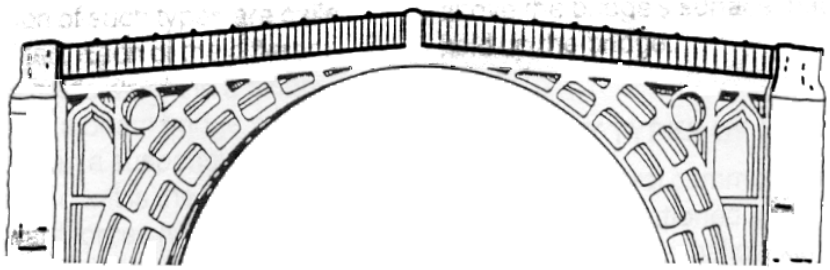
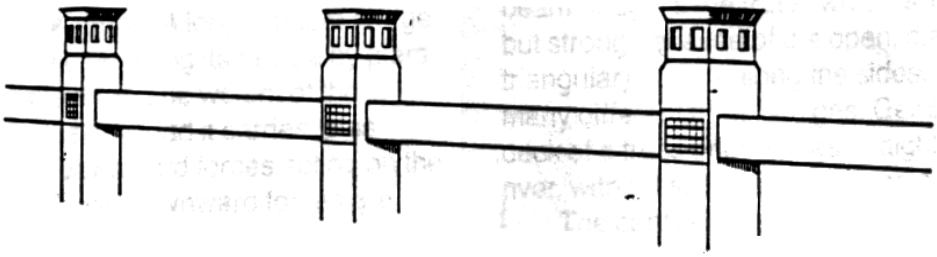


Figure 1.2: History of Bridge Development (a)

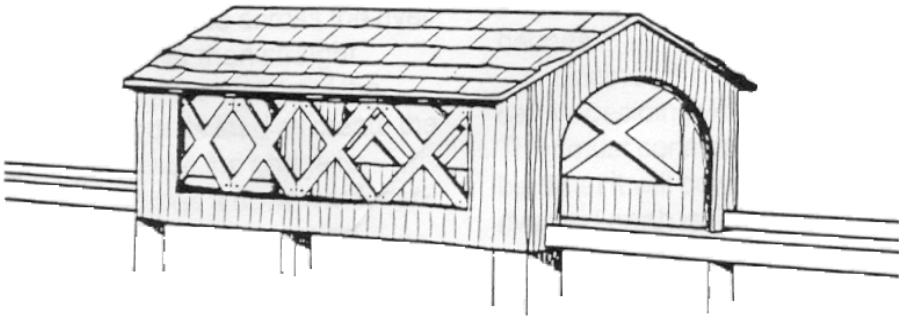
HISTORY OF BRIDGE DEVELOPMENT



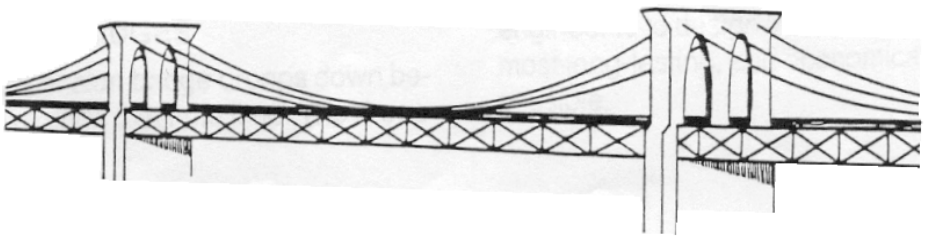
First Cast-Iron Bridge at Coalbrookdale



Britannia Tubular Bridge



Covered bridge



Brooklyn Bridge

Figure 1.3: History of Bridge Development (b)

1.3 Components

The bridge structure comprises of the following parts:

Superstructure or Decking: This includes slab, girder, truss, etc. This bears the load passing over it and transmits the forces caused by the same to the substructures.

Bearings: The bearings transmit the load received from the decking on to the substructure and are provided for distribution of the load evenly over the substructure material which may not have sufficient bearing strength to bear the superstructure load directly.

Substructure: This comprises piers and abutments, wing walls or returns and their foundation.

Piers and Abutments*:* These are vertical structures supporting deck/bearing provided for transmitting the load down to the bed/earth through foundation.

Wing walls and Returns*:* These are provided as extension of the abutments to retain the earth of approach bank which otherwise has a natural angle of repose.

Foundation*:* This is provided to transmit the load from the piers or abutments and wings or returns to and evenly distribute the load on to the strata. This is to be provided sufficiently deep so that it is not affected by the scour caused by the flow in the river and does not get undermined. While the above mentioned are structurally operational parts, for safety hand rails or parapets, guard rails or curbs are provided over the decking in order to prevent vehicle or user from falling into the stream or for the separation of traffic streams.

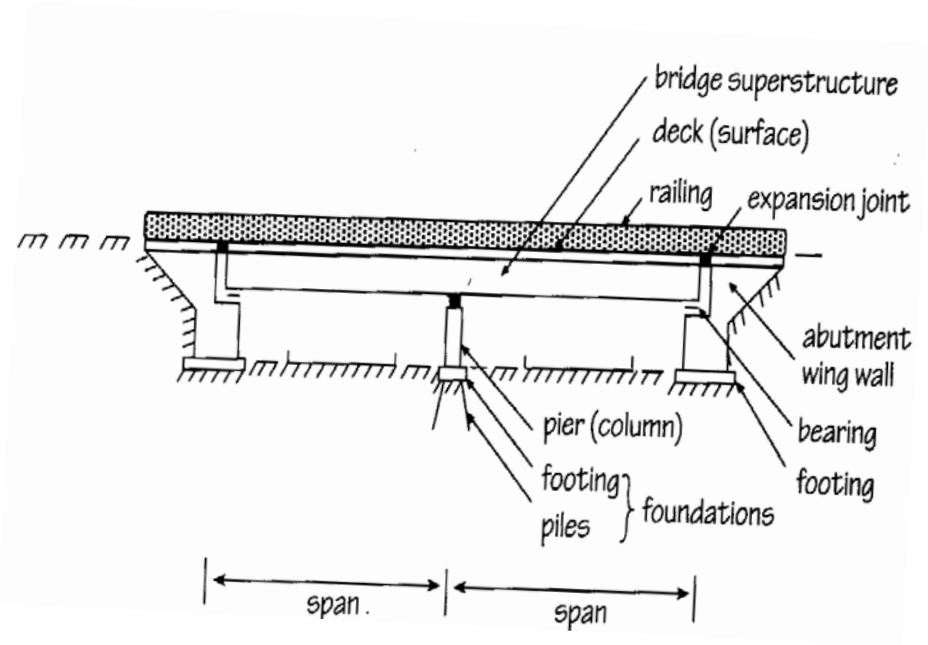


Figure 1.3: Typical diagram of bridge

CHAPTER 2

DESIGN OF BRIDGE USING MS-EXCEL

2.1 Design Of Post-Tensioned Pre-stressed Concrete Highway Deck

2.1.1 Details available

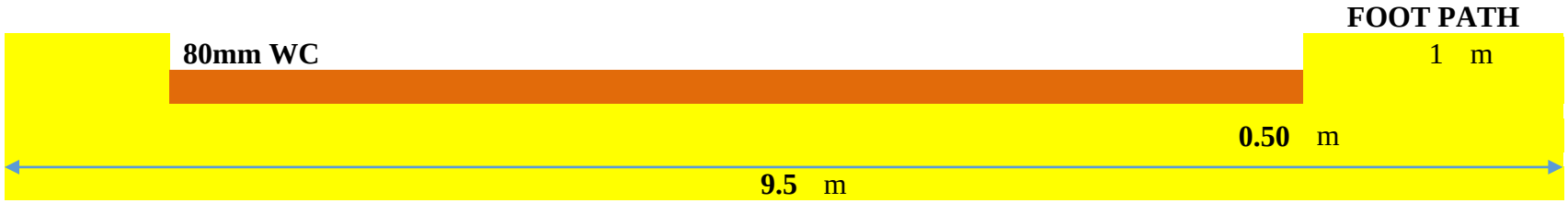
Sr No.	Particulars	Dimension	Units	
1	Clear Span	**18**	m	
2	Width of bearing	**0.4**	m	
3	Clear width of Roadway	**7.5**	m	
4	Foot Path	**1**	m	on either side
5	Thickness of wearing coat	**0.08**	m	
6	Live Load	I.R.C. CLASS AA TRACKED		
7	Grade of Concrete	**45**	M	
8	Type of wires	Cold Drawn stress relieved wires		
9	Dia of tensile wires	**0.0025**	m X-area =	**4.906**
10	No. of wires housed in a cable	**120**	nos	
11	Tensile Strength Of wire* [IS 1785 Part 1]	**2010**	N/mm2	
12	Supplementary r/f	**415**	HYSD BARS	
13	Compressive strength at transfer [fci]	**35**	N/mm2	
14	Loss Ratio	**0.8**		
15	Freyssinst Anchorage Dia	**150**	mm	

DESIGN CONFORMING TO IRC-6, IRC-18, IRC-21 & IS 1343

2.1.2 Depth Of Slab And Effective Span

Assuming thickness for highway bridge deck	**27.5**	mm/m span
Overall thickness of slab	0.50	m
Effective span	18.4	m
Total width	9.5	m

Cross Section Of Deck Slab



2.1.3 Permissible Compressive Stresses In Concrete At Transfer & Working Load As Recommended In IRC-18

Sr No.	Quantity	Value	unit			
1	fct =	**15**	N/mm2	<.45 fci	15.75	**OK**
2	fcw =	**12**	N/mm2	<0.33 fck	14.85	**OK**
	ftw = ftt =	0	N/mm2			

2.1.4 Dead Load Bending Moments

Unit weight of concrete	**24**	kN/m3
Unit weight of wearing coat	**22**	kN/m3
Dead wt of slab	11.88	kN/m2
Dead wt of w.c	1.76	kN/m2
Total dead load	13.64	kN/m2
Dead load bending moment[Mg]	**577.2448**	**kN.m**

2.1.5 Live Load Bending Moments

Impact factor for class AA tracked vehicle is 25% for 5m span, decreasing linearly to 10% for 9m span so Impact factor is taken as		**10%**
For B.M.max tracked vehicle is placed symmetrically on the span		
Length of load from IRC 6(2000)	**3.6**	m
Effective length of load (x)	**4.75**	m
Contact width of vehicle from IRC 6 (2000)	0.85	m
bw	1.01	m

Values Of Constant 'K' From IRC 21-2000

B/L RATIO	Simply supported slabs	Continuous slabs
0.62	1.992	1.864

Effective width of slab [be]	10.17	m
Net effective width of dispersion	**9.762**	m

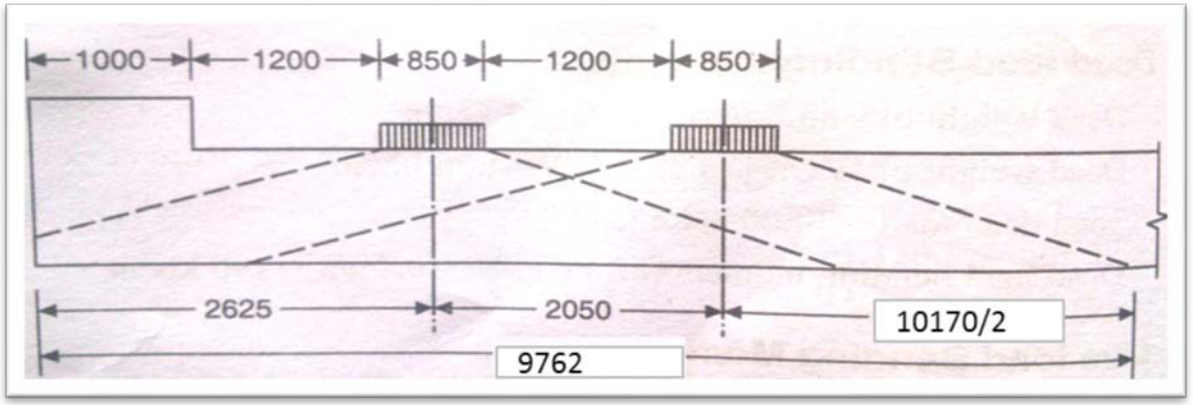


Figure 2.1.1: Dispersion of IRC Class AA tracked load

Load from IRC 6 2000		**700**	kN
Total Load from impact		770	kN
Average Load Intensity		16.61	kN/m2
maximum BM		**316.02**	**kNm**

2.1.6 Shear Due To Class AA Tracked Vehicle

Effective width of dispersion	$x.k(1-{}^{x}/_{L})+b_w$	5.13	m
Net effective width of dispersion		**7.13**	m
Load intensity		22.74	kN/m2
Shear force, Va or Vq		47.07	kN
Shear due to dead load, Vg		125.49	kN
Total Design Shear, Vu		**172.56**	**kN**

2.1.7 Check for Minimum Section Modulus

SECTION MODULUS = Zt =Zb = Z=		40837500	mm3
fct		15	N/mm2
fcw		12	N/mm2
frw		0	N/mm2
ftw		0	N/mm2
Loss ratio		0.8	
fbr = (loss ratio * fct - ftw)		12	N/mm2
Minimum Section Modulus Zb >=	$\frac{Mq + (1 - \eta) \times Mg}{fbr}$		
Zb >=		35955334.06	mm3

ok as it is less than Zb

2.1.8 Minimum Pre-stressing Force

P	=	$\frac{A \times (f_{inf} \times Zb + f_{sup} \times Zt)}{Zb + Zt}$	**3268.67**	**kN**
f sup	=	$\left\{f_{tt} - \frac{Mg}{Zt}\right\}$	**-14.14**	N/mm2
f inf	=	$\left\{\frac{f_{tw}}{\eta} + \frac{Mq + Mg}{\eta \,.\, Zb}\right\}$	**27.34**	N/mm2
Force in each cable			**1183.39**	kN
Spacing			362.04	mm
Adapt spacing			**300**	**mm**

2.1.9 Eccentricity of Cable at Center Of Span

$$e = \left[\frac{Zt\ Zb\ (f_{inf} - f_{sup})}{A.\ (f_{sup}.Zt + f_{inf}.\ Zb)}\right] \qquad 259.10 \quad \text{mm}$$

Thus the cables are arranged in a parabolic profile with a max eccentricity of 259.10 mm at center of span reducing to zero eccentricity at support

2.1.10 Check for Stresses at Service Loads

P =		3268.67	kN	
e =		259.10	mm	
A =		495000	mm2	
Zt =Zb= Z =		40837500	mm3	
Mg =		577.24	kN m	
Mq =		316.02	kN m	
P /A =		6.60	N/mm2	**[1]**
P.e/Z =		20.74	N/mm2	**[2]**
Mg / Z =		14.14	N/mm2	**[3]**
Mq / Z =		7.74	N/mm2	**[4]**
Loss Ratio =		0.8		**[5]**
Stresses at transfer				
At top of slab	[1]-[2]+[3]	0	N/mm2	SAFE
At bottom of slab	[1]+[2]-[3]	13.21	N/mm2	SAFE
Stresses at working loads				
At top of slab	**[5]*([1]-[2])+[3]+[4]**	10.57	N/mm2	SAFE
At bottom of slab	**[5]*([1]+[2])-[3]-[4]**	0	N/mm2	SAFE

Permissible compressive stresses in concrete at transfer & working load as recommended in IRC-18

Sr No.	Qnt	Value	Unit
1	fct	**15**	N/mm2
2	fcw	**12**	N/mm2
3	ftw = ftt	**0**	N/mm2

2.1.11 Check For Ultimate Strength Conforming To IRC 18

b		**1000**	mm	
Ap		1962.5	mm2	
d		470	mm	
fp		2010	N/mm2	
fck		45	N/mm2	
Failure by yielding of steel	$0.9 \times d \times Ap \times fp$			
Mu =		1668576375	Nmm	
Failure by Crushing of concrete	$0.176 \times b \times d^2 \times fck$			
Mu =		1749528000	Nmm	
Actual Mu =		1668576375	Nmm	[2]
Required Ultimate moment =	$1.5\ Mg + 2.5\ Mq$			
		1655904822	Nmm	[1]
Safe if [2] > [1]		**HENCE SAFE**		

2.1.12 Check for Ultimate Shear Strength IRC 18

Ultimate Shear Force, Vu =	1.5Vg + 2.5 Vq =		305.91	kN
Ultimate shear resistane of support section uncracked in flexure =	$V_{co} = 0.67 \times bh \sqrt{f_1^{\,2} + 0.8\, f_{cp}\, f_t} + \eta P \sin\theta$			
width of slab, b =	1000	mm		
over all depth, h =	0.50	m		
Principal tensile stress, ft =	$0.24\sqrt{f_{ck}}$		1.61	N/mm2
Compressive prestress at centroidal axis, fcp=	$\eta P / A$		5.28	N/mm2
Eccentricity, e =	259.10	mm		
Cables are concentric at support section				
Slope of cable = 4e/L	0.058			
Vco =	1167163.84	N		
	1167.16	kN		
As calculated before, Vu =	172.56	kN		

Vu < 50 % Vco thus no shear r/f is required

2.1.13 Supplementary Reinforcement

Min r/f to be provided	**0.18**	%	for fck >= M45
	891	mm2	
Providing Fe415 HYSD Bars	10	mm dia.	
X-Section area of a bar	78.5	mm2	
Spacing	88.10325477	mm	
Spacing Adapted	80	mm	

Provided at both top and bottom faces in the longitudinal and transverse direction

2.1.14 Design of End Block Reinforcement

Table for Bursting Tensile Force In End Blocks From IRC 18 2000

Ypo / Yo	Fbst / Pk
0.3	0.23
0.4	0.2
0.5	0.17
0.6	0.14
0.7	0.11

Tendon Force, Pk	1183.39	kN
Side Of Loaded Area, 2Ypo	**150**	mm
Side Of End-block, 2Yo	**300**	mm
Ypo / Yo	0.50	
Interpolating Fbst / Pk	**0.17**	
Bursting Tensile Force, Fbst	201.18	kN
Using Fe250 Mild steel bars	10	mm dia
Ast	**924.95**	mm2
Spacing	84.87	mm
Adapt Spacing	**80**	**mm**

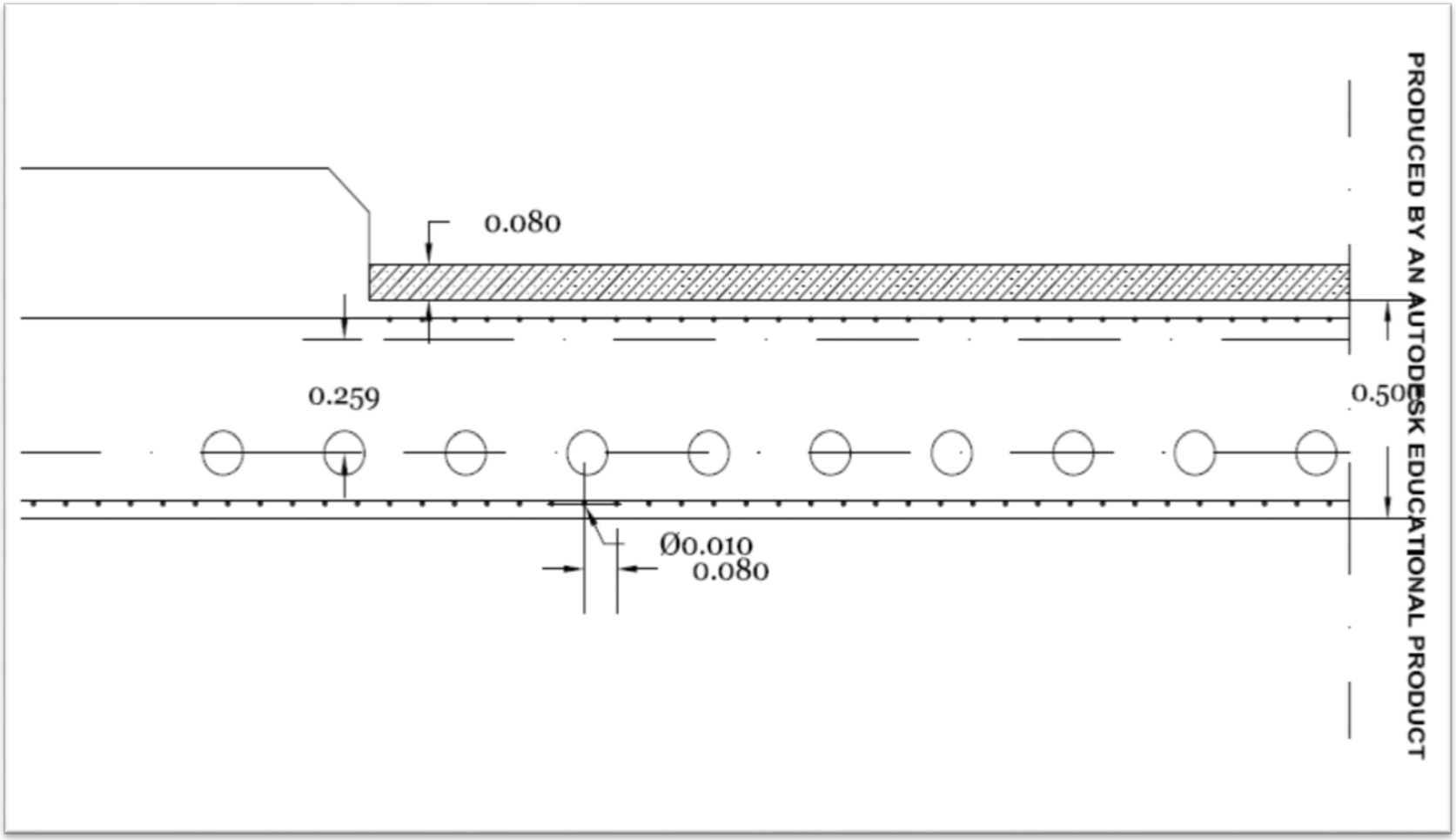


Figure 2.1.2: Detailing Of Deck Slab

2.3 Design of Pile Foundation

2.3.1 Given Constants & Particulars	Value	Units
Type Of Pile	Concrete Piles	
Unit weight of water	9.81	kN/m3
Dry Unit Weight Of Soil (a)	22	kN/m3
Saturated Unit weight of Soil (a)	18	kN/m3
Submerged Unit weight Of Soil (a)	8.19	kN/m3
Unit Cohesion , c	20	kN/m2
Adhesion Factor, **α**	0.75	
φ	0	Degree
Length, L1	5	m
Dry Unit Weight Of Soil (b)	23	kN/m3
Saturated Unit weight of Soil (b)	18.5	kN/m3
Submerged Unit weight Of Soil (b)	8.69	kN/m3
Unit Cohesion , c	22	kN/m2
Adhesion Factor, α	0.75	
φ	0	Digree
Length, L2	6	m
Dry Unit Weight Of Soil (c)	24	kN/m3
Saturated Unit weight of Soil (c)	22	kN/m3
Submerged Unit weight Of Soil (c)	12.19	kN/m3
Unit Cohesion , c	24	kN/m2
Adhesion Factor, α	0.75	
φ	0	Digree
Length, L3	20	m
Water table Depth from ground	Greater Depth	

L =	**5**		
γ dry =	**22**	Layer 1	
γ sub =	**8.19**		
		5	m
L =	**6**		
γ dry =	**23**	Layer 2	
γ sub =	**8.69**		
		11	m
L =	**20**		
γ dry =	**24**	Layer 3	
γ sub =	**12.19**		
		31	m

Figure 2.3.1: Diagram Of Soil Strata

2.3.2 Design of Individual pile

Length Of Pile	20	m
Diameter Of Pile	0.2	m
Base Of Pile Lies in	Layer 3	

Equation Governing design

$$Q_{up} = Q_b + Q_f$$

Qb i.e due to bearing action

Qf i.e. due to skin friction

2.3.2.1 Skin friction action of pile

$$Q_f = q_f \times A_s$$

Also

$$q_f = \alpha C + K\,\sigma^{*}\,tan\delta$$

Layer 1		
Length Of Pile	5	m
α . C	15	kN/m2
K	**1**	
Critical Depth (15 D)	3	m
δ = 3/4 * ∅ (for conc. piles)	0	Degree
Effective overburden pressure	γ L =	**110**
Avg Effective overburden pressure	**55**	kN/m2
qf	15	
As [Surface Area]	3.14	m2
qf * As	47.1	kN
Layer 2		
Length Of Pile	11	m
Corrected length	11	m
α . C	16.5	kN/m2
[loose sand=1 dense sand= 2] K	**0**	
Critical Depth (15 D)	3	m
δ = 3/4 * ∅ (for conc. piles)	0	degree
Effective s at top of pile in layer	γ L =	110
Effective s at base ofpile in layer	γ L =	**363**
Avg Effective overburden pressure	**236.5**	kN/m2
qf	16.5	kN/m2
As [Surface Area]	6.908	m2
qf * As	113.98	kN
Layer 3		
Length Of Pile	9	m

α . C	18		kN/m2
[loose sand=1 dense sand= 2] K	**2**		
Critical Depth (15 D)	3		m
δ = 3/4 * ∅ (for conc. piles)	0		degree
Effective s at top of pile in layer	γ L =		363
Effective s at base ofpile in layer	γ L =		**579**
Avg Effective overburden pressure	**471**		kN/m2
qf	18		kN/m2
As [Surface Area]	5.652		m2
qf * As	101.74		kN
Total skin friction action [Qf]		**262.82 kN**	

2.3.2.2 Bearing Action Of A Pile

Equation governing the design is as follows

$$q_b = cN_c + \sigma^* N_q + 0.5\,\gamma\, B\, N_\gamma$$

Unit Cohesion, c	24	kN/m2
Bearing capacity factors:		
Nc	9	
Nq	0	

Note: since third term is << second term comparatively so it is neglected giving design on conservative sign

Area of Pile Base (Ab)	0.0314	m2
qb	216	kN/m2
Bearing Action Of Pile	6.7824	kN
Ultimate load capacity of pile	**269.60**	**kN**

Chapter 3

DESIGN OF BRIDGE USING CSI BRIDGE

3.1 Design of Highway Deck

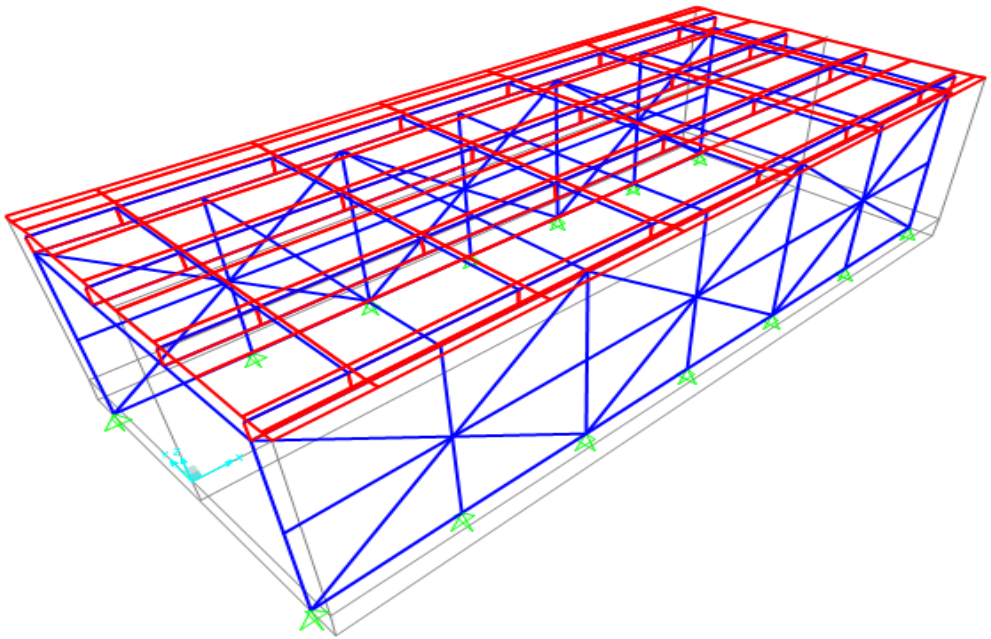


Figure 3.1.1: 3D Line Diagram of Highway Bridge

Data Available:

Type of Bridge: Steel I Girder Bridge

Span Of Bridge: 24 m

Total Width: 11 m

Elevation: 6.5 m

Number of Lanes: 2

Software Used: CSI Bridge

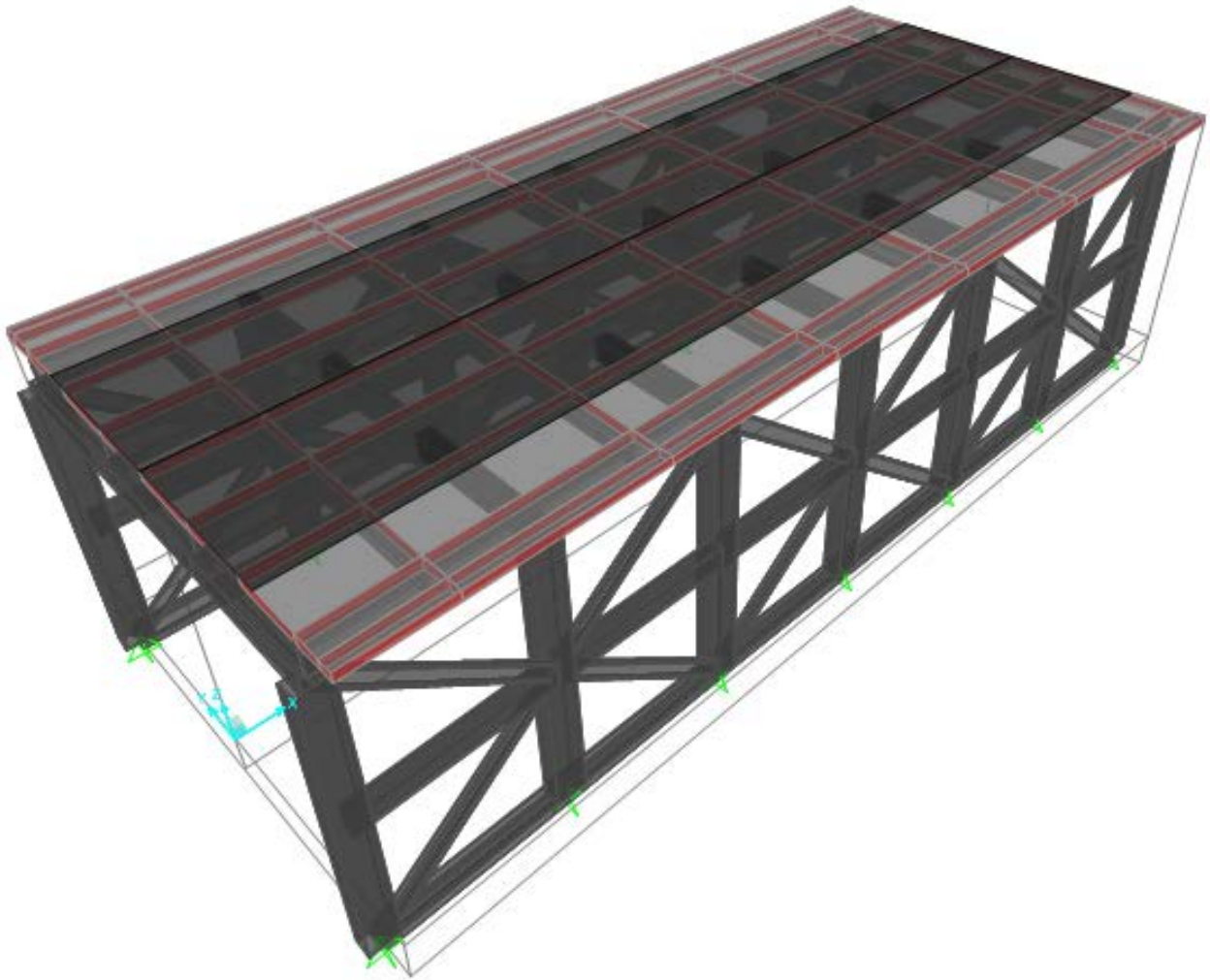


Figure 3.1.2: 3D Extruded view of Highway Bridge

3.1.1 Active Degrees of Freedom

UX	UY	UZ	RX	RY	RZ
Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Yes	Yes	Yes	Yes	Yes	Yes

3.1.2 Bridge DesReqSuper 01 - General

DesReqName	CheckType	BridgeObj	Run	Status
REQ	StICompStrength	HIGHWAY	Yes	Finished

3.1.3 Bridge Abutment Definitions

Abutment	GirderSup	SubType	FSProp
BABT1	Bottom	Spring	Fixed

3.1.4 Bridge Bearing Definitions

Bearing	Type	U1Type	U2Type	U3Type	R1Type	R2Type	R3Type
BBRG1	User	Fixed	Fixed	Fixed	Free	Free	Free

3.1.5 Bridge Diaphragm Definitions

Diaph	DiaphType	Beam	IncConnPlat
DIAPHRAGM	Single Beam	ISMB350	No

3.1.6 Bridge Layout Line 1 - General

LayoutLine	Coordinate System	X	Y	Z
		m	m	m
HIGHWAY LAYOUT	GLOBAL	0	0	6.5

Bridge Layout Line 2 - Horizontal Layout Data

LayoutLine	**SegType**	**Station**	**Bearing**	**X**	**Y**
HIGHWAY LAYOUT	Initial Station and Bearing	0	N900000E	0	0
HIGHWAY LAYOUT	Straight at Previous Bearing to End	24		24	0

Bridge Layout Line 3 - Vertical Layout Data

LayoutLine	**SegType**	**Station**	**Z**
Text	Text	m	m
HIGHWAY LAYOUT	Initial Station, Elevation Z and Grade	0	6.5
HIGHWAY LAYOUT	Constant at Previous Grade to End	24	6.5

Bridge Layout Line 4 - Layout Line Points

LayoutLine	**Point**	**CoordSys**	**X**	**Y**	**Z**
Text	Unitless		m	m	m
HIGHWAY LAYOUT	1	GLOBAL	0	0	6.5
HIGHWAY LAYOUT	2	GLOBAL	24	0	6.5

3.1.7 Bridge Object Definitions 01 - General

BridgeObj	LayoutLine	NumSpans	NumBents	SuperElev
		Unitless	Unitless	Yes/No
HIGHWAY	HIGHWAY LAYOUT	1	0	No

Bridge Object Definitions 02 - Reference Line

BridgeObj	SpanName	Station	Length	SpanType
		m	m	
HIGHWAY	Start Abutment	0	0	Start Abutment
HIGHWAY	Span To End Abutment	24	24	Full Span to End Abutment

Bridge Object Definitions 03 – Diaphragms (Cross Beams)

BridgeObj	SpanName	DiaphProp	DiaphDist	DiaphBrg	DiaphLoc
HIGHWAY	Span To End Abutment	DIAPHRAGM	2	Default	All Spaces
HIGHWAY	Span To End Abutment	DIAPHRAGM	6	Default	All Spaces
HIGHWAY	Span To End Abutment	DIAPHRAGM	10	Default	All Spaces
HIGHWAY	Span To End Abutment	DIAPHRAGM	14	Default	All Spaces
HIGHWAY	Span To End Abutment	DIAPHRAGM	18	Default	All Spaces
HIGHWAY	Span To End Abutment	DIAPHRAGM	22	Default	All Spaces

3.1.8 Bridge Object Cross Beam Forces

Distance	LocType	StepType	P	V2	V3	T	M2	M3	X	Y	Z
m			KN	KN	KN	KN-m	KN-m	KN-m	m	m	m
0.00	After	Max	-1.63	-75.97	7.46	693.44	152.89	0.26	0.00	0.00	6.31
0.00	After	Min	-63.90	-644.20	-7.46	-693.44	-152.89	-53.19	0.00	0.00	6.31
2.00	Before	Max	-1.63	187.95	7.46	524.24	158.70	829.68	2.00	0.00	6.31
2.00	Before	Min	-63.90	-350.45	-7.46	-524.24	-158.70	4.35	2.00	0.00	6.31
2.00	After	Max	-1.63	373.32	7.46	609.71	158.70	829.68	2.00	0.00	6.31
2.00	After	Min	-63.90	-225.44	-7.46	-609.71	-158.70	4.35	2.00	0.00	6.31
6.00	Before	Max	25.49	293.60	9.95	734.36	257.73	910.00	6.00	0.00	6.31
6.00	Before	Min	-91.92	-378.00	-9.95	-734.36	-257.73	-190.39	6.00	0.00	6.31
6.00	After	Max	25.49	419.13	9.95	735.46	257.73	910.00	6.00	0.00	6.31
6.00	After	Min	-91.92	-260.52	-9.95	-735.46	-257.73	-190.39	6.00	0.00	6.31
10.00	Before	Max	24.32	288.32	8.76	747.98	270.27	877.68	10.00	0.00	6.31
10.00	Before	Min	-102.11	-400.87	-8.76	-747.98	-270.27	-145.03	10.00	0.00	6.31
10.00	After	Max	24.32	406.91	8.76	735.11	270.27	877.68	10.00	0.00	6.31
10.00	After	Min	-102.11	-283.67	-8.76	-735.11	-270.27	-145.03	10.00	0.00	6.31
14.00	Before	Max	27.24	284.66	9.07	743.84	271.88	877.96	14.00	0.00	6.31
14.00	Before	Min	-102.08	-404.88	-9.07	-743.84	-271.88	-166.74	14.00	0.00	6.31
14.00	After	Max	27.24	403.74	9.07	740.47	271.88	877.96	14.00	0.00	6.31
14.00	After	Min	-102.08	-288.22	-9.07	-740.47	-271.88	-166.74	14.00	0.00	6.31
18.00	Before	Max	26.88	262.74	10.05	744.02	258.01	912.00	18.00	0.00	6.31

18.00	Before	Min	-92.80	-420.48	-10.05	-744.02	-258.01	-208.29	18.00	0.00	6.31
18.00	After	Max	26.88	381.94	10.05	732.94	258.01	912.00	18.00	0.00	6.31
18.00	After	Min	-92.80	-296.57	-10.05	-732.94	-258.01	-208.29	18.00	0.00	6.31
22.00	Before	Max	-2.41	227.24	7.63	621.07	158.91	836.67	22.00	0.00	6.31
22.00	Before	Min	-63.82	-378.37	-7.63	-621.07	-158.91	4.35	22.00	0.00	6.31
22.00	After	Max	-2.41	353.85	7.63	526.43	158.91	836.67	22.00	0.00	6.31
22.00	After	Min	-63.82	-193.00	-7.63	-526.43	-158.91	4.35	22.00	0.00	6.31
24.00	Before	Max	-2.41	649.57	7.63	702.55	154.24	0.74	24.00	0.00	6.31
24.00	Before	Min	-63.82	75.97	-7.63	-702.55	-154.24	-53.55	24.00	0.00	6.31

3.1.9 Case - Moving Load 1 - Lane Assignments

Case	AssignNum	VehClass	ScaleFactor	MinLoaded	MaxLoaded	NumLanes
	Unitless		Unitless	Unitless	Unitless	Unitless
LIVE LOAD	1	IRC_A-1	1	0	2	2
LIVE LOAD	2	IRC_AA_Tracked-1	1	0	1	2
LIVE LOAD	3	IRC_AA_Wheeled-1	1	0	1	2

3.1.9 Bridge Object Girder Forces

Girder	Distance	LocType	OutputCase	StepType	P	V2	V3	T	M2	M3
	m				KN	KN	KN	KN-m	KN-m	KN-m
Left Exterior Girder	0.00	After	COMB1	Max	0.27	-28.46	3.39	46.51	8.65	2.08
Left Exterior Girder	0.00	After	COMB1	Min	-44.37	-156.61	-5.67	-60.08	-7.10	-23.63
Left Exterior Girder	2.00	Before	COMB1	Max	-3.07	25.66	79.14	46.25	-3.19	170.70

Left Exterior Girder	2.00	Before	COMB1	Min	-65.09	-62.16	10.81	-90.48	-58.27	20.12
Left Exterior Girder	2.00	After	COMB1	Max	5.49	107.51	-17.82	86.87	10.89	170.99
Left Exterior Girder	2.00	After	COMB1	Min	-70.65	-0.52	-97.83	-76.12	-71.40	20.43
Left Exterior Girder	6.00	Before	COMB1	Max	47.41	25.53	84.61	64.83	9.86	115.61
Left Exterior Girder	6.00	Before	COMB1	Min	-113.69	-99.19	13.96	-92.25	-41.07	6.93
Left Exterior Girder	6.00	After	COMB1	Max	54.83	103.45	-20.12	88.87	14.59	115.72
Left Exterior Girder	6.00	After	COMB1	Min	-115.47	-23.78	-81.65	-63.32	-45.89	6.90
Left Exterior Girder	10.00	Before	COMB1	Max	61.58	23.97	80.98	62.09	8.83	113.93
Left Exterior Girder	10.00	Before	COMB1	Min	-120.00	-104.83	14.51	-88.44	-40.41	1.58
Left Exterior Girder	10.00	After	COMB1	Max	60.17	99.42	-18.06	87.26	11.19	113.85
Left Exterior Girder	10.00	After	COMB1	Min	-118.16	-29.09	-84.70	-63.49	-39.71	1.95
Left Exterior Girder	14.00	Before	COMB1	Max	66.28	27.21	83.87	61.84	8.42	114.07
Left Exterior Girder	14.00	Before	COMB1	Min	-118.00	-101.49	18.06	-88.91	-39.63	3.10
Left Exterior Girder	14.00	After	COMB1	Max	67.92	102.93	-14.51	87.16	11.50	114.19
Left Exterior Girder	14.00	After	COMB1	Min	-118.51	-25.97	-82.37	-64.00	-41.04	3.42
Left Exterior Girder	18.00	Before	COMB1	Max	59.82	22.70	81.56	62.32	12.17	115.88
Left Exterior Girder	18.00	Before	COMB1	Min	-117.85	-106.23	20.12	-90.62	-50.07	4.90
Left Exterior Girder	18.00	After	COMB1	Max	52.15	97.63	-14.28	91.88	10.22	115.89
Left Exterior Girder	18.00	After	COMB1	Min	-115.66	-27.69	-86.48	-66.87	-41.54	5.57
Left Exterior Girder	22.00	Before	COMB1	Max	5.82	0.53	99.25	76.18	10.74	172.60
Left Exterior Girder	22.00	Before	COMB1	Min	-71.17	-109.66	17.82	-88.93	-72.80	21.16
Left Exterior Girder	22.00	After	COMB1	Max	-3.19	61.54	-10.52	90.55	-3.19	172.18
Left Exterior Girder	22.00	After	COMB1	Min	-64.86	-27.52	-80.88	-48.14	-59.44	20.86
Left Exterior Girder	24.00	Before	COMB1	Max	-0.60	158.12	6.75	60.15	8.65	1.50
Left Exterior Girder	24.00	Before	COMB1	Min	-44.07	29.57	-3.23	-44.97	-6.50	-23.99
Interior Girder 1	0.00	After	COMB1	Max	15.36	8.13	11.01	63.64	14.82	10.12
Interior Girder 1	0.00	After	COMB1	Min	-5.10	-238.09	-0.23	-104.86	-0.48	-16.15
Interior Girder 1	2.00	Before	COMB1	Max	30.21	100.96	86.17	80.82	16.81	322.31

Interior Girder 1	2.00	Before	COMB1	Min	-3.95	-155.07	-9.88	-140.66	-57.52	-43.22
Interior Girder 1	2.00	After	COMB1	Max	43.04	135.68	3.36	117.86	12.61	322.29
Interior Girder 1	2.00	After	COMB1	Min	-11.20	-145.45	######	-121.12	-71.98	-42.68
Interior Girder 1	6.00	Before	COMB1	Max	72.01	159.55	94.58	113.67	14.53	386.44
Interior Girder 1	6.00	Before	COMB1	Min	-42.70	-151.00	-6.83	-123.64	-40.35	#####
Interior Girder 1	6.00	After	COMB1	Max	73.77	164.74	2.42	124.45	13.15	386.43
Interior Girder 1	6.00	After	COMB1	Min	-47.46	-149.26	-91.52	-115.72	-36.68	#####
Interior Girder 1	10.00	Before	COMB1	Max	73.50	158.91	90.49	110.99	14.71	373.05
Interior Girder 1	10.00	Before	COMB1	Min	-51.90	-158.35	-9.48	-125.02	-42.37	-85.14
Interior Girder 1	10.00	After	COMB1	Max	71.75	161.94	6.06	123.29	11.30	372.96
Interior Girder 1	10.00	After	COMB1	Min	-50.93	-155.82	-94.66	-116.66	-40.59	-85.01
Interior Girder 1	14.00	Before	COMB1	Max	72.93	154.90	93.37	110.94	11.65	373.13
Interior Girder 1	14.00	Before	COMB1	Min	-53.83	-162.79	-7.14	-125.39	-42.25	-98.59
Interior Girder 1	14.00	After	COMB1	Max	74.35	157.64	8.42	123.19	14.40	372.89
Interior Girder 1	14.00	After	COMB1	Min	-55.89	-160.28	-92.40	-116.87	-40.09	-98.63
Interior Girder 1	18.00	Before	COMB1	Max	76.39	148.78	90.96	110.27	13.36	387.37
Interior Girder 1	18.00	Before	COMB1	Min	-50.55	-166.15	-4.16	-126.48	-39.86	#####
Interior Girder 1	18.00	After	COMB1	Max	73.96	150.75	6.52	122.41	14.80	387.59
Interior Girder 1	18.00	After	COMB1	Min	-44.05	-161.46	-96.84	-119.47	-38.73	#####
Interior Girder 1	22.00	Before	COMB1	Max	44.30	144.97	116.26	124.56	12.38	321.20
Interior Girder 1	22.00	Before	COMB1	Min	-10.15	-137.73	-5.69	-120.82	-74.40	-42.68
Interior Girder 1	22.00	After	COMB1	Max	31.08	155.15	12.14	143.70	17.98	321.02
Interior Girder 1	22.00	After	COMB1	Min	-2.32	-103.52	-88.87	-88.21	-59.52	-43.22
Interior Girder 1	24.00	Before	COMB1	Max	15.53	239.00	0.27	105.54	15.05	10.31
Interior Girder 1	24.00	Before	COMB1	Min	-5.11	-8.13	-10.65	-64.24	-0.47	-16.24
Interior Girder 2	0.00	After	COMB1	Max	15.36	8.13	0.23	104.86	0.48	10.12
Interior Girder 2	0.00	After	COMB1	Min	-5.10	-238.09	-11.01	-63.64	-14.82	-16.15
Interior Girder 2	2.00	Before	COMB1	Max	30.21	100.96	9.88	140.66	57.52	322.31

Interior Girder 2	2.00	Before	COMB1	Min	-3.95	-155.07	-86.17	-80.82	-16.81	-43.22
Interior Girder 2	2.00	After	COMB1	Max	43.04	135.68	112.79	121.12	71.98	322.29
Interior Girder 2	2.00	After	COMB1	Min	-11.20	-145.45	-3.36	-117.86	-12.61	-42.68
Interior Girder 2	6.00	Before	COMB1	Max	72.01	159.55	6.83	123.64	40.35	386.44
Interior Girder 2	6.00	Before	COMB1	Min	-42.70	-151.00	-94.58	-113.67	-14.53	#####
Interior Girder 2	6.00	After	COMB1	Max	73.77	164.74	91.52	115.72	36.68	386.43
Interior Girder 2	6.00	After	COMB1	Min	-47.46	-149.26	-2.42	-124.45	-13.15	#####
Interior Girder 2	10.00	Before	COMB1	Max	73.50	158.91	9.48	125.02	42.37	373.05
Interior Girder 2	10.00	Before	COMB1	Min	-51.90	-158.35	-90.49	-110.99	-14.71	-85.14
Interior Girder 2	10.00	After	COMB1	Max	71.75	161.94	94.66	116.66	40.59	372.96
Interior Girder 2	10.00	After	COMB1	Min	-50.93	-155.82	-6.06	-123.29	-11.30	-85.01
Interior Girder 2	14.00	Before	COMB1	Max	72.93	154.90	7.14	125.39	42.25	373.13
Interior Girder 2	14.00	Before	COMB1	Min	-53.83	-162.79	-93.37	-110.94	-11.65	-98.59
Interior Girder 2	14.00	After	COMB1	Max	74.35	157.64	92.40	116.87	40.09	372.89
Interior Girder 2	14.00	After	COMB1	Min	-55.89	-160.28	-8.42	-123.19	-14.40	-98.63
Interior Girder 2	18.00	Before	COMB1	Max	76.39	148.78	4.16	126.48	39.86	387.37
Interior Girder 2	18.00	Before	COMB1	Min	-50.55	-166.15	-90.96	-110.27	-13.36	#####
Interior Girder 2	18.00	After	COMB1	Max	73.96	150.75	96.84	119.47	38.73	387.59
Interior Girder 2	18.00	After	COMB1	Min	-44.05	-161.46	-6.52	-122.41	-14.80	#####
Interior Girder 2	22.00	Before	COMB1	Max	44.30	144.97	5.69	120.82	74.40	321.20
Interior Girder 2	22.00	Before	COMB1	Min	-10.15	-137.73	######	-124.56	-12.38	-42.68
Interior Girder 2	22.00	After	COMB1	Max	31.08	155.15	88.87	88.21	59.52	321.02
Interior Girder 2	22.00	After	COMB1	Min	-2.32	-103.52	-12.14	-143.70	-17.98	-43.22
Interior Girder 2	24.00	Before	COMB1	Max	15.53	239.00	10.65	64.24	0.47	10.31
Interior Girder 2	24.00	Before	COMB1	Min	-5.11	-8.13	-0.27	-105.54	-15.05	-16.24
Right Exterior Girder	0.00	After	COMB1	Max	0.27	-28.46	5.67	60.08	7.10	2.08
Right Exterior Girder	0.00	After	COMB1	Min	-44.37	-156.61	-3.39	-46.51	-8.65	-23.63
Right Exterior Girder	2.00	Before	COMB1	Max	-3.07	25.66	-10.81	90.48	58.27	170.70

Right Exterior Girder	2.00	Before	COMB1	Min	-65.09	-62.16	-79.14	-46.25	3.19	20.12
Right Exterior Girder	2.00	After	COMB1	Max	5.49	107.51	97.83	76.12	71.40	170.99
Right Exterior Girder	2.00	After	COMB1	Min	-70.65	-0.52	17.82	-86.87	-10.89	20.43
Right Exterior Girder	6.00	Before	COMB1	Max	47.41	25.53	-13.96	92.25	41.07	115.61
Right Exterior Girder	6.00	Before	COMB1	Min	-113.69	-99.19	-84.61	-64.83	-9.86	6.93
Right Exterior Girder	6.00	After	COMB1	Max	54.83	103.45	81.65	63.32	45.89	115.72
Right Exterior Girder	6.00	After	COMB1	Min	-115.47	-23.78	20.12	-88.87	-14.59	6.90
Right Exterior Girder	10.00	Before	COMB1	Max	61.58	23.97	-14.51	88.44	40.41	113.93
Right Exterior Girder	10.00	Before	COMB1	Min	-120.00	-104.83	-80.98	-62.09	-8.83	1.58
Right Exterior Girder	10.00	After	COMB1	Max	60.17	99.42	84.70	63.49	39.71	113.85
Right Exterior Girder	10.00	After	COMB1	Min	-118.16	-29.09	18.06	-87.26	-11.19	1.95
Right Exterior Girder	14.00	Before	COMB1	Max	66.28	27.21	-18.06	88.91	39.63	114.07
Right Exterior Girder	14.00	Before	COMB1	Min	-118.00	-101.49	-83.87	-61.84	-8.42	3.10
Right Exterior Girder	14.00	After	COMB1	Max	67.92	102.93	82.37	64.00	41.04	114.19
Right Exterior Girder	14.00	After	COMB1	Min	-118.51	-25.97	14.51	-87.16	-11.50	3.42
Right Exterior Girder	18.00	Before	COMB1	Max	59.82	22.70	-20.12	90.62	50.07	115.88
Right Exterior Girder	18.00	Before	COMB1	Min	-117.85	-106.23	-81.56	-62.32	-12.17	4.90
Right Exterior Girder	18.00	After	COMB1	Max	52.15	97.63	86.48	66.87	41.54	115.89
Right Exterior Girder	18.00	After	COMB1	Min	-115.66	-27.69	14.28	-91.88	-10.22	5.57
Right Exterior Girder	22.00	Before	COMB1	Max	5.82	0.53	-17.82	88.93	72.80	172.60
Right Exterior Girder	22.00	Before	COMB1	Min	-71.17	-109.66	-99.25	-76.18	-10.74	21.16
Right Exterior Girder	22.00	After	COMB1	Max	-3.19	61.54	80.88	48.14	59.44	172.18
Right Exterior Girder	22.00	After	COMB1	Min	-64.86	-27.52	10.52	-90.55	3.19	20.86
Right Exterior Girder	24.00	Before	COMB1	Max	-0.60	158.12	3.23	44.97	6.50	1.50
Right Exterior Girder	24.00	Before	COMB1	Min	-44.07	29.57	-6.75	-60.15	-8.65	-23.99

3.1.10 Joint Coordinates

Joint	CoordSys	CoordType	GlobalX	GlobalY	GlobalZ
			m	m	m
1	GLOBAL	Cartesian	0.00	5.490	6.40
2	GLOBAL	Cartesian	0.00	5.185	6.40
5	GLOBAL	Cartesian	0.00	4.575	6.38
7	GLOBAL	Cartesian	0.00	3.050	6.38
9	GLOBAL	Cartesian	0.00	1.525	6.38
11	GLOBAL	Cartesian	0.00	0.000	6.38
13	GLOBAL	Cartesian	0.00	-1.525	6.38
15	GLOBAL	Cartesian	0.00	-3.050	6.38
17	GLOBAL	Cartesian	0.00	-4.575	6.38
19	GLOBAL	Cartesian	0.00	-5.185	6.40
21	GLOBAL	Cartesian	0.00	-5.490	6.40
23	GLOBAL	Cartesian	0.00	4.575	6.18
24	GLOBAL	Cartesian	0.00	4.575	5.62
25	GLOBAL	Cartesian	4.00	4.575	5.62
27	GLOBAL	Cartesian	0.00	1.525	6.18
28	GLOBAL	Cartesian	0.00	1.525	5.62
29	GLOBAL	Cartesian	4.00	1.525	5.62
31	GLOBAL	Cartesian	0.00	-1.525	6.18
32	GLOBAL	Cartesian	0.00	-1.525	5.62
33	GLOBAL	Cartesian	4.00	-1.525	5.62
35	GLOBAL	Cartesian	0.00	-4.575	6.18
36	GLOBAL	Cartesian	0.00	-4.575	5.62
37	GLOBAL	Cartesian	4.00	-4.575	5.62
58	GLOBAL	Cartesian	8.00	4.575	5.62
60	GLOBAL	Cartesian	8.00	1.525	5.62
62	GLOBAL	Cartesian	8.00	-1.525	5.62
64	GLOBAL	Cartesian	8.00	-4.575	5.62
77	GLOBAL	Cartesian	12.00	4.575	5.62
79	GLOBAL	Cartesian	12.00	1.525	5.62
81	GLOBAL	Cartesian	12.00	-1.525	5.62
83	GLOBAL	Cartesian	12.00	-4.575	5.62
96	GLOBAL	Cartesian	16.00	4.575	5.62
98	GLOBAL	Cartesian	16.00	1.525	5.62
100	GLOBAL	Cartesian	16.00	-1.525	5.62
102	GLOBAL	Cartesian	16.00	-4.575	5.62
115	GLOBAL	Cartesian	20.00	4.575	5.62
117	GLOBAL	Cartesian	20.00	1.525	5.62
119	GLOBAL	Cartesian	20.00	-1.525	5.62
121	GLOBAL	Cartesian	20.00	-4.575	5.62

123	GLOBAL	Cartesian	24.00	5.185	6.40
124	GLOBAL	Cartesian	24.00	5.490	6.40
125	GLOBAL	Cartesian	24.00	4.575	6.38
126	GLOBAL	Cartesian	24.00	3.050	6.38
127	GLOBAL	Cartesian	24.00	1.525	6.38
128	GLOBAL	Cartesian	24.00	0.000	6.38
129	GLOBAL	Cartesian	24.00	-1.525	6.38
130	GLOBAL	Cartesian	24.00	-3.050	6.38
131	GLOBAL	Cartesian	24.00	-4.575	6.38
132	GLOBAL	Cartesian	24.00	-5.185	6.40
133	GLOBAL	Cartesian	24.00	-5.490	6.40
134	GLOBAL	Cartesian	24.00	4.575	5.62
135	GLOBAL	Cartesian	24.00	4.575	6.18
136	GLOBAL	Cartesian	24.00	1.525	5.62
137	GLOBAL	Cartesian	24.00	1.525	6.18
138	GLOBAL	Cartesian	24.00	-1.525	5.62
139	GLOBAL	Cartesian	24.00	-1.525	6.18
140	GLOBAL	Cartesian	24.00	-4.575	5.62
141	GLOBAL	Cartesian	24.00	-4.575	6.18
153	GLOBAL	Cartesian	0.00	-4.575	-0.88
154	GLOBAL	Cartesian	4.00	-4.575	-0.88
155	GLOBAL	Cartesian	8.00	-4.575	-0.88
156	GLOBAL	Cartesian	12.00	-4.575	-0.88
157	GLOBAL	Cartesian	16.00	-4.575	-0.88
158	GLOBAL	Cartesian	20.00	-4.575	-0.88
159	GLOBAL	Cartesian	24.00	-4.575	-0.88
160	GLOBAL	Cartesian	0.00	-4.575	2.37
161	GLOBAL	Cartesian	4.00	-4.575	2.37
162	GLOBAL	Cartesian	8.00	-4.575	2.37
163	GLOBAL	Cartesian	12.00	-4.575	2.37
164	GLOBAL	Cartesian	16.00	-4.575	2.37
165	GLOBAL	Cartesian	20.00	-4.575	2.37
166	GLOBAL	Cartesian	24.00	-4.575	2.37
188	GLOBAL	Cartesian	0.00	4.575	-0.88
189	GLOBAL	Cartesian	4.00	4.575	-0.88
190	GLOBAL	Cartesian	8.00	4.575	-0.88
191	GLOBAL	Cartesian	12.00	4.575	-0.88
192	GLOBAL	Cartesian	16.00	4.575	-0.88
193	GLOBAL	Cartesian	20.00	4.575	-0.88
194	GLOBAL	Cartesian	24.00	4.575	-0.88
195	GLOBAL	Cartesian	0.00	4.575	2.37
196	GLOBAL	Cartesian	4.00	4.575	2.37
197	GLOBAL	Cartesian	8.00	4.575	2.37

198	GLOBAL	Cartesian	12.00	4.575	2.37
199	GLOBAL	Cartesian	16.00	4.575	2.37
200	GLOBAL	Cartesian	20.00	4.575	2.37
201	GLOBAL	Cartesian	24.00	4.575	2.37
221	GLOBAL	Cartesian	6.00	5.185	6.40
222	GLOBAL	Cartesian	6.00	5.490	6.40
223	GLOBAL	Cartesian	6.00	4.575	6.38
224	GLOBAL	Cartesian	6.00	3.050	6.38
225	GLOBAL	Cartesian	6.00	1.525	6.38
226	GLOBAL	Cartesian	6.00	0.000	6.38
227	GLOBAL	Cartesian	6.00	-1.525	6.38
228	GLOBAL	Cartesian	6.00	-3.050	6.38
229	GLOBAL	Cartesian	6.00	-4.575	6.38
230	GLOBAL	Cartesian	6.00	-5.185	6.40
231	GLOBAL	Cartesian	6.00	-5.490	6.40
232	GLOBAL	Cartesian	6.00	4.575	5.62
233	GLOBAL	Cartesian	6.00	4.575	6.18
234	GLOBAL	Cartesian	6.00	1.525	5.62
235	GLOBAL	Cartesian	6.00	1.525	6.18
236	GLOBAL	Cartesian	6.00	-1.525	5.62
237	GLOBAL	Cartesian	6.00	-1.525	6.18
238	GLOBAL	Cartesian	6.00	-4.575	5.62
239	GLOBAL	Cartesian	6.00	-4.575	6.18
278	GLOBAL	Cartesian	18.00	5.185	6.40
279	GLOBAL	Cartesian	18.00	5.490	6.40
280	GLOBAL	Cartesian	18.00	4.575	6.38
281	GLOBAL	Cartesian	18.00	3.050	6.38
282	GLOBAL	Cartesian	18.00	1.525	6.38
283	GLOBAL	Cartesian	18.00	0.000	6.38
284	GLOBAL	Cartesian	18.00	-1.525	6.38
285	GLOBAL	Cartesian	18.00	-3.050	6.38
286	GLOBAL	Cartesian	18.00	-4.575	6.38
287	GLOBAL	Cartesian	18.00	-5.185	6.40
288	GLOBAL	Cartesian	18.00	-5.490	6.40
289	GLOBAL	Cartesian	18.00	4.575	5.62
290	GLOBAL	Cartesian	18.00	4.575	6.18
291	GLOBAL	Cartesian	18.00	1.525	5.62
292	GLOBAL	Cartesian	18.00	1.525	6.18
293	GLOBAL	Cartesian	18.00	-1.525	5.62
294	GLOBAL	Cartesian	18.00	-1.525	6.18
295	GLOBAL	Cartesian	18.00	-4.575	5.62
296	GLOBAL	Cartesian	18.00	-4.575	6.18
316	GLOBAL	Cartesian	2.00	5.185	6.40

317	GLOBAL	Cartesian	2.00	5.490	6.40
318	GLOBAL	Cartesian	2.00	4.575	6.38
319	GLOBAL	Cartesian	2.00	3.050	6.38
320	GLOBAL	Cartesian	2.00	1.525	6.38
321	GLOBAL	Cartesian	2.00	0.000	6.38
322	GLOBAL	Cartesian	2.00	-1.525	6.38
323	GLOBAL	Cartesian	2.00	-3.050	6.38
324	GLOBAL	Cartesian	2.00	-4.575	6.38
325	GLOBAL	Cartesian	2.00	-5.185	6.40
326	GLOBAL	Cartesian	2.00	-5.490	6.40
327	GLOBAL	Cartesian	2.00	4.575	5.62
328	GLOBAL	Cartesian	2.00	4.575	6.18
329	GLOBAL	Cartesian	2.00	1.525	5.62
330	GLOBAL	Cartesian	2.00	1.525	6.18
331	GLOBAL	Cartesian	2.00	-1.525	5.62
332	GLOBAL	Cartesian	2.00	-1.525	6.18
333	GLOBAL	Cartesian	2.00	-4.575	5.62
334	GLOBAL	Cartesian	2.00	-4.575	6.18
335	GLOBAL	Cartesian	10.00	5.185	6.40
336	GLOBAL	Cartesian	10.00	5.490	6.40
337	GLOBAL	Cartesian	10.00	4.575	6.38
338	GLOBAL	Cartesian	10.00	3.050	6.38
339	GLOBAL	Cartesian	10.00	1.525	6.38
340	GLOBAL	Cartesian	10.00	0.000	6.38
341	GLOBAL	Cartesian	10.00	-1.525	6.38
342	GLOBAL	Cartesian	10.00	-3.050	6.38
343	GLOBAL	Cartesian	10.00	-4.575	6.38
344	GLOBAL	Cartesian	10.00	-5.185	6.40
345	GLOBAL	Cartesian	10.00	-5.490	6.40
346	GLOBAL	Cartesian	10.00	4.575	5.62
347	GLOBAL	Cartesian	10.00	4.575	6.18
348	GLOBAL	Cartesian	10.00	1.525	5.62
349	GLOBAL	Cartesian	10.00	1.525	6.18
350	GLOBAL	Cartesian	10.00	-1.525	5.62
351	GLOBAL	Cartesian	10.00	-1.525	6.18
352	GLOBAL	Cartesian	10.00	-4.575	5.62
353	GLOBAL	Cartesian	10.00	-4.575	6.18
354	GLOBAL	Cartesian	14.00	5.185	6.40
355	GLOBAL	Cartesian	14.00	5.490	6.40
356	GLOBAL	Cartesian	14.00	4.575	6.38
357	GLOBAL	Cartesian	14.00	3.050	6.38
358	GLOBAL	Cartesian	14.00	1.525	6.38
359	GLOBAL	Cartesian	14.00	0.000	6.38

360	GLOBAL	Cartesian	14.00	-1.525	6.38
361	GLOBAL	Cartesian	14.00	-3.050	6.38
362	GLOBAL	Cartesian	14.00	-4.575	6.38
363	GLOBAL	Cartesian	14.00	-5.185	6.40
364	GLOBAL	Cartesian	14.00	-5.490	6.40
365	GLOBAL	Cartesian	14.00	4.575	5.62
366	GLOBAL	Cartesian	14.00	4.575	6.18
367	GLOBAL	Cartesian	14.00	1.525	5.62
368	GLOBAL	Cartesian	14.00	1.525	6.18
369	GLOBAL	Cartesian	14.00	-1.525	5.62
370	GLOBAL	Cartesian	14.00	-1.525	6.18
371	GLOBAL	Cartesian	14.00	-4.575	5.62
372	GLOBAL	Cartesian	14.00	-4.575	6.18
373	GLOBAL	Cartesian	22.00	5.185	6.40
374	GLOBAL	Cartesian	22.00	5.490	6.40
375	GLOBAL	Cartesian	22.00	4.575	6.38
376	GLOBAL	Cartesian	22.00	3.050	6.38
377	GLOBAL	Cartesian	22.00	1.525	6.38
378	GLOBAL	Cartesian	22.00	0.000	6.38
379	GLOBAL	Cartesian	22.00	-1.525	6.38
380	GLOBAL	Cartesian	22.00	-3.050	6.38
381	GLOBAL	Cartesian	22.00	-4.575	6.38
382	GLOBAL	Cartesian	22.00	-5.185	6.40
383	GLOBAL	Cartesian	22.00	-5.490	6.40
384	GLOBAL	Cartesian	22.00	4.575	5.62
385	GLOBAL	Cartesian	22.00	4.575	6.18
386	GLOBAL	Cartesian	22.00	1.525	5.62
387	GLOBAL	Cartesian	22.00	1.525	6.18
388	GLOBAL	Cartesian	22.00	-1.525	5.62
389	GLOBAL	Cartesian	22.00	-1.525	6.18
390	GLOBAL	Cartesian	22.00	-4.575	5.62
391	GLOBAL	Cartesian	22.00	-4.575	6.18

3.1.11 Joint Reactions

Joint	OutputCase	CaseType	StepType	F1	F2	F3
				KN	KN	KN
153	COMB1	Combination	Max	26.35	55.59	521.79
153	COMB1	Combination	Min	5.99	8.29	120.71
154	COMB1	Combination	Max	4.24	39.45	539.43
154	COMB1	Combination	Min	-1.82	10.72	194.64
155	COMB1	Combination	Max	17.81	39.38	554.31
155	COMB1	Combination	Min	-10.67	11.63	211.46

156	COMB1	Combination	Max	3.67	39.45	533.75
156	COMB1	Combination	Min	-4.01	12.12	202.85
157	COMB1	Combination	Max	11.15	39.76	556.23
157	COMB1	Combination	Min	-18.05	11.67	211.51
158	COMB1	Combination	Max	1.84	41.41	546.75
158	COMB1	Combination	Min	-4.72	10.77	194.73
159	COMB1	Combination	Max	-6.02	56.71	524.04
159	COMB1	Combination	Min	-26.96	8.19	119.21
188	COMB1	Combination	Max	26.35	-8.29	521.79
188	COMB1	Combination	Min	5.99	-55.59	120.71
189	COMB1	Combination	Max	4.24	-10.72	539.43
189	COMB1	Combination	Min	-1.82	-39.45	194.64
190	COMB1	Combination	Max	17.81	-11.63	554.31
190	COMB1	Combination	Min	-10.67	-39.38	211.46
191	COMB1	Combination	Max	3.67	-12.12	533.75
191	COMB1	Combination	Min	-4.01	-39.45	202.85
192	COMB1	Combination	Max	11.15	-11.67	556.23
192	COMB1	Combination	Min	-18.05	-39.76	211.51
193	COMB1	Combination	Max	1.84	-10.77	546.75
193	COMB1	Combination	Min	-4.72	-41.41	194.73
194	COMB1	Combination	Max	-6.02	-8.19	524.04
194	COMB1	Combination	Min	-26.96	-56.71	119.21

3.1.12 Section Properties

Material	Shape	t3	t2	tf	tw	t2b	tfb	Area	TotalWt
		m	m	m	m	m	m	m2	KN
Fe345	Box/Tube	0.500	0.300	0.030	0.030			0.044	382.942
Fe345	Box/Tube	0.650	0.400	0.025	0.025			0.050	350.227
M45	Bridge Section							3.214	0.000
M45	PC Conc I Girder	0.711	0.406					0.178	0.000
Fe345	Rectangular	0.024	0.250					0.006	87.195
Fe345	I/Wide Flange	0.300	0.140	0.012	0.008	0.14	0.012	0.006	0.000
Fe345	I/Wide Flange	0.350	0.140	0.014	0.008	0.14	0.014	0.007	91.705
Fe345	I/Wide Flange	0.600	0.250	0.024	0.012	0.25	0.024	0.018	68.300

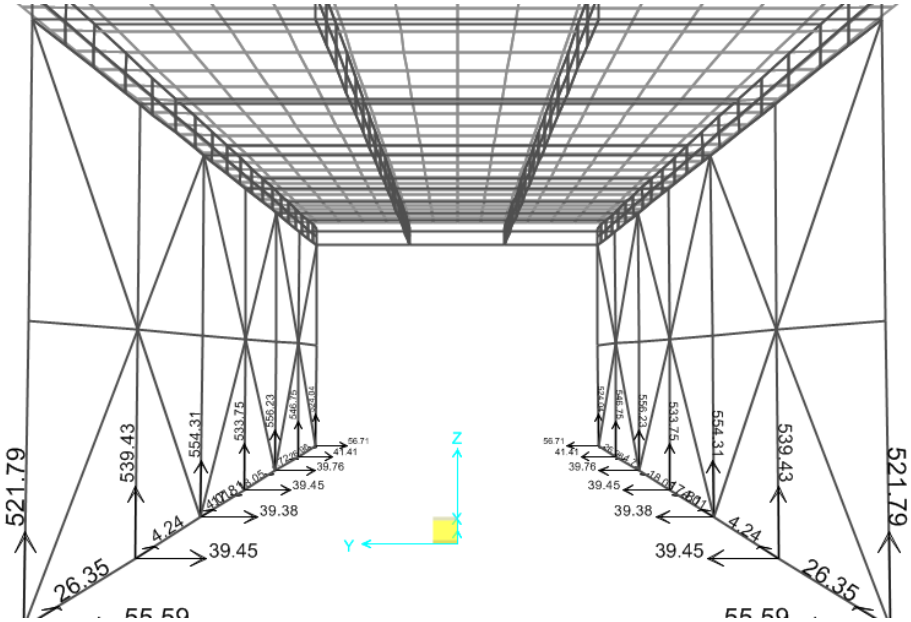


Figure 3.1.3: Diagram showing Base reaction forces

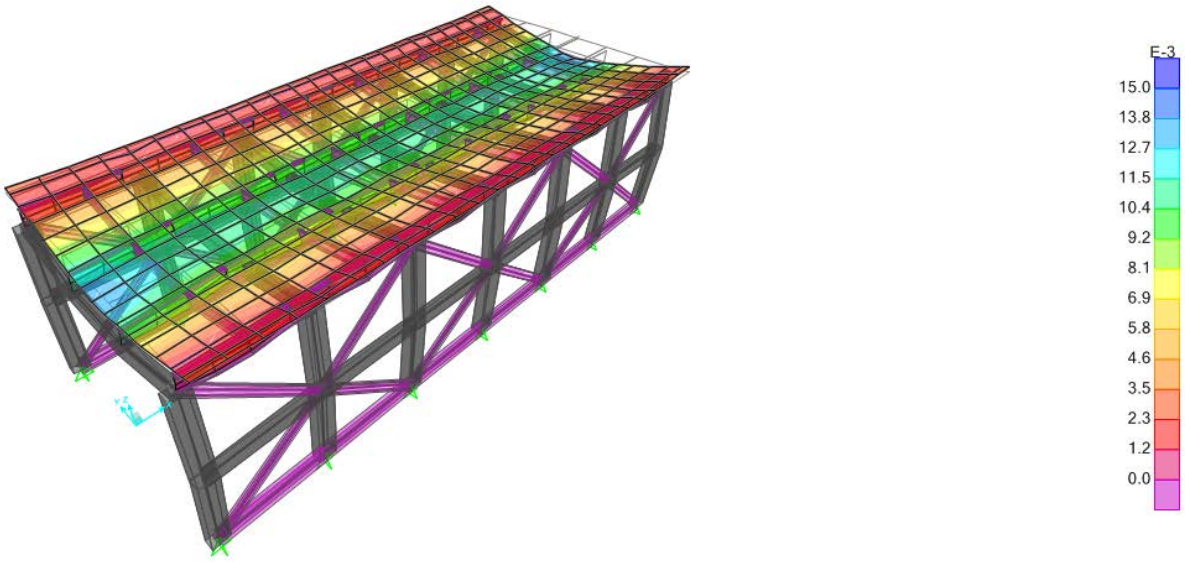


Figure 3.1.4: Diagram showing displacement contours

3.1.13 Bridge Super Design - SteelICompStrgth-FlxNg

Station	Location	Girder	Combo	StepType	DCRatio
m					Unitless
0.00	After	Left Exterior Girder	COMB1	Max	0.35
0.00	After	Interior Girder 1	COMB1	Max	0.20
0.00	After	Interior Girder 2	COMB1	Min	0.20
0.00	After	Right Exterior Girder	COMB1	Min	0.35
2.00	Before	Left Exterior Girder	COMB1	Max	0.36
2.00	Before	Interior Girder 1	COMB1	Max	0.21
2.00	Before	Interior Girder 2	COMB1	Min	0.21
2.00	Before	Right Exterior Girder	COMB1	Min	0.36
2.00	After	Left Exterior Girder	COMB1	Min	0.40
2.00	After	Interior Girder 1	COMB1	Min	0.23
2.00	After	Interior Girder 2	COMB1	Max	0.23
2.00	After	Right Exterior Girder	COMB1	Max	0.40
6.00	Before	Left Exterior Girder	COMB1	Max	0.36
6.00	Before	Interior Girder 1	COMB1	Max	0.21
6.00	Before	Interior Girder 2	COMB1	Min	0.21
6.00	Before	Right Exterior Girder	COMB1	Min	0.36
6.00	After	Left Exterior Girder	COMB1	Min	0.36
6.00	After	Interior Girder 1	COMB1	Min	0.21
6.00	After	Interior Girder 2	COMB1	Max	0.21
6.00	After	Right Exterior Girder	COMB1	Max	0.36
10.00	Before	Left Exterior Girder	COMB1	Max	0.36
10.00	Before	Interior Girder 1	COMB1	Max	0.21
10.00	Before	Interior Girder 2	COMB1	Min	0.21
10.00	Before	Right Exterior Girder	COMB1	Min	0.36
10.00	After	Left Exterior Girder	COMB1	Min	0.36
10.00	After	Interior Girder 1	COMB1	Min	0.21
10.00	After	Interior Girder 2	COMB1	Max	0.21

10.00	After	Right Exterior Girder	COMB1	Max	0.36
14.00	Before	Left Exterior Girder	COMB1	Max	0.36
14.00	Before	Interior Girder 1	COMB1	Max	0.21
14.00	Before	Interior Girder 2	COMB1	Min	0.21
14.00	Before	Right Exterior Girder	COMB1	Min	0.36
14.00	After	Left Exterior Girder	COMB1	Min	0.36
14.00	After	Interior Girder 1	COMB1	Min	0.21
14.00	After	Interior Girder 2	COMB1	Max	0.21
14.00	After	Right Exterior Girder	COMB1	Max	0.36
18.00	Before	Left Exterior Girder	COMB1	Max	0.36
18.00	Before	Interior Girder 1	COMB1	Max	0.21
18.00	Before	Interior Girder 2	COMB1	Min	0.21
18.00	Before	Right Exterior Girder	COMB1	Min	0.36
18.00	After	Left Exterior Girder	COMB1	Min	0.37
18.00	After	Interior Girder 1	COMB1	Min	0.22
18.00	After	Interior Girder 2	COMB1	Max	0.22
18.00	After	Right Exterior Girder	COMB1	Max	0.37
22.00	Before	Left Exterior Girder	COMB1	Max	0.41
22.00	Before	Interior Girder 1	COMB1	Max	0.24
22.00	Before	Interior Girder 2	COMB1	Min	0.24
22.00	Before	Right Exterior Girder	COMB1	Min	0.41
22.00	After	Left Exterior Girder	COMB1	Min	0.38
22.00	After	Interior Girder 1	COMB1	Min	0.21
22.00	After	Interior Girder 2	COMB1	Max	0.21
22.00	After	Right Exterior Girder	COMB1	Max	0.38
24.00	Before	Left Exterior Girder	COMB1	Min	0.37
24.00	Before	Interior Girder 1	COMB1	Min	0.21
24.00	Before	Interior Girder 2	COMB1	Max	0.21
24.00	Before	Right Exterior Girder	COMB1	Max	0.37

3.1.14 Bridge Super Design - SteelICompStrgth-FlxPs

Station	Location	Girder	Combo	StepType	DCRatio
m			Text	Text	Unitless
0.00	After	Left Exterior Girder	COMB1	Max	0.35
0.00	After	Interior Girder 1	COMB1	Max	0.20
0.00	After	Interior Girder 2	COMB1	Min	0.20
0.00	After	Right Exterior Girder	COMB1	Min	0.35
2.00	Before	Left Exterior Girder	COMB1	Max	0.36
2.00	Before	Interior Girder 1	COMB1	Max	0.21
2.00	Before	Interior Girder 2	COMB1	Min	0.21
2.00	Before	Right Exterior Girder	COMB1	Min	0.36
2.00	After	Left Exterior Girder	COMB1	Min	0.40
2.00	After	Interior Girder 1	COMB1	Min	0.23
2.00	After	Interior Girder 2	COMB1	Max	0.23
2.00	After	Right Exterior Girder	COMB1	Max	0.40
6.00	Before	Left Exterior Girder	COMB1	Max	0.36
6.00	Before	Interior Girder 1	COMB1	Max	0.21
6.00	Before	Interior Girder 2	COMB1	Min	0.21
6.00	Before	Right Exterior Girder	COMB1	Min	0.36
6.00	After	Left Exterior Girder	COMB1	Min	0.36
6.00	After	Interior Girder 1	COMB1	Min	0.21
6.00	After	Interior Girder 2	COMB1	Max	0.21
6.00	After	Right Exterior Girder	COMB1	Max	0.36
10.00	Before	Left Exterior Girder	COMB1	Max	0.36
10.00	Before	Interior Girder 1	COMB1	Max	0.21
10.00	Before	Interior Girder 2	COMB1	Min	0.21
10.00	Before	Right Exterior Girder	COMB1	Min	0.36
10.00	After	Left Exterior Girder	COMB1	Min	0.36
10.00	After	Interior Girder 1	COMB1	Min	0.21
10.00	After	Interior Girder 2	COMB1	Max	0.21
10.00	After	Right Exterior Girder	COMB1	Max	0.36
14.00	Before	Left Exterior Girder	COMB1	Max	0.36
14.00	Before	Interior Girder 1	COMB1	Max	0.21
14.00	Before	Interior Girder 2	COMB1	Min	0.21
14.00	Before	Right Exterior Girder	COMB1	Min	0.36
14.00	After	Left Exterior Girder	COMB1	Min	0.36
14.00	After	Interior Girder 1	COMB1	Min	0.21
14.00	After	Interior Girder 2	COMB1	Max	0.21
14.00	After	Right Exterior Girder	COMB1	Max	0.36
18.00	Before	Left Exterior Girder	COMB1	Max	0.36
18.00	Before	Interior Girder 1	COMB1	Max	0.21

18.00	Before	Interior Girder 2	COMB1	Min	0.21
18.00	Before	Right Exterior Girder	COMB1	Min	0.36
18.00	After	Left Exterior Girder	COMB1	Min	0.37
18.00	After	Interior Girder 1	COMB1	Min	0.22
18.00	After	Interior Girder 2	COMB1	Max	0.22
18.00	After	Right Exterior Girder	COMB1	Max	0.37
22.00	Before	Left Exterior Girder	COMB1	Max	0.41
22.00	Before	Interior Girder 1	COMB1	Max	0.24
22.00	Before	Interior Girder 2	COMB1	Min	0.24
22.00	Before	Right Exterior Girder	COMB1	Min	0.41
22.00	After	Left Exterior Girder	COMB1	Min	0.38
22.00	After	Interior Girder 1	COMB1	Min	0.21
22.00	After	Interior Girder 2	COMB1	Max	0.21
22.00	After	Right Exterior Girder	COMB1	Max	0.38
24.00	Before	Left Exterior Girder	COMB1	Min	0.37
24.00	Before	Interior Girder 1	COMB1	Min	0.21
24.00	Before	Interior Girder 2	COMB1	Max	0.21
24.00	Before	Right Exterior Girder	COMB1	Max	0.37

3.1.15 Bridge Super Design- SteelICompStrgth-Shear

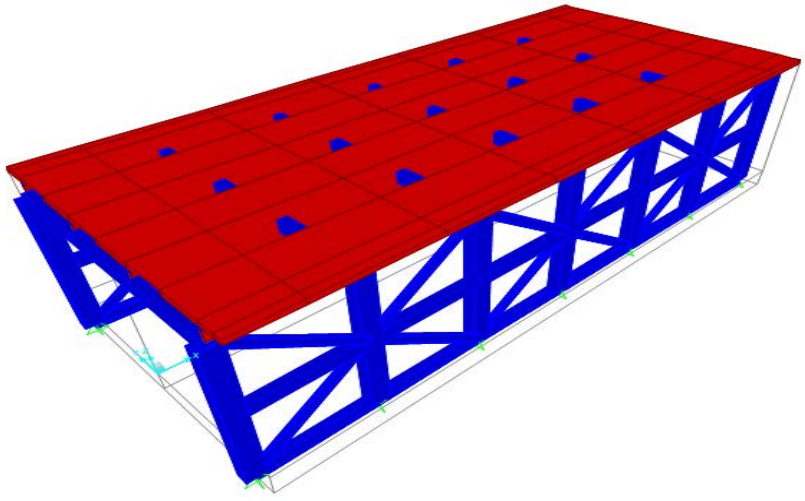
Station	Location	Girder	Combo	StepType	DCRatio
m	Text	Text	Text	Text	Unitless
0.00	After	Left Exterior Girder	COMB1	Max	0.12
0.00	After	Interior Girder 1	COMB1	Max	0.18
0.00	After	Interior Girder 2	COMB1	Max	0.18
0.00	After	Right Exterior Girder	COMB1	Max	0.12
2.00	Before	Left Exterior Girder	COMB1	Min	0.05
2.00	Before	Interior Girder 1	COMB1	Min	0.12
2.00	Before	Interior Girder 2	COMB1	Min	0.12
2.00	Before	Right Exterior Girder	COMB1	Min	0.05
2.00	After	Left Exterior Girder	COMB1	Min	0.08
2.00	After	Interior Girder 1	COMB1	Max	0.11
2.00	After	Interior Girder 2	COMB1	Max	0.11
2.00	After	Right Exterior Girder	COMB1	Min	0.08
6.00	Before	Left Exterior Girder	COMB1	Min	0.08
6.00	Before	Interior Girder 1	COMB1	Max	0.12

6.00	Before	Interior Girder 2	COMB1	Max	0.12
6.00	Before	Right Exterior Girder	COMB1	Min	0.08
6.00	After	Left Exterior Girder	COMB1	Min	0.08
6.00	After	Interior Girder 1	COMB1	Min	0.13
6.00	After	Interior Girder 2	COMB1	Min	0.13
6.00	After	Right Exterior Girder	COMB1	Min	0.08
10.00	Before	Left Exterior Girder	COMB1	Min	0.08
10.00	Before	Interior Girder 1	COMB1	Max	0.12
10.00	Before	Interior Girder 2	COMB1	Max	0.12
10.00	Before	Right Exterior Girder	COMB1	Min	0.08
10.00	After	Left Exterior Girder	COMB1	Min	0.08
10.00	After	Interior Girder 1	COMB1	Min	0.12
10.00	After	Interior Girder 2	COMB1	Min	0.12
10.00	After	Right Exterior Girder	COMB1	Min	0.08
14.00	Before	Left Exterior Girder	COMB1	Min	0.08
14.00	Before	Interior Girder 1	COMB1	Min	0.12
14.00	Before	Interior Girder 2	COMB1	Min	0.12
14.00	Before	Right Exterior Girder	COMB1	Min	0.08
14.00	After	Left Exterior Girder	COMB1	Min	0.08
14.00	After	Interior Girder 1	COMB1	Max	0.12
14.00	After	Interior Girder 2	COMB1	Max	0.12
14.00	After	Right Exterior Girder	COMB1	Min	0.08
18.00	Before	Left Exterior Girder	COMB1	Min	0.08
18.00	Before	Interior Girder 1	COMB1	Min	0.13
18.00	Before	Interior Girder 2	COMB1	Min	0.13
18.00	Before	Right Exterior Girder	COMB1	Min	0.08
18.00	After	Left Exterior Girder	COMB1	Min	0.07
18.00	After	Interior Girder 1	COMB1	Max	0.12
18.00	After	Interior Girder 2	COMB1	Max	0.12
18.00	After	Right Exterior Girder	COMB1	Min	0.07
22.00	Before	Left Exterior Girder	COMB1	Min	0.08

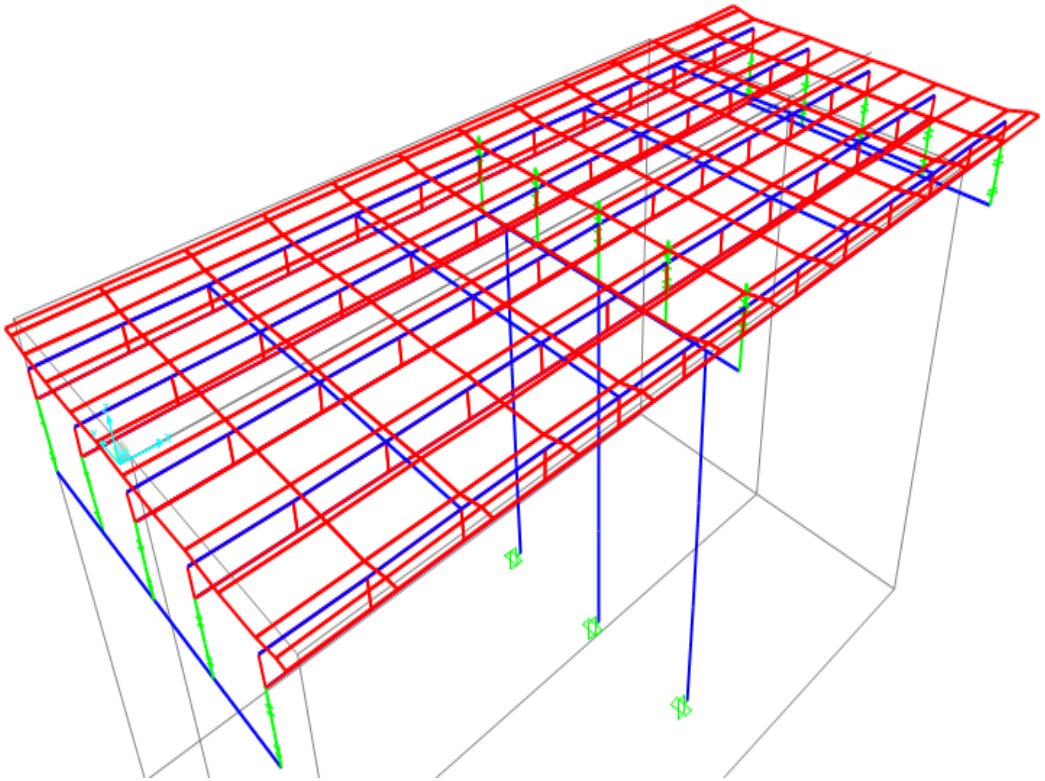
22.00	Before	Interior Girder 1	COMB1	Max	0.11
22.00	Before	Interior Girder 2	COMB1	Max	0.11
22.00	Before	Right Exterior Girder	COMB1	Min	0.08
22.00	After	Left Exterior Girder	COMB1	Min	0.05
22.00	After	Interior Girder 1	COMB1	Min	0.12
22.00	After	Interior Girder 2	COMB1	Min	0.12
22.00	After	Right Exterior Girder	COMB1	Min	0.05
24.00	Before	Left Exterior Girder	COMB1	Max	0.12
24.00	Before	Interior Girder 1	COMB1	Max	0.18
24.00	Before	Interior Girder 2	COMB1	Max	0.18
24.00	Before	Right Exterior Girder	COMB1	Max	0.12

3.1.16 Material Used - By Section Property

Section	Object Type	Num Pieces	Total Length	Total Weight
		Unitless	m	KN
BOX 650*400	Frame	14	91.00	350.23
BOX 500*300	Frame	33	112.05	382.94
ISWB600-2	Frame	12	48.00	68.30
ISMB350	Frame	42	178.59	91.71
FSEC2	Frame	56	192.00	87.19



3.2 Design of Railway Bridge



Details Available

Length of Bridge: 24m

Span length: 2m

Width Of Bridge: 11m

Type of Bridge: Steel I Girder Bridge

Software used: CSI Bridge

Figure 3.2.1 : 3D Line Diagram of railway bridge deck

3.2.1 Active Degrees of Freedom

UX	UY	UZ	RX	RY	RZ
Yes/No	Yes/No	Yes/No	Yes/No	Yes/No	Yes/No
Yes	Yes	Yes	Yes	Yes	Yes

3.2.2 Base Reaction

OutputCase	Type	GlobalFX	GlobalFY	GlobalFZ	GlobalMX	GlobalMY
		KN	KN	KN	KN-m	KN-m
DEAD		-9.30	0.00	12757.41	-1.27	-62391.96
ACASE1	Max	0.00	0.00	0.00	0.00	0.00
ACASE1	Min	0.00	0.00	0.00	0.00	0.00
LIVE+DEAD	Max	-9.30	0.00	12757.41	-1.27	-62391.96
LIVE+DEAD	Min	-9.30	0.00	12757.41	-1.27	-62391.96

3.2.3 Bridge super design Steel I Compressive Strength Flex. Ng.

Station	Location	Girder	Combo	StepType	DCRatio
m					Unitless
0	After	Left Exterior Girder	LIVE+DEAD	Max	0.593
0	After	Interior Girder 1	LIVE+DEAD	Max	0.025
0	After	Interior Girder 2	LIVE+DEAD	Max	0.072
0	After	Interior Girder 3	LIVE+DEAD	Max	0.025
0	After	Right Exterior Girder	LIVE+DEAD	Max	0.593
2	Before	Left Exterior Girder	LIVE+DEAD	Min	0.034
2	Before	Interior Girder 1	LIVE+DEAD	Min	0.114
2	Before	Interior Girder 2	LIVE+DEAD	Min	0.107
2	Before	Interior Girder 3	LIVE+DEAD	Min	0.114
2	Before	Right Exterior Girder	LIVE+DEAD	Max	0.034
2	After	Left Exterior Girder	LIVE+DEAD	Max	0.034
2	After	Interior Girder 1	LIVE+DEAD	Max	0.149
2	After	Interior Girder 2	LIVE+DEAD	Max	0.094
2	After	Interior Girder 3	LIVE+DEAD	Max	0.149
2	After	Right Exterior Girder	LIVE+DEAD	Min	0.034
4	Before	Left Exterior Girder	LIVE+DEAD	Max	0.016
4	Before	Interior Girder 1	LIVE+DEAD	Min	0.021
4	Before	Interior Girder 2	LIVE+DEAD	Max	0.004
4	Before	Interior Girder 3	LIVE+DEAD	Max	0.021
4	Before	Right Exterior Girder	LIVE+DEAD	Min	0.016
4	After	Left Exterior Girder	LIVE+DEAD	Max	0.015
4	After	Interior Girder 1	LIVE+DEAD	Max	0.009
4	After	Interior Girder 2	LIVE+DEAD	Min	0.002
4	After	Interior Girder 3	LIVE+DEAD	Min	0.009

4	After	Right Exterior Girder	LIVE+DEAD	Min	0.015
6	Before	Left Exterior Girder	LIVE+DEAD	Max	0.001
6	Before	Interior Girder 1	LIVE+DEAD	Min	0.000
6	Before	Interior Girder 2	LIVE+DEAD	Max	0.000
6	Before	Interior Girder 3	LIVE+DEAD	Max	0.000
6	Before	Right Exterior Girder	LIVE+DEAD	Min	0.001
6	After	Left Exterior Girder	LIVE+DEAD	Min	0.001
6	After	Interior Girder 1	LIVE+DEAD	Max	0.000
6	After	Interior Girder 2	LIVE+DEAD	Min	0.000
6	After	Interior Girder 3	LIVE+DEAD	Min	0.000
6	After	Right Exterior Girder	LIVE+DEAD	Max	0.001
8	Before	Left Exterior Girder	LIVE+DEAD	Min	0.026
8	Before	Interior Girder 1	LIVE+DEAD	Max	0.010
8	Before	Interior Girder 2	LIVE+DEAD	Min	0.002
8	Before	Interior Girder 3	LIVE+DEAD	Min	0.010
8	Before	Right Exterior Girder	LIVE+DEAD	Min	0.026
8	After	Left Exterior Girder	LIVE+DEAD	Max	0.026
8	After	Interior Girder 1	LIVE+DEAD	Max	0.006
8	After	Interior Girder 2	LIVE+DEAD	Min	0.004
8	After	Interior Girder 3	LIVE+DEAD	Min	0.006
8	After	Right Exterior Girder	LIVE+DEAD	Max	0.026
10	Before	Left Exterior Girder	LIVE+DEAD	Min	0.164
10	Before	Interior Girder 1	LIVE+DEAD	Min	0.117
10	Before	Interior Girder 2	LIVE+DEAD	Min	0.112
10	Before	Interior Girder 3	LIVE+DEAD	Min	0.117
10	Before	Right Exterior Girder	LIVE+DEAD	Min	0.164
10	After	Left Exterior Girder	LIVE+DEAD	Max	0.162
10	After	Interior Girder 1	LIVE+DEAD	Max	0.119
10	After	Interior Girder 2	LIVE+DEAD	Max	0.112
10	After	Interior Girder 3	LIVE+DEAD	Max	0.119
10	After	Right Exterior Girder	LIVE+DEAD	Max	0.162
12	Before	Left Exterior Girder	LIVE+DEAD	Min	0.374
12	Before	Interior Girder 1	LIVE+DEAD	Min	0.416
12	Before	Interior Girder 2	LIVE+DEAD	Min	0.412
12	Before	Interior Girder 3	LIVE+DEAD	Min	0.416
12	Before	Right Exterior Girder	LIVE+DEAD	Min	0.374
12	After	Left Exterior Girder	LIVE+DEAD	Max	0.375
12	After	Interior Girder 1	LIVE+DEAD	Max	0.415
12	After	Interior Girder 2	LIVE+DEAD	Max	0.411
12	After	Interior Girder 3	LIVE+DEAD	Max	0.415
12	After	Right Exterior Girder	LIVE+DEAD	Max	0.375
14	Before	Left Exterior Girder	LIVE+DEAD	Min	0.142
14	Before	Interior Girder 1	LIVE+DEAD	Min	0.133
14	Before	Interior Girder 2	LIVE+DEAD	Min	0.129

14	Before	Interior Girder 3	LIVE+DEAD	Min	0.133
14	Before	Right Exterior Girder	LIVE+DEAD	Min	0.142
14	After	Left Exterior Girder	LIVE+DEAD	Max	0.146
14	After	Interior Girder 1	LIVE+DEAD	Max	0.128
14	After	Interior Girder 2	LIVE+DEAD	Max	0.129
14	After	Interior Girder 3	LIVE+DEAD	Max	0.128
14	After	Right Exterior Girder	LIVE+DEAD	Max	0.146
16	Before	Left Exterior Girder	LIVE+DEAD	Max	0.005
16	Before	Interior Girder 1	LIVE+DEAD	Max	0.005
16	Before	Interior Girder 2	LIVE+DEAD	Max	0.004
16	Before	Interior Girder 3	LIVE+DEAD	Min	0.005
16	Before	Right Exterior Girder	LIVE+DEAD	Min	0.005
16	After	Left Exterior Girder	LIVE+DEAD	Max	0.003
16	After	Interior Girder 1	LIVE+DEAD	Max	0.002
16	After	Interior Girder 2	LIVE+DEAD	Max	0.002
16	After	Interior Girder 3	LIVE+DEAD	Min	0.002
16	After	Right Exterior Girder	LIVE+DEAD	Min	0.003
18	Before	Left Exterior Girder	LIVE+DEAD	Max	0.001
18	Before	Interior Girder 1	LIVE+DEAD	Max	0.000
18	Before	Interior Girder 2	LIVE+DEAD	Max	0.000
18	Before	Interior Girder 3	LIVE+DEAD	Min	0.000
18	Before	Right Exterior Girder	LIVE+DEAD	Min	0.001
18	After	Left Exterior Girder	LIVE+DEAD	Min	0.001
18	After	Interior Girder 1	LIVE+DEAD	Min	0.000
18	After	Interior Girder 2	LIVE+DEAD	Min	0.000
18	After	Interior Girder 3	LIVE+DEAD	Max	0.000
18	After	Right Exterior Girder	LIVE+DEAD	Max	0.001
20	Before	Left Exterior Girder	LIVE+DEAD	Min	0.002
20	Before	Interior Girder 1	LIVE+DEAD	Min	0.002
20	Before	Interior Girder 2	LIVE+DEAD	Max	0.002
20	Before	Interior Girder 3	LIVE+DEAD	Max	0.002
20	Before	Right Exterior Girder	LIVE+DEAD	Max	0.002
20	After	Left Exterior Girder	LIVE+DEAD	Min	0.008
20	After	Interior Girder 1	LIVE+DEAD	Min	0.007
20	After	Interior Girder 2	LIVE+DEAD	Min	0.004
20	After	Interior Girder 3	LIVE+DEAD	Max	0.007
20	After	Right Exterior Girder	LIVE+DEAD	Max	0.008
22	Before	Left Exterior Girder	LIVE+DEAD	Min	0.058
22	Before	Interior Girder 1	LIVE+DEAD	Min	0.040
22	Before	Interior Girder 2	LIVE+DEAD	Min	0.042
22	Before	Interior Girder 3	LIVE+DEAD	Min	0.040
22	Before	Right Exterior Girder	LIVE+DEAD	Min	0.058
22	After	Left Exterior Girder	LIVE+DEAD	Max	0.055
22	After	Interior Girder 1	LIVE+DEAD	Max	0.044

22	After	Interior Girder 2	LIVE+DEAD	Max	0.042
22	After	Interior Girder 3	LIVE+DEAD	Max	0.044
22	After	Right Exterior Girder	LIVE+DEAD	Max	0.055
24	Before	Left Exterior Girder	LIVE+DEAD	Min	0.258
24	Before	Interior Girder 1	LIVE+DEAD	Min	0.284
24	Before	Interior Girder 2	LIVE+DEAD	Min	0.293
24	Before	Interior Girder 3	LIVE+DEAD	Min	0.284
24	Before	Right Exterior Girder	LIVE+DEAD	Min	0.258

3.2.4 Bridge super design Steel I Compressive Strength Flex.- Shear

Station	Location	Girder	Combo	StepType	DCRatio
m					Unitless
0	After	Left Exterior Girder	LIVE+DEAD	Max	0.33
0	After	Interior Girder 1	LIVE+DEAD	Min	0.22
0	After	Interior Girder 2	LIVE+DEAD	Max	0.04
0	After	Interior Girder 3	LIVE+DEAD	Min	0.22
0	After	Right Exterior Girder	LIVE+DEAD	Max	0.33
2	Before	Left Exterior Girder	LIVE+DEAD	Min	0.07
2	Before	Interior Girder 1	LIVE+DEAD	Min	0.19
2	Before	Interior Girder 2	LIVE+DEAD	Max	0.03
2	Before	Interior Girder 3	LIVE+DEAD	Min	0.19
2	Before	Right Exterior Girder	LIVE+DEAD	Min	0.07
2	After	Left Exterior Girder	LIVE+DEAD	Max	0.03
2	After	Interior Girder 1	LIVE+DEAD	Max	0.20
2	After	Interior Girder 2	LIVE+DEAD	Max	0.08
2	After	Interior Girder 3	LIVE+DEAD	Max	0.20
2	After	Right Exterior Girder	LIVE+DEAD	Max	0.03
4	Before	Left Exterior Girder	LIVE+DEAD	Max	0.02
4	Before	Interior Girder 1	LIVE+DEAD	Min	0.16
4	Before	Interior Girder 2	LIVE+DEAD	Min	0.07
4	Before	Interior Girder 3	LIVE+DEAD	Min	0.16
4	Before	Right Exterior Girder	LIVE+DEAD	Max	0.02
4	After	Left Exterior Girder	LIVE+DEAD	Max	0.02
4	After	Interior Girder 1	LIVE+DEAD	Max	0.08
4	After	Interior Girder 2	LIVE+DEAD	Max	0.09
4	After	Interior Girder 3	LIVE+DEAD	Max	0.08
4	After	Right Exterior Girder	LIVE+DEAD	Max	0.02
6	Before	Left Exterior Girder	LIVE+DEAD	Max	0.01
6	Before	Interior Girder 1	LIVE+DEAD	Max	0.06
6	Before	Interior Girder 2	LIVE+DEAD	Min	0.05
6	Before	Interior Girder 3	LIVE+DEAD	Max	0.06
6	Before	Right Exterior Girder	LIVE+DEAD	Max	0.01
6	After	Left Exterior Girder	LIVE+DEAD	Min	0.02
6	After	Interior Girder 1	LIVE+DEAD	Min	0.06

6	After	Interior Girder 2	LIVE+DEAD	Max	0.03
6	After	Interior Girder 3	LIVE+DEAD	Min	0.06
6	After	Right Exterior Girder	LIVE+DEAD	Min	0.02
8	Before	Left Exterior Girder	LIVE+DEAD	Max	0.04
8	Before	Interior Girder 1	LIVE+DEAD	Max	0.11
8	Before	Interior Girder 2	LIVE+DEAD	Max	0.06
8	Before	Interior Girder 3	LIVE+DEAD	Max	0.11
8	Before	Right Exterior Girder	LIVE+DEAD	Max	0.04
8	After	Left Exterior Girder	LIVE+DEAD	Min	0.05
8	After	Interior Girder 1	LIVE+DEAD	Min	0.11
8	After	Interior Girder 2	LIVE+DEAD	Min	0.09
8	After	Interior Girder 3	LIVE+DEAD	Min	0.11
8	After	Right Exterior Girder	LIVE+DEAD	Min	0.05
10	Before	Left Exterior Girder	LIVE+DEAD	Max	0.07
10	Before	Interior Girder 1	LIVE+DEAD	Max	0.15
10	Before	Interior Girder 2	LIVE+DEAD	Max	0.14
10	Before	Interior Girder 3	LIVE+DEAD	Max	0.15
10	Before	Right Exterior Girder	LIVE+DEAD	Max	0.07
10	After	Left Exterior Girder	LIVE+DEAD	Min	0.08
10	After	Interior Girder 1	LIVE+DEAD	Min	0.16
10	After	Interior Girder 2	LIVE+DEAD	Min	0.15
10	After	Interior Girder 3	LIVE+DEAD	Min	0.16
10	After	Right Exterior Girder	LIVE+DEAD	Min	0.08
12	Before	Left Exterior Girder	LIVE+DEAD	Max	0.09
12	Before	Interior Girder 1	LIVE+DEAD	Max	0.23
12	Before	Interior Girder 2	LIVE+DEAD	Max	0.20
12	Before	Interior Girder 3	LIVE+DEAD	Max	0.23
12	Before	Right Exterior Girder	LIVE+DEAD	Max	0.09
12	After	Left Exterior Girder	LIVE+DEAD	Max	0.10
12	After	Interior Girder 1	LIVE+DEAD	Max	0.22
12	After	Interior Girder 2	LIVE+DEAD	Max	0.19
12	After	Interior Girder 3	LIVE+DEAD	Max	0.22
12	After	Right Exterior Girder	LIVE+DEAD	Max	0.10
14	Before	Left Exterior Girder	LIVE+DEAD	Min	0.08
14	Before	Interior Girder 1	LIVE+DEAD	Min	0.16
14	Before	Interior Girder 2	LIVE+DEAD	Min	0.14
14	Before	Interior Girder 3	LIVE+DEAD	Min	0.16
14	Before	Right Exterior Girder	LIVE+DEAD	Min	0.08
14	After	Left Exterior Girder	LIVE+DEAD	Max	0.08
14	After	Interior Girder 1	LIVE+DEAD	Max	0.14
14	After	Interior Girder 2	LIVE+DEAD	Max	0.13
14	After	Interior Girder 3	LIVE+DEAD	Max	0.14
14	After	Right Exterior Girder	LIVE+DEAD	Max	0.08
16	Before	Left Exterior Girder	LIVE+DEAD	Min	0.05

16	Before	Interior Girder 1	LIVE+DEAD	Min	0.10
16	Before	Interior Girder 2	LIVE+DEAD	Min	0.09
16	Before	Interior Girder 3	LIVE+DEAD	Min	0.10
16	Before	Right Exterior Girder	LIVE+DEAD	Min	0.05
16	After	Left Exterior Girder	LIVE+DEAD	Max	0.04
16	After	Interior Girder 1	LIVE+DEAD	Max	0.10
16	After	Interior Girder 2	LIVE+DEAD	Max	0.08
16	After	Interior Girder 3	LIVE+DEAD	Max	0.10
16	After	Right Exterior Girder	LIVE+DEAD	Max	0.04
18	Before	Left Exterior Girder	LIVE+DEAD	Min	0.02
18	Before	Interior Girder 1	LIVE+DEAD	Min	0.05
18	Before	Interior Girder 2	LIVE+DEAD	Min	0.03
18	Before	Interior Girder 3	LIVE+DEAD	Min	0.05
18	Before	Right Exterior Girder	LIVE+DEAD	Min	0.02
18	After	Left Exterior Girder	LIVE+DEAD	Max	0.01
18	After	Interior Girder 1	LIVE+DEAD	Max	0.04
18	After	Interior Girder 2	LIVE+DEAD	Max	0.02
18	After	Interior Girder 3	LIVE+DEAD	Max	0.04
18	After	Right Exterior Girder	LIVE+DEAD	Max	0.01
20	Before	Left Exterior Girder	LIVE+DEAD	Max	0.03
20	Before	Interior Girder 1	LIVE+DEAD	Max	0.08
20	Before	Interior Girder 2	LIVE+DEAD	Max	0.06
20	Before	Interior Girder 3	LIVE+DEAD	Max	0.08
20	Before	Right Exterior Girder	LIVE+DEAD	Max	0.03
20	After	Left Exterior Girder	LIVE+DEAD	Min	0.04
20	After	Interior Girder 1	LIVE+DEAD	Min	0.08
20	After	Interior Girder 2	LIVE+DEAD	Min	0.07
20	After	Interior Girder 3	LIVE+DEAD	Min	0.08
20	After	Right Exterior Girder	LIVE+DEAD	Min	0.04
22	Before	Left Exterior Girder	LIVE+DEAD	Max	0.07
22	Before	Interior Girder 1	LIVE+DEAD	Max	0.13
22	Before	Interior Girder 2	LIVE+DEAD	Max	0.12
22	Before	Interior Girder 3	LIVE+DEAD	Max	0.13
22	Before	Right Exterior Girder	LIVE+DEAD	Max	0.07
22	After	Left Exterior Girder	LIVE+DEAD	Min	0.07
22	After	Interior Girder 1	LIVE+DEAD	Min	0.14
22	After	Interior Girder 2	LIVE+DEAD	Min	0.13
22	After	Interior Girder 3	LIVE+DEAD	Min	0.14
22	After	Right Exterior Girder	LIVE+DEAD	Min	0.07
24	Before	Left Exterior Girder	LIVE+DEAD	Max	0.09
24	Before	Interior Girder 1	LIVE+DEAD	Max	0.19
24	Before	Interior Girder 2	LIVE+DEAD	Max	0.17
24	Before	Interior Girder 3	LIVE+DEAD	Max	0.19
24	Before	Right Exterior Girder	LIVE+DEAD	Max	0.09

3.2.5 Abutment Definition

Abutment	GirderSup	SubType	BeamSect	BeamLength	FSProp
				m	
BABT1	Bottom	Beam	abutment	9.15	founspring

3.2.6 Bearing Definition

Bearing	Type	U1Type	U2Type	U3Type	R1Type	R2Type	R3Type
Bearing	User	Fixed	Fixed	Free	Free	Free	Free
fixed	User	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

3.2.7 Bent Definitions 1- General

Bent	BeamLength	BeamSect	Type	GirderSup1	NumCols
	m				Unitless
BENT1	9.15	bent	Single	Integral	3

3.2.8.1 Bent Definitions 2- Column Data

Bent	ColNum	Section	Distance	Height	R1Release	R2Release	R3Release
			m	m			
BENT1	1	column	1	9	Fixed	Fixed	Fixed
BENT1	2	column	4.58	9	Fixed	Fixed	Fixed
BENT1	3	column	8.15	9	Fixed	Fixed	Fixed

3.2.9 Diaphragm Definitions

Diaph	DiaphType	Beam	BeamDist	IncConnPlat
			m	Yes/No
Diaphragm	Single Beam	ISWB600-2	0	No

3.2.10 Foundation Spring Definitions

FndSpring	Type	U1Type	U2Type	U3Type	R1Type	R2Type	R3Type	DefLength	DefArea
								m	m2
founspring	User	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed	1	1

3.2.11 Bridge Layout line 1- Layout line Points

LayoutLine	Point	CoordSys	X	Y	Z
	Unitless		m	m	m
layout	1	GLOBAL	0	0	0
layout	2	GLOBAL	24	0	0

3.2.12 Bridge Load Definitions 2- Area

Name	RefLocLft	DistLft	RefLocRgt	DistRgt	FOverL2Lft	FOverL2Rgt
		m		m	KN/m2	KN/m2
dead track left	Left Edge of Deck	2.252	Left Edge of Deck	3.928	7.5	7.5
dead track right	Right Edge of Deck	3.928	Right Edge of Deck	2.252	7.5	7.5

3.2.13 Bridge Object Definitions - Reference line

BridgeObj	SpanName	Station	Length	SpanType
		m	m	
BOBJ1	Start Abutment	0	0	Start Abutment
BOBJ1	span 1	12	12	Full Span to End Bent
BOBJ1	Span To End Abutment	24	12	Full Span to End Abutment

3.2.14 Bridge Object Definitions - Diaphragms

BridgeObj	SpanName	DiaphProp	DiaphDist	DiaphBrg	DiaphLoc
			m		
BOBJ1	span 1	Diaphragm	4	Default	All Spaces
BOBJ1	span 1	Diaphragm	8	Default	All Spaces
BOBJ1	Span To End Abutment	Diaphragm	4	Default	All Spaces
BOBJ1	Span To End Abutment	Diaphragm	8	Default	All Spaces

Bridge Object Definitions - Area Loads

BridgeObj	LoadPat	LoadName	StartSta	EndSta	VariationL	VariationR
			m	m		
BOBJ1	DEAD	dead track left	0	24	None	None
BOBJ1	DEAD	dead track right	0	24	None	None

3.2.15 Bridge Object Girder Forces

Girder	Dist.	LocType	OutputCase	P	V2	V3	T	M2	M3
	m			KN	KN	KN	KN-m	KN-m	KN-m
Left Exterior Girder	0.00	After	LIVE+DEAD	-802.05	-676.58	132.26	2228.65	77.55	-650.72
Left Exterior Girder	0.00	After	LIVE+DEAD	-864.12	-728.76	127.61	2198.30	73.97	-696.20
Left Exterior Girder	2.00	Before	LIVE+DEAD	-668.33	-108.61	-85.61	964.30	-127.92	200.44
Left Exterior Girder	2.00	Before	LIVE+DEAD	-730.08	-158.43	-92.82	931.20	-136.81	85.17
Left Exterior Girder	2.00	After	LIVE+DEAD	-628.40	-25.14	-201.18	484.15	-155.82	229.65
Left Exterior Girder	2.00	After	LIVE+DEAD	-690.99	-71.61	-206.97	451.42	-169.11	114.52
Left Exterior Girder	4.00	Before	LIVE+DEAD	-559.39	53.91	-210.91	264.72	187.27	264.71
Left Exterior Girder	4.00	Before	LIVE+DEAD	-620.73	14.14	-226.59	234.15	174.88	87.19
Left Exterior Girder	4.00	After	LIVE+DEAD	-465.82	-10.14	7.33	109.89	85.85	260.01
Left Exterior Girder	4.00	After	LIVE+DEAD	-526.37	-47.15	-8.20	82.64	74.22	81.89
Left Exterior Girder	6.00	Before	LIVE+DEAD	-445.43	29.74	-29.96	86.27	89.13	281.14
Left Exterior Girder	6.00	Before	LIVE+DEAD	-504.75	-7.80	-33.80	59.60	73.13	88.35
Left Exterior Girder	6.00	After	LIVE+DEAD	-419.06	41.43	-38.08	68.60	59.13	278.93
Left Exterior Girder	6.00	After	LIVE+DEAD	-477.27	2.94	-42.95	41.86	43.77	86.02
Left Exterior Girder	8.00	Before	LIVE+DEAD	-387.28	92.81	-20.89	50.59	95.75	173.66
Left Exterior Girder	8.00	Before	LIVE+DEAD	-444.44	54.63	-37.53	23.63	79.37	-2.72
Left Exterior Girder	8.00	After	LIVE+DEAD	-364.92	100.99	-4.11	44.05	65.60	171.96
Left Exterior Girder	8.00	After	LIVE+DEAD	-420.48	57.83	-19.33	13.70	48.63	-4.25
Left Exterior Girder	10.00	Before	LIVE+DEAD	-361.53	159.43	-1.90	22.14	72.25	-67.29
Left Exterior Girder	10.00	Before	LIVE+DEAD	-415.23	109.57	-7.06	-10.25	59.54	-180.77
Left Exterior Girder	10.00	After	LIVE+DEAD	-350.31	167.76	-8.36	10.44	51.74	-64.65
Left Exterior Girder	10.00	After	LIVE+DEAD	-402.63	114.33	-13.98	-23.40	40.88	-178.95
Left Exterior Girder	12.00	Before	LIVE+DEAD	-348.79	201.28	-38.64	4.94	107.12	-388.01
Left Exterior Girder	12.00	Before	LIVE+DEAD	-399.11	146.75	-49.79	-29.62	92.61	-449.56
Left Exterior Girder	12.00	After	LIVE+DEAD	-341.70	-160.05	29.05	49.27	99.30	-389.56

Left Exterior Girder	12.00	After	LIVE+DEAD	-392.02	-214.59	17.89	14.71	84.78	-451.11
Left Exterior Girder	14.00	Before	LIVE+DEAD	-319.25	-128.58	-5.59	45.19	56.22	-40.62
Left Exterior Girder	14.00	Before	LIVE+DEAD	-371.57	-182.02	-11.21	11.35	45.36	-154.92
Left Exterior Girder	14.00	After	LIVE+DEAD	-318.68	-125.08	-9.18	35.82	63.79	-46.56
Left Exterior Girder	14.00	After	LIVE+DEAD	-372.38	-174.94	-14.35	3.43	51.08	-160.04
Left Exterior Girder	16.00	Before	LIVE+DEAD	-302.23	-74.73	9.53	17.64	59.63	223.41
Left Exterior Girder	16.00	Before	LIVE+DEAD	-357.80	-117.89	-5.68	-12.71	42.66	47.20
Left Exterior Girder	16.00	After	LIVE+DEAD	-300.25	-53.52	-16.53	25.22	62.63	222.38
Left Exterior Girder	16.00	After	LIVE+DEAD	-357.41	-91.70	-33.16	-1.74	46.26	46.00
Left Exterior Girder	18.00	Before	LIVE+DEAD	-288.94	-1.46	-2.02	16.91	74.32	322.00
Left Exterior Girder	18.00	Before	LIVE+DEAD	-347.16	-39.94	-6.88	-9.83	58.97	129.09
Left Exterior Girder	18.00	After	LIVE+DEAD	-289.70	10.23	4.63	13.51	76.70	321.31
Left Exterior Girder	18.00	After	LIVE+DEAD	-349.02	-27.30	0.80	-13.16	60.70	128.52
Left Exterior Girder	20.00	Before	LIVE+DEAD	-297.95	62.97	32.10	5.14	60.49	281.30
Left Exterior Girder	20.00	Before	LIVE+DEAD	-358.50	25.96	16.57	-22.11	48.86	103.19
Left Exterior Girder	20.00	After	LIVE+DEAD	-302.75	89.53	7.39	17.21	64.25	282.12
Left Exterior Girder	20.00	After	LIVE+DEAD	-364.09	49.76	-8.28	-13.36	51.85	104.61
Left Exterior Girder	22.00	Before	LIVE+DEAD	-317.39	145.06	26.11	7.76	55.34	66.70
Left Exterior Girder	22.00	Before	LIVE+DEAD	-379.98	98.59	20.32	-24.97	42.05	-48.43
Left Exterior Girder	22.00	After	LIVE+DEAD	-320.81	154.52	31.64	7.66	48.35	70.62
Left Exterior Girder	22.00	After	LIVE+DEAD	-382.56	104.71	24.43	-25.44	39.46	-44.65
Left Exterior Girder	24.00	Before	LIVE+DEAD	-331.76	198.88	25.99	-0.27	6.06	-256.71
Left Exterior Girder	24.00	Before	LIVE+DEAD	-393.83	146.70	21.34	-30.62	2.48	-302.19
Interior Girder 1	0.00	After	LIVE+DEAD	11.89	292.60	30.49	-457.51	30.21	33.06
Interior Girder 1	0.00	After	LIVE+DEAD	-61.49	192.47	27.26	-499.42	26.43	-24.79
Interior Girder 1	2.00	Before	LIVE+DEAD	-133.40	-144.21	-59.90	-381.65	-73.70	29.81
Interior Girder 1	2.00	Before	LIVE+DEAD	-199.71	-250.72	-65.17	-420.20	-85.70	-117.14
Interior Girder 1	2.00	After	LIVE+DEAD	-178.63	-158.34	-100.76	-132.35	-110.60	-5.81
Interior Girder 1	2.00	After	LIVE+DEAD	-242.45	-263.30	-107.79	-167.41	-119.21	-153.27

Interior Girder 1	4.00	Before	LIVE+DEAD	-198.63	-99.91	-151.84	-50.63	20.70	382.76
Interior Girder 1	4.00	Before	LIVE+DEAD	-260.17	-206.32	-165.09	-81.06	5.88	181.14
Interior Girder 1	4.00	After	LIVE+DEAD	-259.22	-1.41	-110.27	48.70	-121.92	385.21
Interior Girder 1	4.00	After	LIVE+DEAD	-320.09	-103.71	-118.87	23.09	-136.33	183.31
Interior Girder 1	6.00	Before	LIVE+DEAD	-255.55	72.84	-70.16	61.36	15.05	421.33
Interior Girder 1	6.00	Before	LIVE+DEAD	-319.30	-27.75	-74.88	37.65	-0.26	193.28
Interior Girder 1	6.00	After	LIVE+DEAD	-257.09	79.20	-54.04	56.30	-42.00	424.97
Interior Girder 1	6.00	After	LIVE+DEAD	-321.54	-21.62	-60.04	32.45	-58.87	197.02
Interior Girder 1	8.00	Before	LIVE+DEAD	-282.80	139.74	-47.73	50.96	25.29	301.69
Interior Girder 1	8.00	Before	LIVE+DEAD	-345.95	36.78	-59.96	25.82	13.08	97.76
Interior Girder 1	8.00	After	LIVE+DEAD	-298.47	143.38	-6.82	38.36	-7.21	303.72
Interior Girder 1	8.00	After	LIVE+DEAD	-362.68	35.94	-15.33	8.33	-23.39	100.46
Interior Girder 1	10.00	Before	LIVE+DEAD	-303.69	198.64	-9.35	28.34	7.34	46.61
Interior Girder 1	10.00	Before	LIVE+DEAD	-363.77	92.68	-14.12	-6.76	1.54	-111.21
Interior Girder 1	10.00	After	LIVE+DEAD	-314.67	211.97	-4.70	25.66	-4.00	43.68
Interior Girder 1	10.00	After	LIVE+DEAD	-375.66	104.42	-11.54	-14.07	-16.21	-112.94
Interior Girder 1	12.00	Before	LIVE+DEAD	-315.72	297.36	13.33	34.33	-5.42	-366.07
Interior Girder 1	12.00	Before	LIVE+DEAD	-373.59	185.24	1.71	-6.11	-12.48	-445.33
Interior Girder 1	12.00	After	LIVE+DEAD	-319.70	-177.69	-32.40	27.36	-16.91	-364.93
Interior Girder 1	12.00	After	LIVE+DEAD	-377.57	-289.82	-44.02	-13.08	-23.96	-444.20
Interior Girder 1	14.00	Before	LIVE+DEAD	-335.07	-95.30	-17.38	37.42	7.69	29.54
Interior Girder 1	14.00	Before	LIVE+DEAD	-396.05	-202.84	-24.22	-2.31	-4.52	-127.07
Interior Girder 1	14.00	After	LIVE+DEAD	-330.86	-82.05	-12.03	34.59	0.26	35.36
Interior Girder 1	14.00	After	LIVE+DEAD	-390.95	-188.01	-16.80	-0.51	-5.53	-122.46
Interior Girder 1	16.00	Before	LIVE+DEAD	-344.23	-20.86	-3.99	22.42	6.87	268.44
Interior Girder 1	16.00	Before	LIVE+DEAD	-408.44	-128.30	-12.50	-7.61	-9.31	65.18
Interior Girder 1	16.00	After	LIVE+DEAD	-343.43	-28.01	-10.16	18.62	1.41	270.29
Interior Girder 1	16.00	After	LIVE+DEAD	-406.58	-130.97	-22.40	-6.52	-10.80	66.36
Interior Girder 1	18.00	Before	LIVE+DEAD	-352.03	34.63	-3.28	14.57	8.68	374.59

Interior Girder 1	18.00	Before	LIVE+DEAD	-416.48	-66.20	-9.27	-9.28	-8.19	146.65
Interior Girder 1	18.00	After	LIVE+DEAD	-351.44	44.43	9.42	12.24	9.64	375.26
Interior Girder 1	18.00	After	LIVE+DEAD	-415.20	-56.17	4.70	-11.47	-5.67	147.22
Interior Girder 1	20.00	Before	LIVE+DEAD	-345.54	108.10	22.64	9.08	-1.47	317.61
Interior Girder 1	20.00	Before	LIVE+DEAD	-406.41	5.79	14.04	-16.52	-15.88	115.71
Interior Girder 1	20.00	After	LIVE+DEAD	-342.95	105.41	13.30	11.39	5.92	315.95
Interior Girder 1	20.00	After	LIVE+DEAD	-404.49	-1.00	0.05	-19.04	-8.89	114.33
Interior Girder 1	22.00	Before	LIVE+DEAD	-328.22	166.87	13.83	6.50	2.14	123.89
Interior Girder 1	22.00	Before	LIVE+DEAD	-392.05	61.92	6.80	-28.57	-6.47	-23.58
Interior Girder 1	22.00	After	LIVE+DEAD	-326.79	179.91	10.57	4.99	5.05	119.45
Interior Girder 1	22.00	After	LIVE+DEAD	-393.11	73.40	5.31	-33.57	-6.95	-27.51
Interior Girder 1	24.00	Before	LIVE+DEAD	-312.30	249.47	4.78	3.57	3.49	-239.73
Interior Girder 1	24.00	Before	LIVE+DEAD	-385.68	149.34	1.55	-38.34	-0.29	-297.58
Interior Girder 2	0.00	After	LIVE+DEAD	-36.21	18.07	1.62	26.64	2.74	-22.64
Interior Girder 2	0.00	After	LIVE+DEAD	-102.86	-51.28	-1.62	-26.64	-2.74	-75.17
Interior Girder 2	2.00	Before	LIVE+DEAD	-18.49	45.56	5.06	27.30	7.80	4.34
Interior Girder 2	2.00	Before	LIVE+DEAD	-85.40	-15.93	-5.06	-27.30	-7.80	-115.26
Interior Girder 2	2.00	After	LIVE+DEAD	-4.95	-51.13	5.26	26.01	8.91	18.45
Interior Girder 2	2.00	After	LIVE+DEAD	-71.38	-106.34	-5.26	-26.01	-8.91	-101.69
Interior Girder 2	4.00	Before	LIVE+DEAD	-103.21	-43.64	14.52	22.85	4.38	198.81
Interior Girder 2	4.00	Before	LIVE+DEAD	-170.22	-96.24	-14.52	-22.85	-4.38	13.95
Interior Girder 2	4.00	After	LIVE+DEAD	-168.44	-68.97	10.98	22.21	4.79	205.39
Interior Girder 2	4.00	After	LIVE+DEAD	-234.93	-120.89	-10.98	-22.22	-4.79	20.19
Interior Girder 2	6.00	Before	LIVE+DEAD	-217.12	-7.21	2.32	23.09	10.30	340.18
Interior Girder 2	6.00	Before	LIVE+DEAD	-282.51	-59.59	-2.31	-23.09	-10.31	135.86
Interior Girder 2	6.00	After	LIVE+DEAD	-267.24	12.15	4.03	23.16	11.82	337.21
Interior Girder 2	6.00	After	LIVE+DEAD	-332.84	-40.57	-4.02	-23.17	-11.83	133.03
Interior Girder 2	8.00	Before	LIVE+DEAD	-279.82	80.45	14.12	22.34	2.97	291.45
Interior Girder 2	8.00	Before	LIVE+DEAD	-340.61	27.87	-14.11	-22.35	-2.98	103.56

Interior Girder 2	8.00	After	LIVE+DEAD	-295.03	114.73	11.34	22.47	4.79	288.53
Interior Girder 2	8.00	After	LIVE+DEAD	-353.79	60.39	-11.31	-22.49	-4.79	101.25
Interior Girder 2	10.00	Before	LIVE+DEAD	-292.31	181.25	2.83	24.72	6.08	24.64
Interior Girder 2	10.00	Before	LIVE+DEAD	-351.33	123.55	-2.80	-24.74	-6.13	-105.97
Interior Girder 2	10.00	After	LIVE+DEAD	-294.30	194.40	3.17	29.98	7.52	24.08
Interior Girder 2	10.00	After	LIVE+DEAD	-352.58	132.28	-3.18	-30.03	-7.62	-106.10
Interior Girder 2	12.00	Before	LIVE+DEAD	-293.50	256.05	6.04	30.23	4.60	-364.89
Interior Girder 2	12.00	Before	LIVE+DEAD	-351.15	187.46	-6.60	-30.40	-4.30	-441.79
Interior Girder 2	12.00	After	LIVE+DEAD	-299.71	-176.89	6.60	30.40	4.60	-364.05
Interior Girder 2	12.00	After	LIVE+DEAD	-357.37	-245.48	-6.04	-30.23	-4.30	-440.96
Interior Girder 2	14.00	Before	LIVE+DEAD	-315.62	-122.96	3.18	30.03	7.52	6.18
Interior Girder 2	14.00	Before	LIVE+DEAD	-373.90	-185.08	-3.17	-29.98	-7.62	-124.00
Interior Girder 2	14.00	After	LIVE+DEAD	-323.66	-114.72	2.80	24.74	6.08	7.57
Interior Girder 2	14.00	After	LIVE+DEAD	-382.68	-172.42	-2.83	-24.72	-6.13	-123.04
Interior Girder 2	16.00	Before	LIVE+DEAD	-328.88	-57.68	11.31	22.49	4.79	259.95
Interior Girder 2	16.00	Before	LIVE+DEAD	-387.64	-112.02	-11.34	-22.47	-4.79	72.67
Interior Girder 2	16.00	After	LIVE+DEAD	-332.63	-48.58	14.11	22.35	2.97	260.59
Interior Girder 2	16.00	After	LIVE+DEAD	-393.42	-101.16	-14.12	-22.34	-2.98	72.70
Interior Girder 2	18.00	Before	LIVE+DEAD	-337.60	10.64	4.02	23.17	11.82	357.47
Interior Girder 2	18.00	Before	LIVE+DEAD	-403.19	-42.08	-4.03	-23.16	-11.83	153.29
Interior Girder 2	18.00	After	LIVE+DEAD	-336.81	20.43	2.31	23.09	10.30	357.63
Interior Girder 2	18.00	After	LIVE+DEAD	-402.20	-31.95	-2.32	-23.09	-10.31	153.30
Interior Girder 2	20.00	Before	LIVE+DEAD	-331.56	79.54	10.98	22.22	4.79	305.54
Interior Girder 2	20.00	Before	LIVE+DEAD	-398.05	27.61	-10.98	-22.21	-4.79	120.34
Interior Girder 2	20.00	After	LIVE+DEAD	-327.86	89.78	14.52	22.85	4.38	305.14
Interior Girder 2	20.00	After	LIVE+DEAD	-394.87	37.18	-14.52	-22.84	-4.38	120.28
Interior Girder 2	22.00	Before	LIVE+DEAD	-327.78	151.35	5.26	26.01	8.91	94.39
Interior Girder 2	22.00	Before	LIVE+DEAD	-394.21	96.13	-5.26	-26.01	-8.91	-25.76
Interior Girder 2	22.00	After	LIVE+DEAD	-326.74	164.40	5.06	27.30	7.80	94.13

Interior Girder 2	22.00	After	LIVE+DEAD	-393.64	102.91	-5.06	-27.30	-7.80	-25.46
Interior Girder 2	24.00	Before	LIVE+DEAD	-328.41	226.20	1.62	26.64	2.74	-253.77
Interior Girder 2	24.00	Before	LIVE+DEAD	-395.06	156.86	-1.62	-26.64	-2.74	-306.30
Right Exterior Girder	0.00	After	LIVE+DEAD	-802.03	-676.58	-127.61	-2198.30	-73.97	-650.70
Right Exterior Girder	0.00	After	LIVE+DEAD	-864.09	-728.75	-132.26	-2228.65	-77.55	-696.18
Right Exterior Girder	2.00	Before	LIVE+DEAD	-668.31	-108.61	92.82	-931.20	136.82	200.45
Right Exterior Girder	2.00	Before	LIVE+DEAD	-730.05	-158.42	85.61	-964.30	127.92	85.18
Right Exterior Girder	2.00	After	LIVE+DEAD	-628.38	-25.14	206.97	-451.42	169.11	229.66
Right Exterior Girder	2.00	After	LIVE+DEAD	-690.97	-71.61	201.18	-484.15	155.82	114.53
Right Exterior Girder	4.00	Before	LIVE+DEAD	-559.38	53.92	226.58	-234.15	-174.88	264.71
Right Exterior Girder	4.00	Before	LIVE+DEAD	-620.71	14.15	210.91	-264.72	-187.27	87.19
Right Exterior Girder	4.00	After	LIVE+DEAD	-465.80	-10.14	8.20	-82.64	-74.22	260.01
Right Exterior Girder	4.00	After	LIVE+DEAD	-526.36	-47.14	-7.33	-109.89	-85.85	81.90
Right Exterior Girder	6.00	Before	LIVE+DEAD	-445.42	29.74	33.79	-59.60	-73.13	281.14
Right Exterior Girder	6.00	Before	LIVE+DEAD	-504.74	-7.79	29.96	-86.27	-89.13	88.34
Right Exterior Girder	6.00	After	LIVE+DEAD	-419.05	41.43	42.94	-41.86	-43.77	278.93
Right Exterior Girder	6.00	After	LIVE+DEAD	-477.27	2.95	38.08	-68.60	-59.13	86.02
Right Exterior Girder	8.00	Before	LIVE+DEAD	-387.28	92.81	37.52	-23.63	-79.36	173.65
Right Exterior Girder	8.00	Before	LIVE+DEAD	-444.44	54.64	20.89	-50.59	-95.74	-2.73
Right Exterior Girder	8.00	After	LIVE+DEAD	-364.92	100.99	19.31	-13.70	-48.63	171.94
Right Exterior Girder	8.00	After	LIVE+DEAD	-420.49	57.83	4.10	-44.04	-65.60	-4.26
Right Exterior Girder	10.00	Before	LIVE+DEAD	-361.53	159.42	7.07	10.26	-59.54	-67.30
Right Exterior Girder	10.00	Before	LIVE+DEAD	-415.24	109.57	1.90	-22.14	-72.25	-180.78
Right Exterior Girder	10.00	After	LIVE+DEAD	-350.30	167.76	14.03	23.41	-40.86	-64.66
Right Exterior Girder	10.00	After	LIVE+DEAD	-402.62	114.32	8.41	-10.43	-51.72	-178.96
Right Exterior Girder	12.00	Before	LIVE+DEAD	-348.72	201.28	49.89	29.63	-92.67	-388.02
Right Exterior Girder	12.00	Before	LIVE+DEAD	-399.04	146.75	38.74	-4.93	-107.18	-449.57
Right Exterior Girder	12.00	After	LIVE+DEAD	-391.95	-214.58	-29.15	-49.28	-99.35	-451.12
Right Exterior Girder	14.00	Before	LIVE+DEAD	-319.24	-128.58	11.16	-11.36	-45.34	-40.63

Right Exterior Girder	14.00	Before	LIVE+DEAD	-371.57	-182.01	5.54	-45.20	-56.20	-154.93
Right Exterior Girder	14.00	After	LIVE+DEAD	-318.69	-125.08	14.34	-3.43	-51.08	-46.58
Right Exterior Girder	14.00	After	LIVE+DEAD	-372.39	-174.94	9.18	-35.83	-63.78	-160.05
Right Exterior Girder	16.00	Before	LIVE+DEAD	-302.23	-74.73	5.70	12.70	-42.65	223.40
Right Exterior Girder	16.00	Before	LIVE+DEAD	-357.80	-117.89	-9.52	-17.64	-59.63	47.19
Right Exterior Girder	16.00	After	LIVE+DEAD	-300.25	-53.52	33.17	1.74	-46.25	222.37
Right Exterior Girder	16.00	After	LIVE+DEAD	-357.41	-91.70	16.54	-25.22	-62.62	45.99
Right Exterior Girder	18.00	Before	LIVE+DEAD	-288.93	-1.46	6.89	9.83	-58.96	322.00
Right Exterior Girder	18.00	Before	LIVE+DEAD	-347.15	-39.95	2.02	-16.91	-74.32	129.09
Right Exterior Girder	18.00	After	LIVE+DEAD	-289.68	10.23	-0.79	13.16	-60.70	321.31
Right Exterior Girder	18.00	After	LIVE+DEAD	-349.00	-27.31	-4.63	-13.51	-76.70	128.51
Right Exterior Girder	20.00	Before	LIVE+DEAD	-297.93	62.96	-16.56	22.11	-48.86	281.30
Right Exterior Girder	20.00	Before	LIVE+DEAD	-358.48	25.96	-32.09	-5.14	-60.49	103.19
Right Exterior Girder	20.00	After	LIVE+DEAD	-302.73	89.52	8.28	13.36	-51.85	282.13
Right Exterior Girder	20.00	After	LIVE+DEAD	-364.07	49.76	-7.39	-17.21	-64.24	104.61
Right Exterior Girder	22.00	Before	LIVE+DEAD	-317.37	145.06	-20.32	24.98	-42.04	66.71
Right Exterior Girder	22.00	Before	LIVE+DEAD	-379.96	98.59	-26.11	-7.76	-55.33	-48.42
Right Exterior Girder	22.00	After	LIVE+DEAD	-320.79	154.52	-24.43	25.45	-39.46	70.63
Right Exterior Girder	22.00	After	LIVE+DEAD	-382.54	104.71	-31.64	-7.65	-48.35	-44.64
Right Exterior Girder	24.00	Before	LIVE+DEAD	-331.74	198.88	-21.34	30.62	-2.48	-256.69
Right Exterior Girder	24.00	Before	LIVE+DEAD	-393.81	146.70	-25.99	0.27	-6.06	-302.17

3.2.16 Moving Load- Lane Assignment

Case	AssignNum	VehClass	ScaleFactor	MinLoaded	MaxLoaded	NumLanes
ACASE1	1	Train	1	0	2	2

3.2.17 Frame Section Prop.- Concrete Column

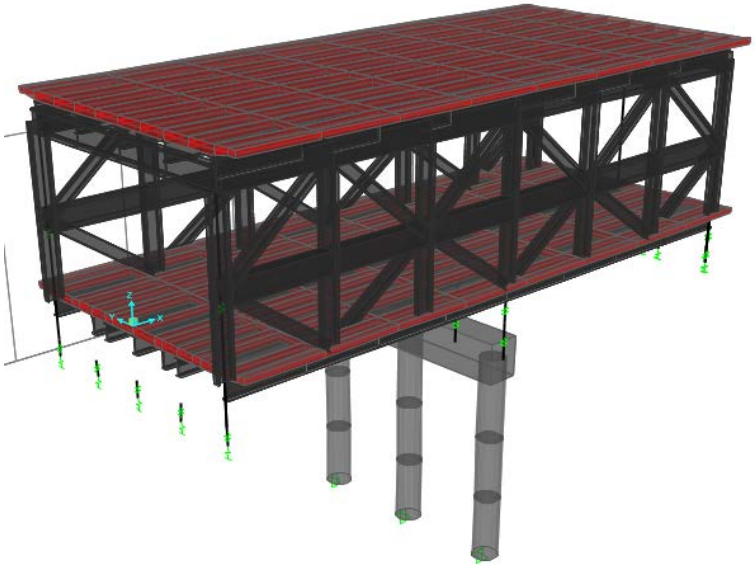
SectnName	RebarMatL	RebarMatC	ReinfConfig	Cover	NumBars3Dir	NumBars2Dir	NumBarsCirc	BarSizeL	BarSizeC	SpacingC	NumCBars2	NumCBars3
				m	Unitless	Unitless	Unitless			m	Unitless	Unitless
Abutment	A615Gr60	A615Gr60	Rect	0.04	3	3		#9	#4	0.15	3	3
bent	A615Gr60	A615Gr60	Rect	0.04	3	3		#9	#4	0.15	3	3
column	A615Gr60	A615Gr60	Circ	0.04			8	#9	#4	0.15		

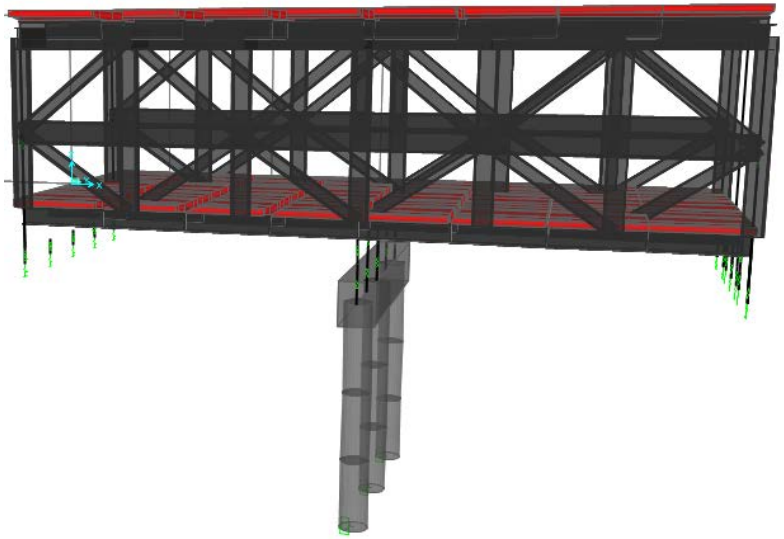
3.2.18 Lane Definition Data

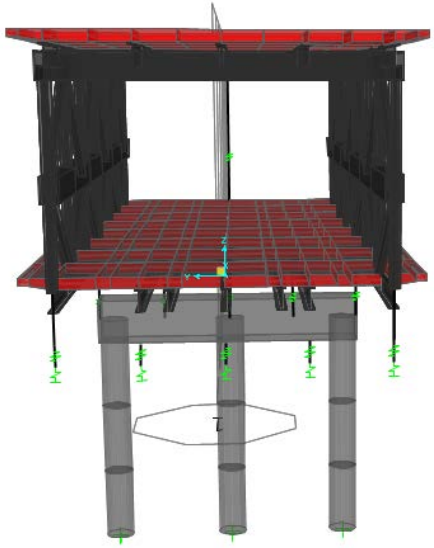
Lane	LaneFrom	LayoutLine	Station	Width	Offset	LoadGroup	DiscAlong	DiscAcross
			m	m	m		m	m
LANE1	Layout Line	layout	0	1.676	-2.4	Default	3.048	3.048
LANE1	Layout Line	layout	24	1.676	-2.4	Default		
LANE2	Layout Line	layout	0	1.676	2.4	Default	3.048	3.048
LANE2	Layout Line	layout	24	1.676	2.4	Default		

3.2.19 Material List- By Section properties

Section	ObjectType	NumPieces	TotalLength	TotalWeight
		Unitless	m	KN
bent	Frame	1.000	9.150	411.628
abutment	Frame	2.000	18.300	686.047
column	Frame	9.000	27.000	763.182
ISWB600-2	Frame	16.000	36.600	52.079
FSEC2	Frame	72.000	144.000	65.396
FSEC1	Frame	48.000	96.000	46.184







3D Model of Rail cum Road Bridge

CHAPTER 4

RESULTS & CONCLUSION

The bridge is designed as per the following details:

Section 1: Highway Bridge Section

Type Of Bridge	Steel I Girder Bridge
Total Length	24m
Number of span(s)	1
Total Width	11m
Number of Lanes	2

Total Material Used - By Section Property

Section	Object Type	Num Pieces	Total Length	Total Weight
		Unitless	m	KN
BOX 650*400	Frame	14	91.00	350.23
BOX 500*300	Frame	33	112.05	382.94
ISWB600-2	Frame	12	48.00	68.30
ISMB350	Frame	42	178.59	91.71
FSEC2	Frame	56	192.00	87.19
Total Weight of Steel Used				980.33 KN

Section 2: Railway Bridge Section

Type Of Bridge	Steel I Girder Bridge
Total Length	24m
Number of span(s)	2
Length of Span	12m
Total Width	11m
Number of Lanes	2

Total Material Used - By Section Property				
Section	**ObjectType**	**NumPieces**	**TotalLength**	**TotalWeight**
		Unitless	m	KN
bent	Frame	1.000	9.150	411.628
abutment	Frame	2.000	18.300	686.047
column	Frame	9.000	27.000	763.182
ISWB600-2	Frame	16.000	36.600	52.079
FSEC2	Frame	72.000	144.000	65.396
FSEC1	Frame	48.000	96.000	46.184
Total Weight of Steel Used				163.7 KN
Total Weight Of Concrete Used				1860.9 KN

Combined Section I & II

Total Weight of steel used = 1144.00 KN

Total Weight of concrete used = 1860.90 KN

Weight of steel used per meter of span = 47.67 KN

Weight of concrete used per meter of span = 77.53 KN

This Design of Double Deck Rail cum Road Bridge is applicable to Seismic zone 1 & zone 2 of Indian Sub-Continent.

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The End Of Report