# Seismic Analysis of Cantilever Steel Truss Bridge

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## Abstract

Bridges are important elements in any transportation system. As bridges are vital links, they are required to be functional even after an earthquake to provide access to hospitals, fire stations, and a variety of other important services. This paper introduces the seismic analysis of the cantilever steel bridge of main span of 150 m long and 50m, 50m of sub-spans and carriage way of 3 lanes and having width of 15 m. In this paper we will carry out response spectrum analysis of the cantilever steel bridge in MIDAS civil software.

## Keywords

Cantilever steel bridge, Seismic Analysis, Response spectrum analysis, MidasCivil software.

## 1. Introduction

The bridge is called cantilever bridge when it is built using cantilevers, structure which is projected horizontally into space and supported on only one end. Large cantilever bridges are designed to for long bridges, rail traffic bridge using truss made from structural steel and box sections. When it was initially used, the steel truss cantilever bridge represented a significant advance in engineering because it could span over 460m and could be built more readily at tricky crossings because it required little to no falsework.

In the current situations there is huge use of steel as structural members of the bridges. This is because steel offers large number of advantages compared to other construction materials. Constructions using steel as structural members offers easiness in fabrication, high strength and ductility and speed in construction (Figure 1).

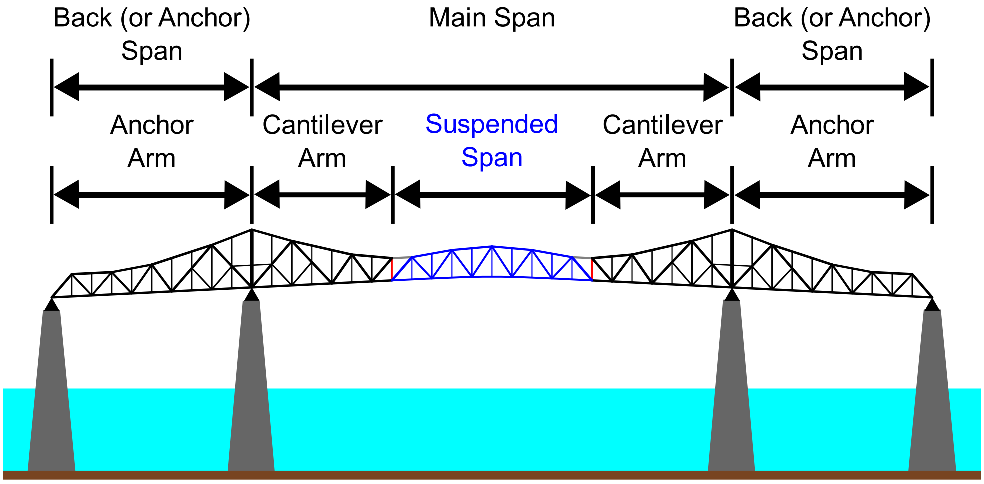


Figure 1. Schematic View of the Cantilever Truss Bridge

### 1.1 Response Spectrum Analysis

This is a general technique where the structure is dynamically analysed to determine the first and higher modes of vibration. It is ideal for more complex structural systems (e.g., continuous bridges, bridges with substantial differences in pier heights, bridges with curved plans, etc.). It depicts the maximum reaction of fictitious systems with one degree of freedom over a range of times to an earthquake with a given value of damping.
The maximal response, which can be defined as the highest absolute acceleration, highest relative velocity, or highest relative displacement, is plotted versus the undamped natural period and for different damping values.

## 1.2 Objectives

- To model a cantilever steel truss bridge in Midas Civil Software.
- To perform Static analysis of cantilever steel bridge.
- To carry out response spectrum analysis of bridge in Midas Civil.

## 2.Literature Review

Tokyo Gate bridge is a cantilever type of bridge. It is having the main span of 440 m with its total length 792m. It is one of the longest bridges in the world. In that bridge they have use of High-Performance Steel -SBHS Steel. All the connection in that case are welded joints. There are two side spans which are fabricated and assembled in factory and brought to side using cranes. Erection and fabrication of bridge is easy while constructing in that way. In order to build a segment using the balance cantilever method, a pier is required. Long span bridges are best suited for crossing vast rivers using the balance cantilever approach since it minimizes the amount of ground level construction. The balance cantilever method frequently uses non-composite box girders. A main beam that is made up of girders that resemble hollow boxes is known as a box girder. To lessen segment self-weight, different depths of segment can be applied. To prevent significant asymmetric overturning moments in the piers during the building phase, box girders must be built symmetrically outward from them.

The greatest and most ideal approach for crossing long, wide valleys with reinforced concrete highway bridges using a maximum span and a minimal number of columns is segmentally post-tensioned balanced cantilever. As a result, this technique has become popular in recent years for building bridges. The world has several bridges that have been built or are currently being developed using the balanced cantilever approach. Vertical ground motion is frequently overlooked or undervalued in the design and safety assessment of buildings, particularly bridges. The vertical ground motion component, however, can be much larger than the horizontal components and may seriously destroy the bridge structures, as evidenced by certain prior extremely strong far- and near-fault earthquakes.

## 3.Structural Modelling

### 3.1 Super-Structure

In this bridge, we adopt the geometry of the structure from the Tokyo Gate Bridge. Here the main span is of 150 m and having width 15m wide. It is basically the 3 lanes one way bridge. For the truss structure box sections are used (Figure 2-10).

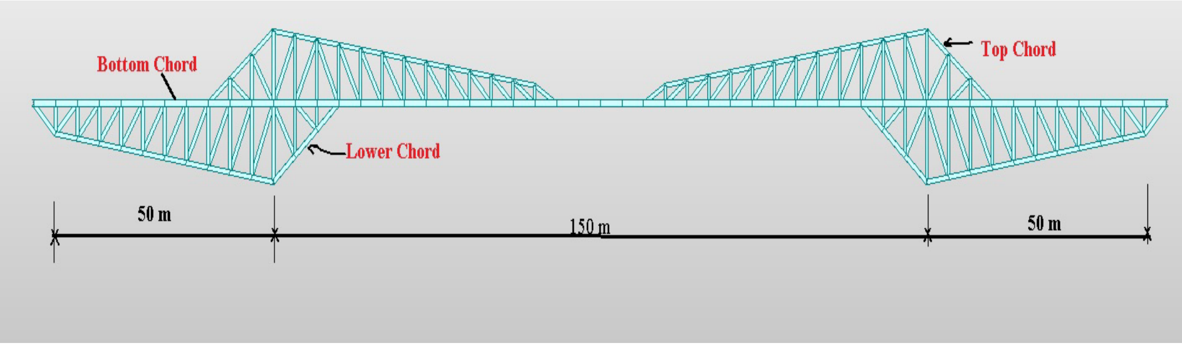


Figure 2. Elevation View of the Cantilever Bridge

Structural material for the sections of super structure is steel which is of grade E600. Stringers are the longitudinal members supporting the slab. Loads will directly transfer to stringer. They are I section made up of plates. Sections with their sizes are mentioned below in table 1.

Table 1. Sections Used in the Modelling of Superstructure of Bridge

| MEMBER | SECTION | H (mm) | B (mm) | $T_w$ (mm) | $T_{f1}$ (mm) | $T_{f2}$ (mm) |
|---|---|---|---|---|---|---|
| **Bottom Chord** | Box | 1200 | 1200 | 50 | 50 | 50 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Top Chord (upper)** | **Box** | **800** | **850** | **50** | **50** | **50** |
| **Top Chord (lower)** | **Box** | **950** | **950** | **50** | **50** | **50** |
| **Verticals** | **Box** | **750** | **820** | **40** | **40** | **40** |
| **Diagonals** | **Box** | **750** | **800** | **40** | **40** | **40** |
| **Horizontals** | **Box** | **680** | **750** | **40** | **40** | **40** |
| **Cross Beams** | **I- section** | **1100** | **600** | **50** | **50** | **50** |
| **Stringers** | **I- section** | **900** | **650** | **50** | **50** | **50** |
| **Bracing** | **I- section** | **700** | **500** | **50** | **50** | **50** |

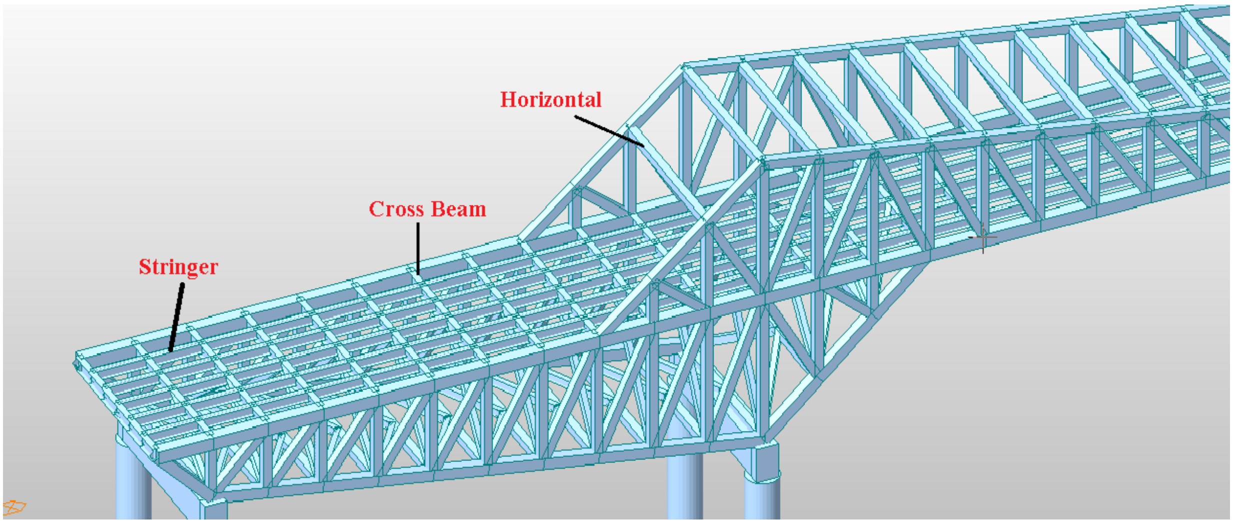


Figure 3. Stringer, Cross beam and Horizontals of the bridge

## 2.2 Sub-Structure

In the given bridge, super-structure is placed on the beam. Concrete of M40 grade is used in substructure. The size of the beam is 2m*3m. The pier supporting those beams are of circular shape and diameter of 3m. We have modelled the pile cap as plate element having depth 1.5m. Piles of 1.2m diameter with spacing 3.2m are arranged in rectangular arrangement. Those piles are arranged as 4x7 arrangement. Soil interaction with pile i.e., fixity and lateral capacity is given to them from site condition data. Lateral load carrying capacity for pile [is-2911(part 1/sec 2): 2010 annexure-c]

## 2.3 Bearings

Loads from super structure is transferred to substructure. POT-PTFE type of bearing is provided is provided in this bridge. POT PTFE Bearings are a type of bearing that accommodates rotation by deforming an elastomeric disc while supporting vertical loads by compressing the disc inside a steel cylinder. A triaxial pressure on the elastomer results in a material with a high vertical stiffness but little deformation resistance. In addition to allowing movement and rotation along any horizontal axis, POT PTFE Bearings are able to support vertical loads and horizontal forces.

this bridge. POT PTFE Bearings are a type of bearing that accommodates rotation by deforming a

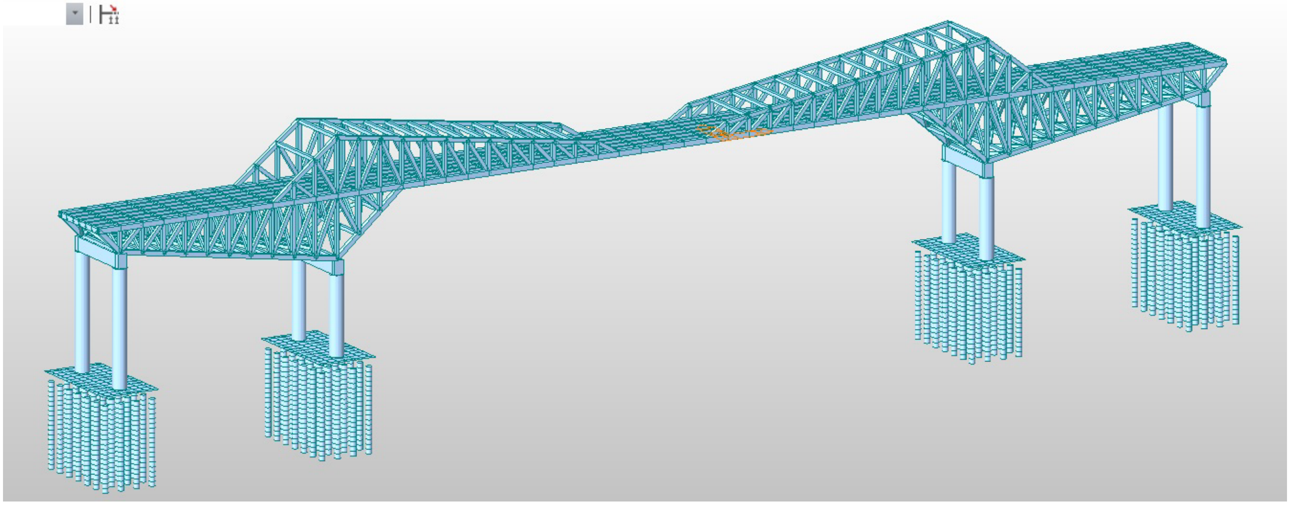


Figure 4. 3D View of the Cantilever Steel Truss Bridge.

## 3. Loadings

The loading on the bridge is applied according to the IRC-6 2019. Here we are dealing with the loads coming on the super structure.

### 3.1Dead Load

Dead loads on the bridge are due to self-weight, load of the slab, weight of the wearing course and crash bearings. Material used for the wearing course is having the weight density of 24 kN/m$^3$. Slabs have 25 kN/m3 density and thickness of slab is 200mm. Following are the dead loads applied on bridge.

a) **Wearing course**

W = 24 x 2.5 x 0.06 = 3.6 kN/m (on stringers)

W = 24 x 1.25 x 0.06 =1.8 kN/m (on Bottom Chords)

b) **Slab Load**

W = 25 x 2.5 x 0.2 = 13.8 kN/m (on stringers)

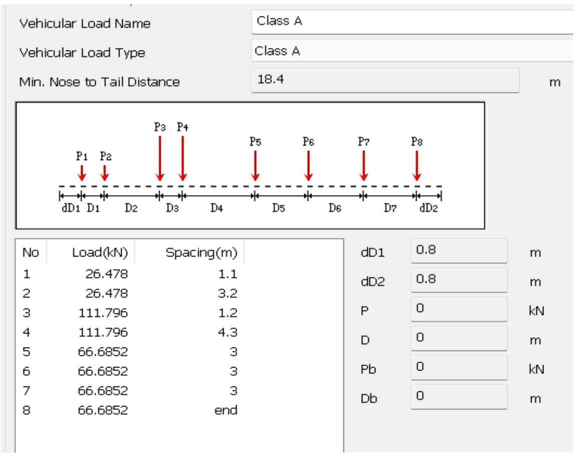
W = 25x 1.25 x 0.2 =6.9 kN/m (on Bottom Chords)

c) **Crash Bearings**

W = 25 x 0.4 = 10 kN/m (on Bottom Chords)

### 3.2 Moving Load

Load coming on the super structure due to the moving vehicles. According to the IRC-6 2019 the moving load combination from table 9, for the 13m carriage way width, we can provide 3 lanes of class A vehicles or 1 lane of class A vehicle and 1 lane of 70 R vehicle.

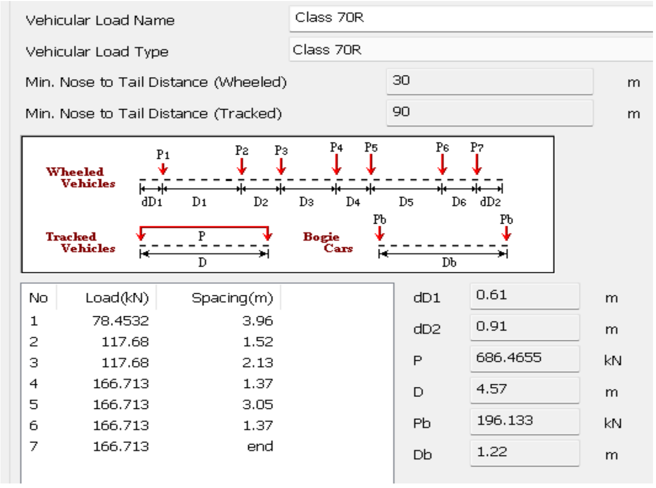


Vehicular Load Name: Class A
Vehicular Load Type: Class A
Min. Nose to Tail Distance: 18.4 m

| No | Load(kN) | Spacing(m) |
|---|---|---|
| 1 | 26.478 | 1.1 |
| 2 | 26.478 | 3.2 |
| 3 | 111.796 | 1.2 |
| 4 | 111.796 | 4.3 |
| 5 | 66.6852 | 3 |
| 6 | 66.6852 | 3 |
| 7 | 66.6852 | 3 |
| 8 | 66.6852 | end |

dD1: 0.8 m
dD2: 0.8 m
P: 0 kN
D: 0 m
Pb: 0 kN
Db: 0 m

Figure 5. Loading Pattern of Class A vehicle.



Vehicular Load Name: Class 70R
Vehicular Load Type: Class 70R
Min. Nose to Tail Distance (Wheeled): 30 m
Min. Nose to Tail Distance (Tracked): 90 m

| No | Load(kN) | Spacing(m) |
|---|---|---|
| 1 | 78.4532 | 3.96 |
| 2 | 117.68 | 1.52 |
| 3 | 117.68 | 2.13 |
| 4 | 166.713 | 1.37 |
| 5 | 166.713 | 3.05 |
| 6 | 166.713 | 1.37 |
| 7 | 166.713 | end |

dD1: 0.61 m
dD2: 0.91 m
P: 686.4655 kN
D: 4.57 m
Pb: 196.133 kN
Db: 1.22 m

Figure 6. Loading pattern of 70R vehicle

## 3.3 Temperature Loads

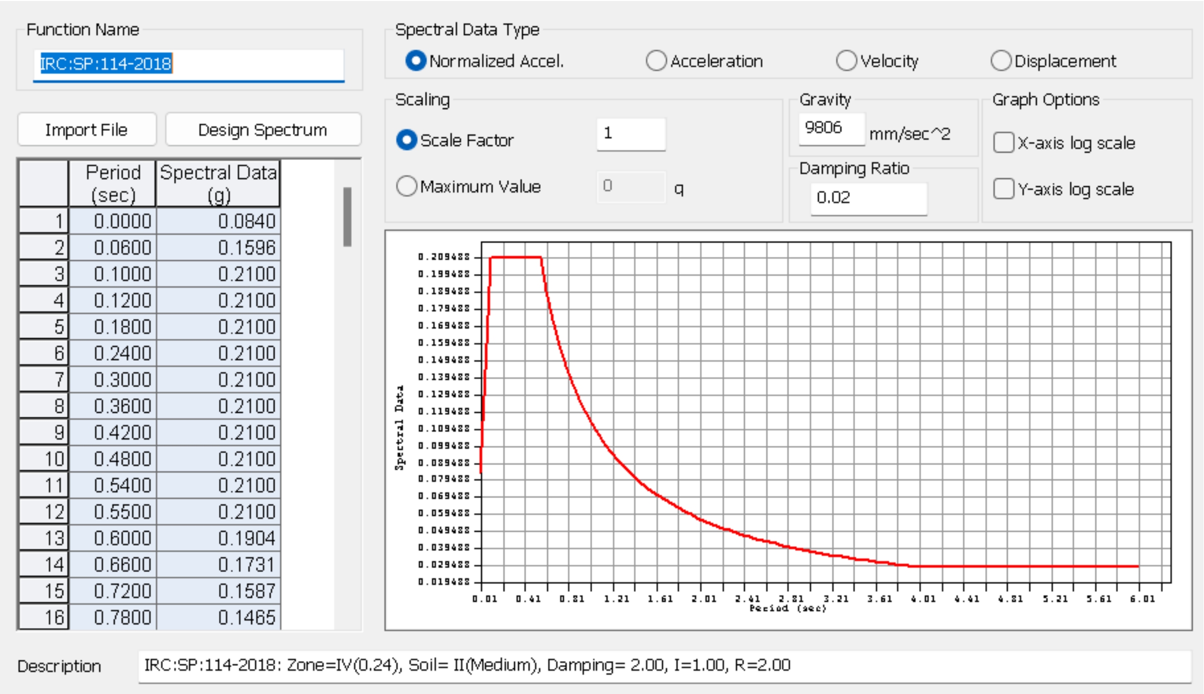
Due to the variation in the temperature at the region, the temperature stresses generated the steel members. IRC 6 have proposed the method to calculate load due temperature.

Shade air temperature for Patna is 46.6$^0$c maximum & 1.4$^0$c minimum

Thus, mean±10$^0$c gives 34$^0$c to 14 $^0$c range, so initial 0$^0$c and final 20$^0$c; $\Delta t=20^0$c.

## 3.4 Response Spectrum Function

This bridge is going to erected in the Patna region of Bihar state. According IS 1893 part III, this bridge is coming in Seismic zone IV. Zone factor for the zone IV is 0.24. Damping ratio is 2% and importance factor for steel bridge is 1.00. Response reduction factor from IRC 6:2017 Table 18, R is taken as 2 for steel bridge. Eigen value analysis for 20 number of frequencies is done.



Function Name: IRC:SP:114-2018

Spectral Data Type: ● Normalized Accel. ○ Acceleration ○ Velocity ○ Displacement

Scaling: ● Scale Factor 1 ○ Maximum Value 0 g

Gravity: 9806 mm/sec^2

Damping Ratio: 0.02

Graph Options: ☐ X-axis log scale ☐ Y-axis log scale

| | Period (sec) | Spectral Data (g) |
|---|---|---|
| 1 | 0.0000 | 0.0840 |
| 2 | 0.0600 | 0.1596 |
| 3 | 0.1000 | 0.2100 |
| 4 | 0.1200 | 0.2100 |
| 5 | 0.1800 | 0.2100 |
| 6 | 0.2400 | 0.2100 |
| 7 | 0.3000 | 0.2100 |
| 8 | 0.3600 | 0.2100 |
| 9 | 0.4200 | 0.2100 |
| 10 | 0.4800 | 0.2100 |
| 11 | 0.5400 | 0.2100 |
| 12 | 0.5500 | 0.2100 |
| 13 | 0.6000 | 0.1904 |
| 14 | 0.6600 | 0.1731 |
| 15 | 0.7200 | 0.1587 |
| 16 | 0.7800 | 0.1465 |

Description: IRC:SP:114-2018: Zone=IV(0.24), Soil= II(Medium), Damping= 2.00, I=1.00, R=2.00

Figure 7. Response spectrum Function Graph.

## 4. Results and Discussion

After performing the analysis in the Midas Civil software. Below mentioned results are given below. For the analysis we consider two critical load combination according to the IRC 6: LSD.

**Combination1**:

1.35( SW + Slab Load + CB ) + 1.75 WC + 1TF + 1.0 Rx + 0.30Ry+ 0.30Rz + 0.2 ( MV )

**Combination 2**

1.35( SW + Slab Load + CB ) + 1.75 WC + 1TF + 0.30 Rx + 1.00Ry+ 0.30Rz + 0.2 ( MV )

**Combination 3**

1.35( SW + Slab Load + CB ) + 1.75 WC + 1TF + 0.30 Rx + 0.30Ry+ 1.00Rz + 0.2 ( MV )

Where,
SW – Self Weight
CB – Crash Bearing
TF – Temperature Forces
Rx – Seismic Load in X- direction
Ry – Seismic Load in Y- direction
Rz – Seismic Load in Vertical- direction
MV – Moving Vehicle Loading

Bottom chord members are basically critical in bending moment. Given below bending moments of the critical member of bottom chord for combinations are given below in tables 2-6.

Table 2. Forces in Critical Members of Bottom Chord in Combination1

| Elem | Load | Axial (kN) | Shear-y (kN) | Shear-z (kN) | Torsion (kN×m) | Moment-y (kN×m) | Moment-z (kN×m) |
|---|---|---|---|---|---|---|---|
| 821 | Comb1 | -1369.34 | 5.32 | -346.33 | 2.52 | 15086.21 | 395.86 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | Comb1 | -32005.5 | 37.13 | -1833.03 | 18.44 | -9251.55 | 475.78 |

Table 3. Forces in Critical Members of Bottom Chord in Combination2

| Elem | Load | Axial (kN) | Shear-y (kN) | Shear-z (kN) | Torsion (kN×m) | Moment-y (kN×m) | Moment-z (kN×m) |
|---|---|---|---|---|---|---|---|
| 821 | Comb2 | -1129.11 | 15.8 | -371.66 | 2.69 | 15303.21 | 1317.99 |
| 4 | Comb2 | -31835.7 | 122.46 | -1822.76 | 31.83 | -9194.24 | 1556.35 |

Table 4. Forces in Critical Members of Bottom Chord in Combination3

| Elem | Load | Axial (kN) | Shear-y (kN) | Shear-z (kN) | Torsion (kN×m) | Moment-y (kN×m) | Moment-z (kN×m) |
|---|---|---|---|---|---|---|---|
| 821 | Comb3 | -1335.38 | 4.96 | -368.19 | 2.37 | 15410.67 | 396.7 |
| 4 | Comb3 | -31742.7 | 36.73 | -1816.45 | 18.34 | -9156.44 | 470.05 |

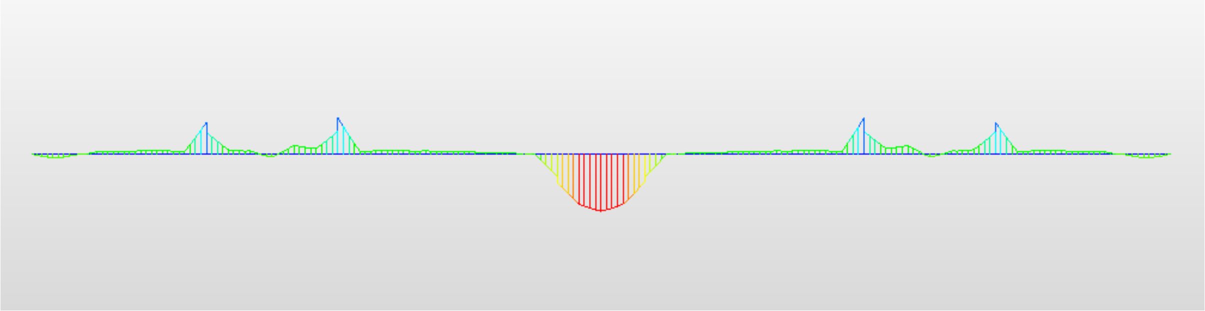


Figure 8. Bending Moment Diagram of Bottom Chord.

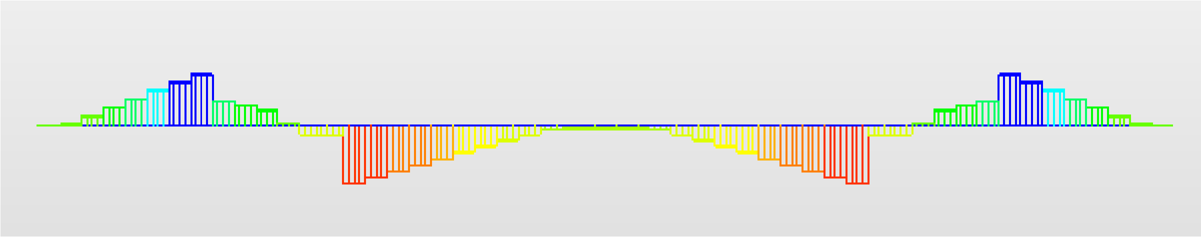


Figure 9. Axial Force Diagram of the Bottom Chord

Load of the Slab and wearing course directly goes to stringers. Stringers behave as a simply supported beams. As they only take the static loads the forces in them are same in all these load combinations are mentioned below in figure 10.

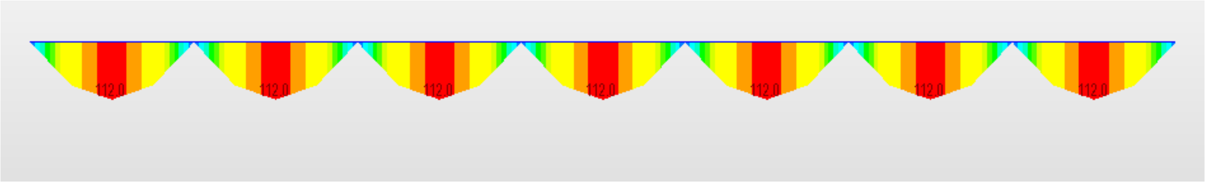


Figure 10. Bending Moment Diagram of Stringer Members.

Table 5. Forces in the Stringer

| Elem | Load | Moment-y (kN×m) |
|---|---|---|
| 974 | Comb1 | 112.01 |
| 1107 | Comb1 | 112.01 |

Cross beam members basically take the loads coming from the stringers to them and transfer to bottom chord member. As they only take the static loads the forces in them are same in all these load combinations are mentioned below in Figure 11 and Figure 12.

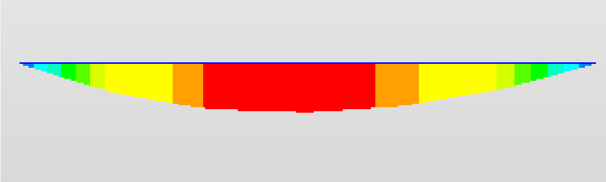


Figure 11. Bending Moment diagram of Elem1270.

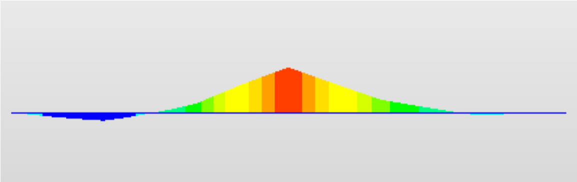


Figure 12. Bending Moment diagram 1236.

Table 6. Forces in the Critical Cross Beam.

| Elem | Load | Axial (kN) | Shear-y (kN) | Shear-z (kN) | Torsion (kN×m) | Moment-y (kN×m) | Moment-z (kN×m) |
|---|---|---|---|---|---|---|---|
| 1250 | Comb1 | 140.65 | -40.2 | -147.25 | -0.62 | 2313.71 | 247.95 |
| 1236 | Comb1 | 24.51 | 4.11 | -485.75 | 0.54 | -1446.9 | 86.53 |

Vertical members basically take axial forces as they are the truss members and in the model the end releases are given to them. Forces in the section vertical members are shown below in Table 7, Table 8, Table 9.

Table 7. Forces in Critical Members of Verticals in Combination1

| Elem | Load | Axial (kN) |
|---|---|---|
| 904 | Comb1 | 6381.31 |
| 40 | Comb1 | -17987.2 |

Table 8. Forces in Critical Members of Verticals in Combination2.

| Elem | Load | Axial (kN) |
|---|---|---|
| 904 | Comb2 | 6453.75 |
| 40 | Comb2 | -17853.4 |

Table 9 Forces in Critical Members of Verticals in Combination3

| Elem | Load | Axial (kN) |
|---|---|---|
| 904 | Comb3 | 6494.23 |
| 40 | Comb3 | -17764.2 |

### 4.1 Eigen Value Analysis

By resolving the fundamental equation made up of a mass matrix and a stiffness matrix, eigenvalue analysis can reveal a structure's dynamic features. Natural modes, also known as mode shapes, natural periods, and modal participation factors, are examples of dynamic features. In the given analysis we took 20 frequencies for the eigen value analysis. This analysis is shown below Table 10 and Table 11 in tabular form.

Table 10. Eigen Value Analysis

| EIGEN VALUE ANALYSIS | | | |
|---|---|---|---|
| Mode No | Frequency | | Period |
| | (rad/sec) | (cycle/sec) | (sec) |
| 1 | 1.881189 | 0.2994 | 3.340008 |
| 2 | 4.825852 | 0.768058 | 1.301985 |
| 3 | 6.373273 | 1.014338 | 0.985865 |
| 4 | 7.076845 | 1.126315 | 0.887851 |
| 5 | 8.564779 | 1.363127 | 0.733607 |
| 6 | 9.443848 | 1.503035 | 0.66532 |
| 7 | 9.826742 | 1.563975 | 0.639397 |
| 8 | 11.17543 | 1.778624 | 0.562232 |
| 9 | 12.12553 | 1.929837 | 0.518178 |
| 10 | 13.47918 | 2.145278 | 0.46614 |
| 11 | 13.62342 | 2.168235 | 0.461205 |
| 12 | 14.02317 | 2.231856 | 0.448058 |
| 13 | 14.07844 | 2.240654 | 0.446298 |
| 14 | 14.11754 | 2.246876 | 0.445062 |
| 15 | 14.12798 | 2.248537 | 0.444734 |
| 16 | 14.13987 | 2.25043 | 0.44436 |
| 17 | 14.14217 | 2.250797 | 0.444287 |
| 18 | 14.14497 | 2.251243 | 0.444199 |
| 19 | 14.14654 | 2.251492 | 0.44415 |
| 20 | 14.14841 | 2.25179 | 0.444091 |

Table 11. Modal Mass Participation

| **MODAL PARTICIPATION MASSES** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mode No** | **Tran-X** | | **Tran-Y** | | **Tran-Z** | | **Rotn-X** | | **Rotn-Y** | | **Rotn-Z** | |
| | **Mass (%)** | **Sum (%)** | **Mass (%)** | **Sum (%)** | **Mass (%)** | **Sum (%)** | **Mass (%)** | **Sum (%)** | **Mass (%)** | **Sum (%)** | **Mass (%)** | **Sum (%)** |
| **1** | **0** | **0** | **35.62** | **35.62** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **2** | **0** | **0** | **0** | **35.62** | **0** | **0** | **0** | **0** | **0** | **0** | **7.51** | **7.51** |
| **3** | **98.02** | **98.02** | **0** | **35.62** | **0** | **0** | **0** | **0** | **0.03** | **0.03** | **0** | **7.51** |
| **4** | **0.01** | **98.03** | **0** | **35.62** | **26.5** | **26.5** | **0** | **0** | **0** | **0.03** | **0** | **7.51** |
| **5** | **0** | **98.03** | **24.93** | **60.55** | **0** | **26.5** | **0.56** | **0.57** | **0** | **0.03** | **0.03** | **7.54** |
| **6** | **0** | **98.03** | **27.75** | **88.3** | **0** | **26.5** | **5.98** | **6.55** | **0** | **0.03** | **0.56** | **8.1** |
| **7** | **0** | **98.03** | **0.22** | **88.51** | **0** | **26.5** | **0.05** | **6.6** | **0** | **0.03** | **87.61** | **95.7** |
| **8** | **0** | **98.03** | **0** | **88.52** | **0** | **26.5** | **0** | **6.6** | **0** | **0.03** | **2.59** | **98.3** |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **9** | **0** | **98.03** | **9.29** | **97.8** | **0** | **26.5** | **20.4** | **27** | **0** | **0.03** | **0.01** | **98.3** |
| **10** | **0** | **98.03** | **0** | **97.8** | **0.03** | **26.5** | **0** | **27** | **0** | **0.03** | **0** | **98.3** |
| **11** | **0.59** | **98.62** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0.02** | **0.05** | **0** | **98.3** |
| **12** | **0.02** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0.01** | **0.06** | **0** | **98.3** |
| **13** | **0** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |
| **14** | **0** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |
| **15** | **0** | **98.64** | **0** | **97.8** | **0.01** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |
| **16** | **0** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |
| **17** | **0** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |
| **18** | **0** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |
| **19** | **0** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |
| **20** | **0** | **98.64** | **0** | **97.8** | **0** | **26.5** | **0** | **27** | **0** | **0.06** | **0** | **98.3** |

Mass participation should be more than 95% in the analysis and in our case, it is more than 95% so its ok. Different modes shapes of the structure after performing analysis are shown below Figure 13-19.

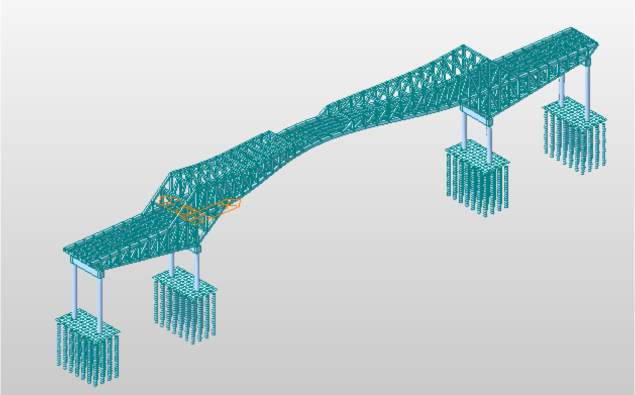


Figure 13. First Mode Shape

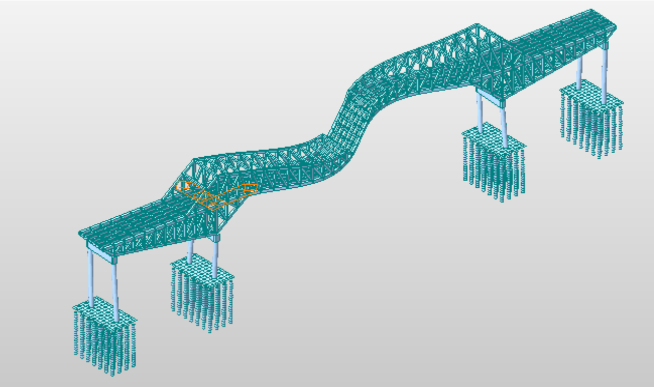


Figure 14. Second Mode Shape

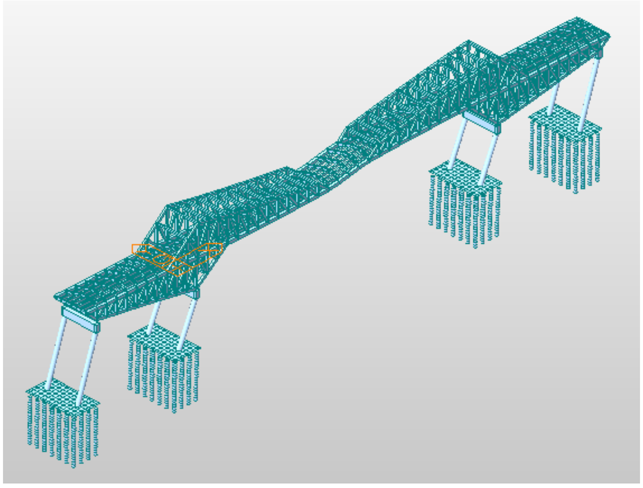


Figure 15. Third Mode Shape

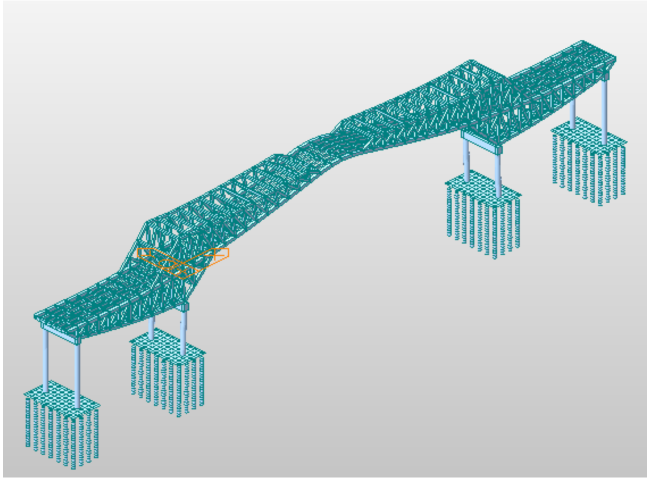


Figure 16. Fourth Mode Shape

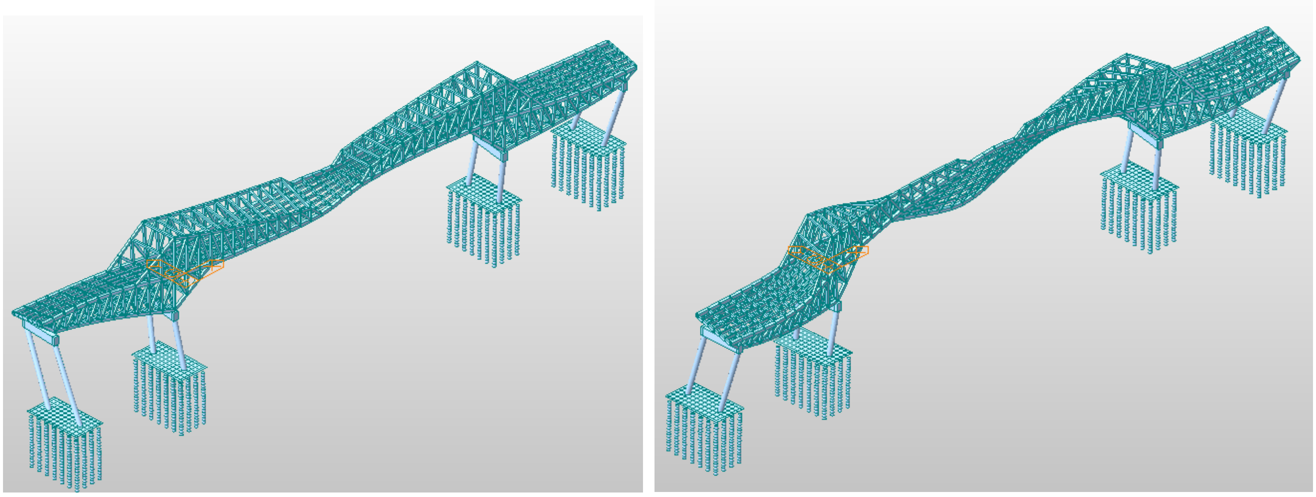


Figure 17. Fifth Mode Shape

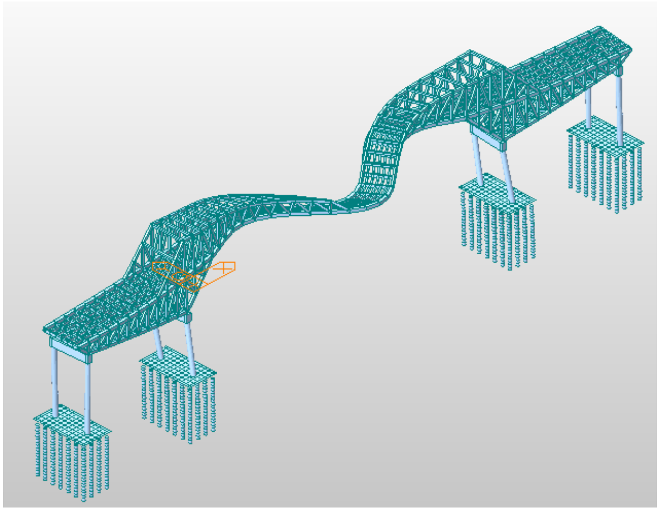


Figure 11. Seventh Mode Shape

### 4.2 Response Spectrum Analysis

After performing the response spectrum analysis. According to IRC 6: 2017, seismic load combinations. It is to be anticipated that direction will produce seismic forces. To do this, following distinct analyses for seismic design forces acting in three orthogonal directions must be carried out. Following three combinations are given in code.

a) Rx + 0.3 Ry + 0.3Rz
b) 0.3Rx + Ry + 0.3Rz
c) 0.3Rx + 0.3Ry + 1Rz

For the first combination the deflection in X, Y and Z directions are shown below.

| **X-Direction** | **Y-Direction** | **Z-Direction** |
|---|---|---|
| **22.48 mm** | **27.50 mm** | **12.90 mm** |

For the second combination the deflection in X, Y and Z directions are shown below.

| **X-Direction** | **Y-Direction** | **Z-Direction** |
|---|---|---|
| **8.27 mm** | **91.66 mm** | **20.03 mm** |

For the third combination the deflection in X, Y and Z directions are shown below

| X-Direction | Y-Direction | Z-Direction |
|---|---|---|
| **8.97 mm** | **25.00 mm** | **27. 52 mm** |

### 4.3 Deflection of the Bridge

For the deflection check of the bridge according to IRC 24:2010, Rolled steel beams, plate girders or lattice girders, either simple or continuous spans, shall be designed so that the total deflection due to live load and impact shall not exceed of 1/800 of the span.

Here, $\frac{L}{800} = \frac{150 \times 10^3}{800}$ = 187.5 mm.

Table 12. Vertical Deflection due to Live Loads

| Live load Case | Maximum Deflection |
|---|---|
| 3 lanes of Class a | 117.180mm |
| 1 Lane of Class A +<br>1 Lane of 70R | 148.00 mm |

### 4.4 Discussion

Construction of the cast in situ concrete bridge takes too much time and for long span bridge they are difficult to construct. Cable stayed bridges can be useful for long span but in cable stayed bridges deflection in pylon is big issue. In case of long span, cantilever steel bridges are good because member to member erection is easy. Two side spas are manufactured in the factory and directly placed on piers. So, the cantilever steel truss bridge economical and the quick replacement to other type of bridges.

## Conclusion

Bridges are important elements in any transportation system. As bridges are vital links, they are required to be functional even after an earthquake to provide access to hospitals, fire stations, and a variety of other important services. This paper introduces the seismic analysis of the cantilever steel bridge of main span of 150 m long and 50m, 50m of sub-spans and carriage way of 3 lanes and having width of 15 m. In this paper we will carry out response spectrum analysis of the cantilever steel bridge in MIDAS civil software.

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