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"Parametric Study of Twin Arch Bridge Structure"

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***Abstract:** Arch Bridges in which location of deck with respect to the arch rib are deck type, through type and semi-through type. Through arch bridge in which deck is above the base of an arch structure and top rises above deck. Which comes under the special shape arch bridges. An arch is a compression element. Resolving forces into compressive stresses and, in turn eliminating tensile stresses. The forces of arch will push outward at the base is called thrust. Rise of arch has more important in the support forces. In this study different parameters like Reaction, Bending moment, Axial force, Deflection in twin arch having varying parameter such as arch rise, angle of inclination with vertical etc.*

Keywords— Twin Arch, Steel Bridge, Analysis, SAP-2000, Hollow Section

I. INTRODUCTION

The bridges are the structure, which provides communication over a gap. In some gaps, the water flows for a part of the year or for whole of the year. The rivers and valleys form natural gaps. The railway crossings, highway crossings, and canal crossings form artificial gaps. The bridges provide passage for the vehicular or other traffic over these gaps. The bridges constructed to carry highway are known as highway bridges. The bridges built to carry railway traffic are known as railway bridges. There are some bridges which carry the highway and railway traffic both and these bridges are known as combined highway and railway bridges. There are some bridges for pedestrians only. These bridges are known as foot bridges. There are some bridges which carry canals and pipe lines and these bridges are known as aqueduct bridges. The bridges are made of timber, stone or brick masonry, reinforced cement concrete, pre stressed cement concrete and steel.

✓ ***Arch Bridge:***

Arch bridges have abutments at each end. The weight of the bridge is thrust into the abutments at either side. The arch can either be a concrete, truss, steel section. Ideally, for architecturally reasons the arch should follow a smooth, continuous curved profile.

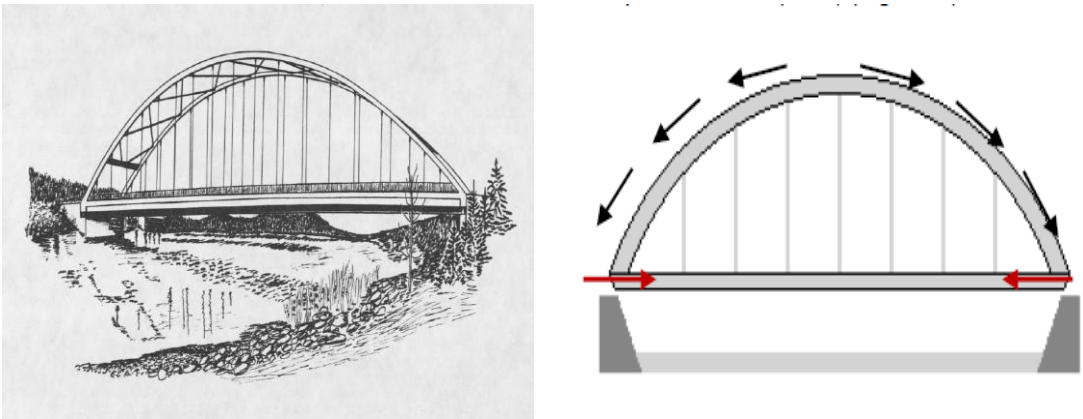

Figure 1 Arch Bridge

✓ ***Twin Arch Bridge:*** Twin arch bridge is the bridge which has an arc shape in Both the plan and Elevation view of the bridge.

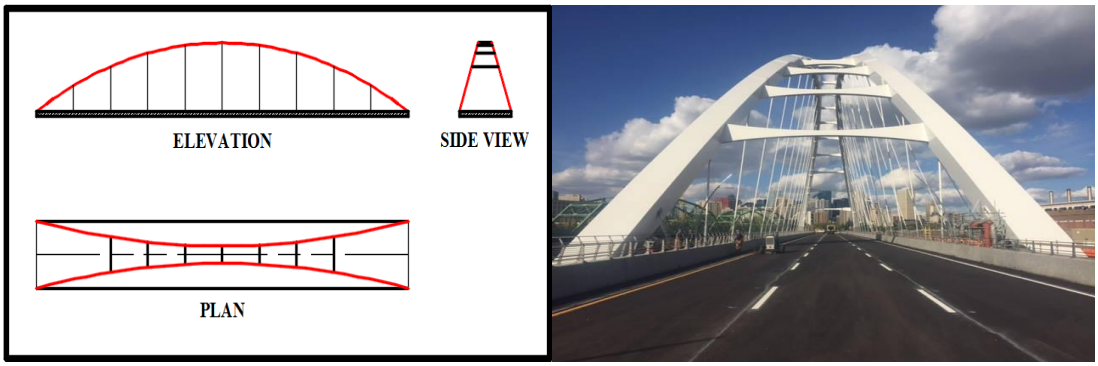

Figure 2 Twin Arch Bridge

II. DATA SELECTION AND STUDY PARAMETERS

Table 1 Selected Data

Span (L)	100m	Material	Steel (Fe250)
Width of Bridge	22.8 m	Section	Hollow Section
No. of Lane	Six	Soil Condition	Rock
Rise of Arch	L/4 , L/5 , L/6	Support	Fix support
Angle of Inclination With Vertical	0° , 10° ,20°	Loads	DL,LL(Moving load)

- **Study Parameters :** Bending Moment,Support Reaction,Axial Force

III. MODEL DESCRIPTION AND COMPONENT SIZE

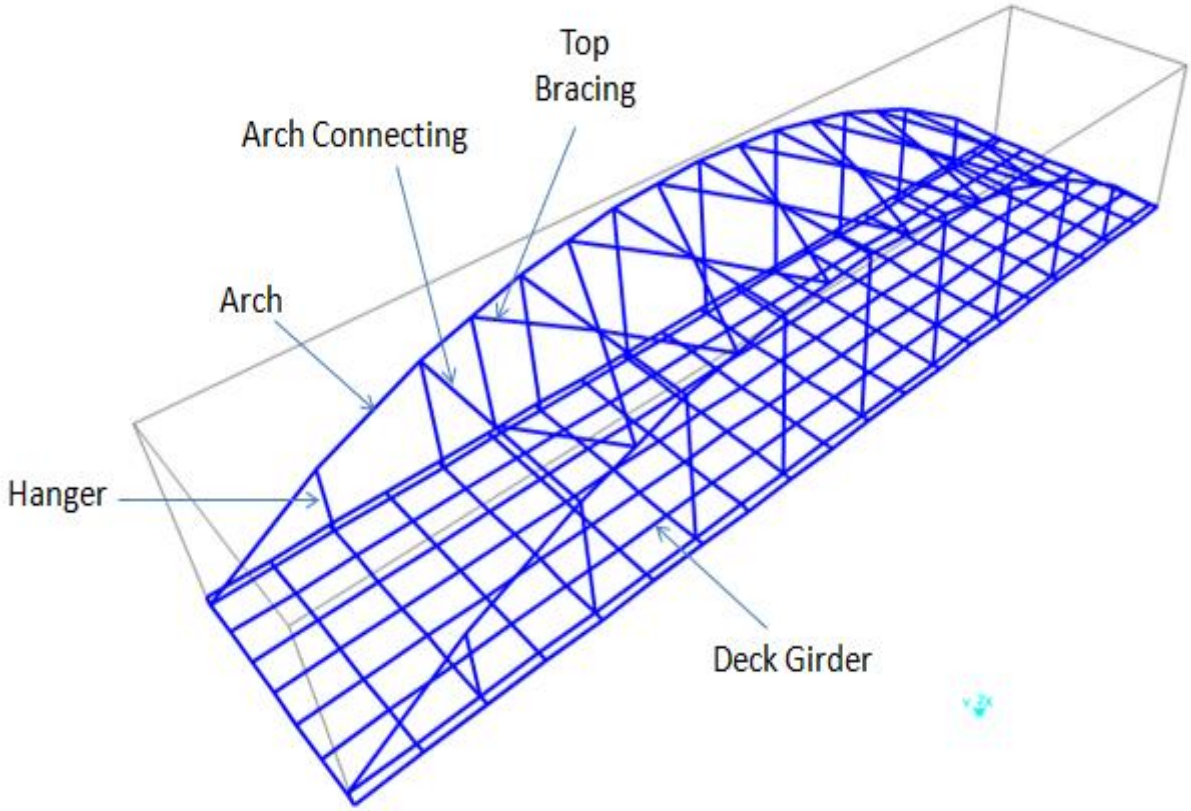

Figure 3 Component Name

Table 2 Section Size

Component	Size	Thickness
Arch	2m Diameter	40mm
Hanger	1mX1m	40mm
Top Bracing	0.5mX0.5m	20mm
Deck Girder	2mX2m	40mm
Arch Connecting	1mX1m	40mm

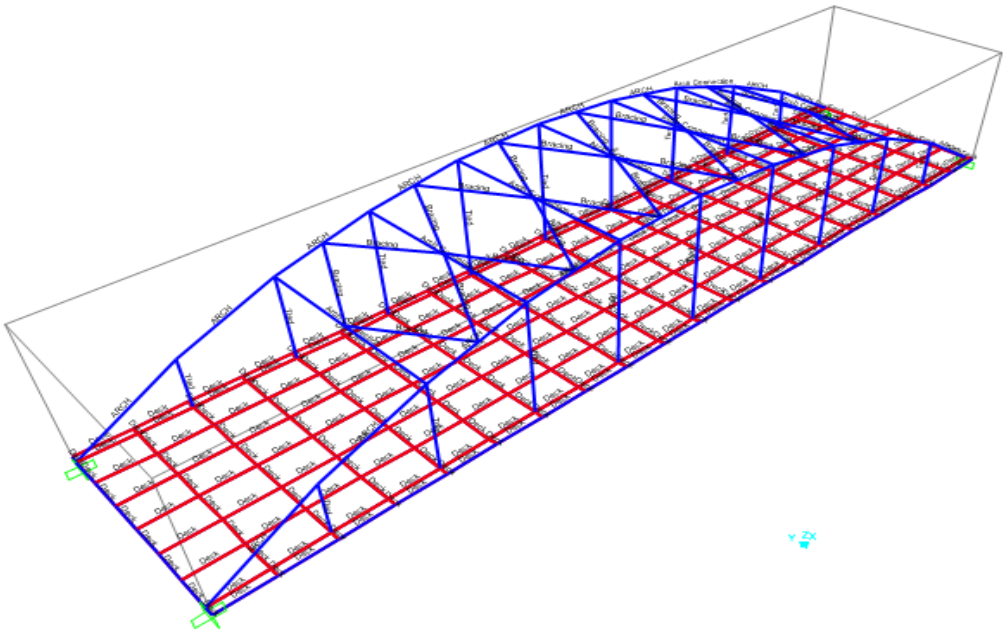

Figure 4 Material Assigns

IV. LOADING AS PER IRC:6-2017

- Slab Thickness : 150mm
- Concrete Grade : M25
- Parapet Load : 1.5 kN/m
- Footway : 4 kN/m²
- Live Load :
  - Table 6 (Live Load Combination)
  - Carriageway Width (20.1m-23.6m)
  - Number of Lanes : 6
  - One Lane of Class A for each lane

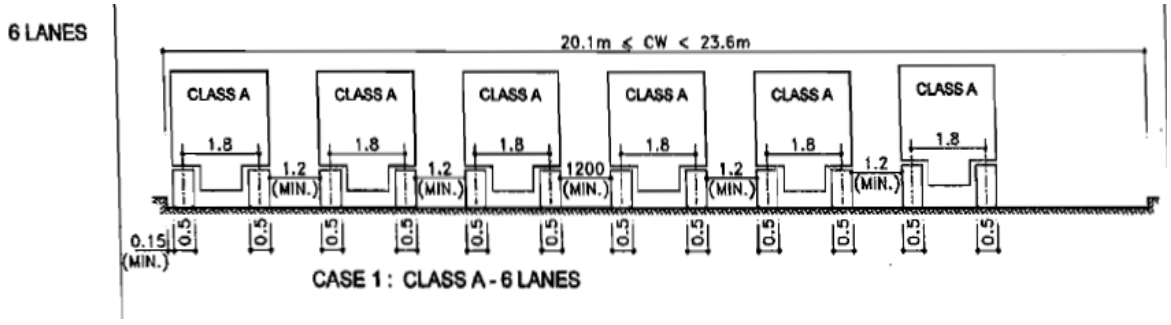

Figure 5 CASE 1 : CLASS A - 6 LANES

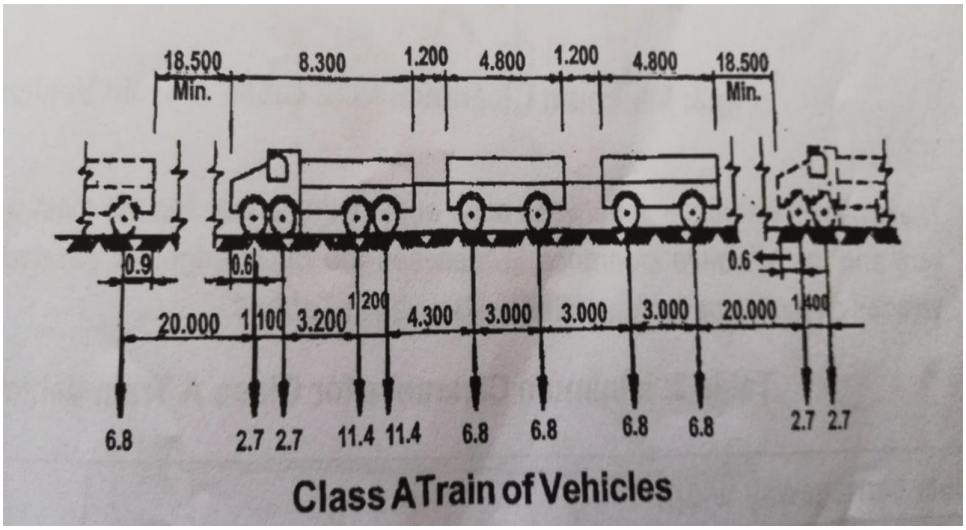

Figure 6 IRC CLASS A LOADING

V. RESULTS

Table 3 AXIAL LOAD (kN)

	0°	**10°**	**20°**
L/6 =16.67m	23795	23132	24881
L/5 =20m	19840	20710	21501
L/4 =25m	15676	15625	16134

Table 4 SUPPORT REACTION (kN)

	0°	**10°**	**20°**
L/6 =16.67m	16540	18740	18596
L/5 =20m	16748	18938	18769
L/4 =25m	18353	18129	17905

Table 5 BENDING MOMENT (kNm)

	0°	**10°**	**20°**
L/6 =16.67m	10627	30819	22978
L/5 =20m	10764	17488	15428
L/4 =25m	31005	31390	31794

VI. CONCLUSIONS.

- Axial Force increases when Rise of the Arch increases from H/6 to H/4 and Angle of inclination from 0° to 20°.
- Support Reaction increase with the increase Angle of inclination up to 10° and it decrease from 10° to 20°.
- Bending Moment increases when Rise of the Arch increases from H/6 to H/4 and Angle of inclination from 0° to 20°.

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