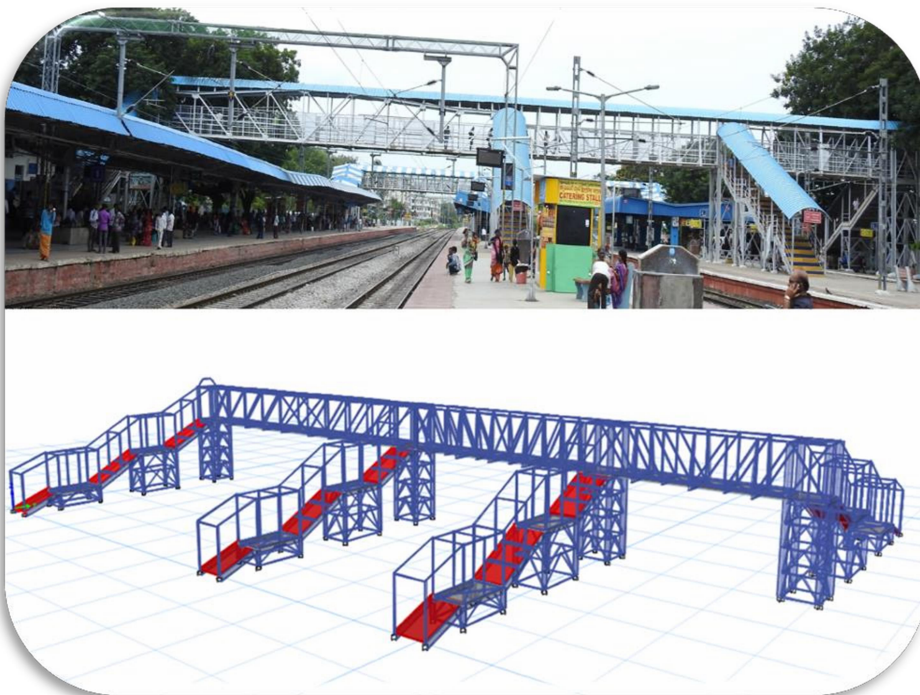




South Central Railway

Inspection of FOB at Lingampally Station



**Preliminary Report
September 2019**

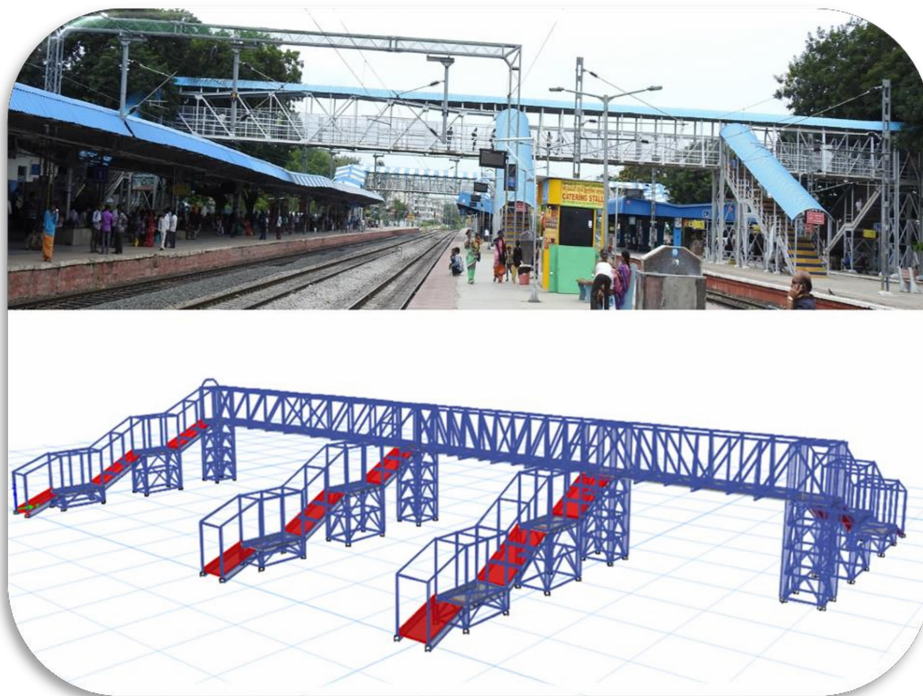


Name of the Project : VISUAL INSPECTION OF FOB/ PF-1 - PF-6 AT LINGAMPALLY RAILWAY STATION

Location : LINGAMPALLY RAILWAY STATION

Location Co-ordinates : 17°28'58.8"N 78°19'01.0"E

Date of Inspection : 14th and 31st AUGUST, 2019



Summary:

- a) Major corrosion is observed at 1st span along concrete steel joint and gusset plate in 2nd and 3rd span.
- b) From visual inspection, slight rusting is observed at tie joint and bottom of sacrificial plate of RCC Slab.
- c) Contact failure at staircase landing at staircase 3.
- d) Leaching is observed in 1st span of FOB.

Tests to be conducted:

- a) Ultrasonic Thickness gauge to measures local thickness of a solid element.
- b) Elcometer (Coating thickness Gauge) to measures dry film thickness on steel surfaces.
- c) Ultrasonic Flaw detector to detect hidden cracks, voids, porosity, and other internal discontinuities in metals.
- d) Fillet weld gauge to measures the size of the weld.
- e) Profometer Test for concrete cover and diameter of rebar.
- f) Rebound Hammer test surface strength of concrete (For Pre-cast slab panels and staircase)

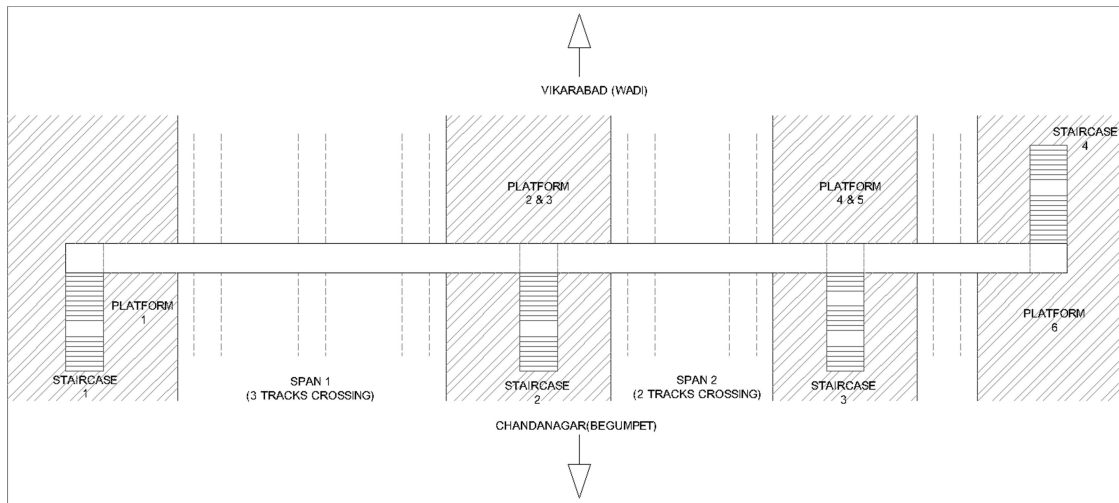
VISUAL INSPECTION OF STEEL FOOT OVER BRIDGE

Name of the Project	Visual inspection of FOB/ PF-1 to PF-6 at Lingampally railway station
Location	Lingampally Railway Station
Date of Inspection	14 th and 31 st Aug 2019

PART 1 GENERAL INFORMATION AND OBSERVATION

1.1	Name of the Bridge	FOB/ PF-1 to PF-6
1.2	Location Location co-ordinates	Lingampally Railway Station 17°28'58.8"N 78°19'01.0"E
1.3	Type of truss Structure	a) Camel Back Truss (span 1), b) Pratt Truss (span 2 & 3)
1.4	Year of Construction, Maintenance History	Approx. 40+ years (span 1)
1.5	Description of the main use of the bridge	Pedestrians Crossing
1.6	Type of Materials used in different parts of bridge	Structural Steel, RCC Slab
1.7	Width of the Pathway (m)	2.30 m
1.8	Length of the Pathway (m)	a) Span 1 = 27.80 m (Clear span) b) Span 2 = 16.4 m c) Span 3 = 12.0 m
1.9	No of Railway Lines Crossings	6 nos (Span 1+2+3 = 3+2+1 tracks)
1.10	Span arrangement (no x Span in meters)	1x27.80 m + 1x16.4 m+1x12.0m
1.11	Vertical Clearance (from rail top to girder bottom)	6.88 m
1.12	Head Room of pathway	2.70 m
1.13	Damages due to accidental hitting, Grazing Marks	No Visible signs appear
1.14	History of Repair (if any...)	Yes (Patch work are observed)
1.15	Original Structural Drawings	Not available

1.16 Key Plan



PART 2 IDENTIFICATION OF LOADS ON BRIDGE			
		Yes/No	Photo ID
	Dead Loads at Roof level		
2.1	a) Pipeline - Utilities	Yes	Two pipe lines of 2-inch dia PVC pipe is observed along the length of span. (Refer fig :2)
	b) Cables	Yes	Cables are protected with 1-inch HDPE pipe. (Refer fig :2)
	c) Roof Truss	Yes	30 x 30 x 4 mm angles are used
	d) Roof Sheet	Yes	Metal sheet is used for roof
	e) load of advertising hoarding	Yes	Advertising boards are provided. (Refer fig :3)
	f) load of train/coach display boards	No	No train display boards are provided
	g) Additional load of overhead electrical equipment (OHE), Signal	No	No Additional load of overhead electrical equipment (OHE), Signal
2.2	Dead Loads at Floor level		
	a) Additional wearing coat on Floor	No	Chequered tiles are used for flooring (Refer fig :4)
	b) Provision of protective screen for passengers	Yes	Chain link fence made of galvanized wire of 2 mm gauge and 2mm galvanized sheet is used above OHE line on both side of gangway is used for protection
	c) Type of Material used for mesh	Galvanized wire mesh	

PART 3 STRUCTURAL SYSTEM OF THE BRIDGE			
			Photo ID
3.1	Foundation details		Not visible at site
3.2	Trestles		
	Type of Trestles	Steel I – Section	Trapezoidal concrete encasement is observed in vertical supports (Refer fig :5)
	Column – Trestles Connection Details		
	a) No of HD Bolts and size	Not visible, filled with concrete	
	b) Thickness of Base Plate	Not visible, filled with concrete	
3.3	Roof Truss		
	Element of roof truss section	Angular sections	1 st span of 27.80 m roof truss is supported with 30 x 30 x 4 mm angular and supported on 65 x 65 x 8 mm tie members. 2 nd and 3 rd span is supported with 30 x 30 x 4 mm angular trusses supported on tie members (Refer fig :6)
	Size of roof truss	2.30 X 0.8 m	
	Connection of Roof elements	Using Gusset plate and Bolts	
3.4	Steel Truss		Camel Back Truss (span 1) Pratt Truss (span 2 & 3)
	Type/Shape of Girder Section	Double angular sections	a. Main tie members 100x100x12 mm Double angular section b. 65 x 65 x 8 mm double angular are used as bracing members
	Height of Girder/ Truss (H)	2.55 m	

	Truss Support Condition	Simply supported	10 mm thick gusset plate is used for welded joint
	Type/Shape of Secondary Girder /Bracings	Double Channel sections, Double angular section	a. For 1 st span ISMC 150 Double Channel are used as secondary girders supported with 65 x 65 x 8 mm angular section to transfer load from slab to roof truss. b. For 2 nd and 3 rd span 100x100x12 mm Double angular section Secondary girders are connected with tie member using bolts and bracing are connected to tie members using welding (Refer fig :7)
	No of Secondary Girders/bracings for span	1 st span : 11 no's 2 nd span: 9 no's 3 rd span: 7 no's	
	Arrangement of Bracings	Diagonal	
	Type of Beam-Column Joint (shape of gusset plate if any)	Cleat angles	
3.5	COLUMN		
	Type/Shape of Column section	I – Section	FOB is supported on vertical column of Four - ISMB 300. (Refer fig :5)
	No of Columns per support	4	
	Dimensions of Column	300x150 mm	
	BEAM-Column joint (bolted, welded, riveted)	Bolted	
3.6	Floor of the Pathway		
	Material of Slab	RCC, Pre-cast panels	a. For 1 st span Pre-cast Reinforced concrete slab panels are used for floor slab of 100 mm thick, RCC slab panels are resting on angular tie members supported on secondary girder and bracing from bottom. b. For 2 nd and 3 rd span cast-in-situ slab is used for floor slab of 100mm thick, with sacrificial plate which is supported on secondary girder and bracings from bottom c. Chequered tile flooring is laid on the top of the slab panels (Refer fig : 4 and 8)
	Thickness of Slab	100 mm	
	Condition of Slab from Bottom	Leaching effect near 1 st span and for 2 nd and 3 rd span slab is covered supported with sacrificial mill plate	
	Condition of Slab from Top	RCC slab is not visible, Covered with Chequered tiles	
	Condition of sheeting- MS. Sheet at bottom	Rusting is observed at the joints connecting MS sheet plate	
3.7	Staircase Details		
	Number of staircases	4 No's	Staircase steps are observed as Precast RCC slab panels of size 300 x 100 mm used. Steps are supported on ISMC 300 channel using cleat angles. Staircase landing of 2 m wide is supported on vertical and horizontal channels members.
	Number of steps from PF – 1 and PF-2	41 no's	
	Number of steps from PF – 4	39 no's	
	Number of steps from PF – 6	44 no's	
	Material used for steps	RCC slab panel	
3.8	Staircase Railing		
	Type of Parapet Railing	Steel railing	Staircase is provided with railing on both sides of one-meter height using 65 x 65 x 6 mm angular and 50 x 6 mm M.S flats are used.
	Height of Railing	1 m	

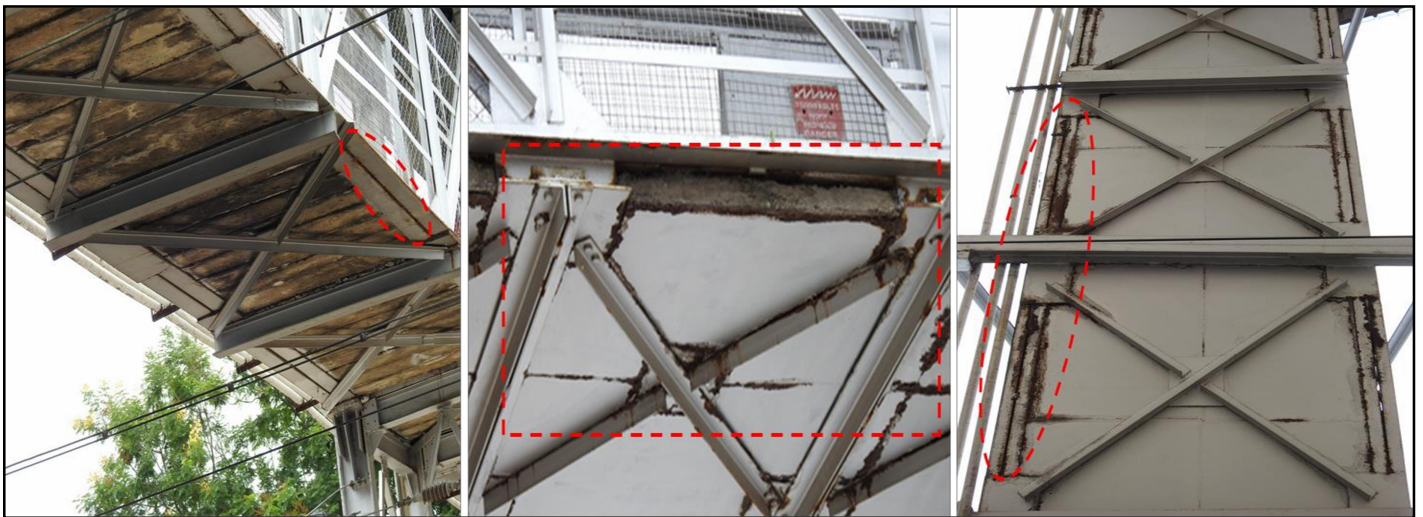
PART 4 SURVEY OF SIGNS OF DISTRESS, DEFORMATION IN BRIDGES

4.1

- ✓ Leaching effect is observed at bottom of slab panels along the length of 1st span
- ✓ Rusting is observed in truss bracing members and sacrificial plate along the length of FOB on both sides.



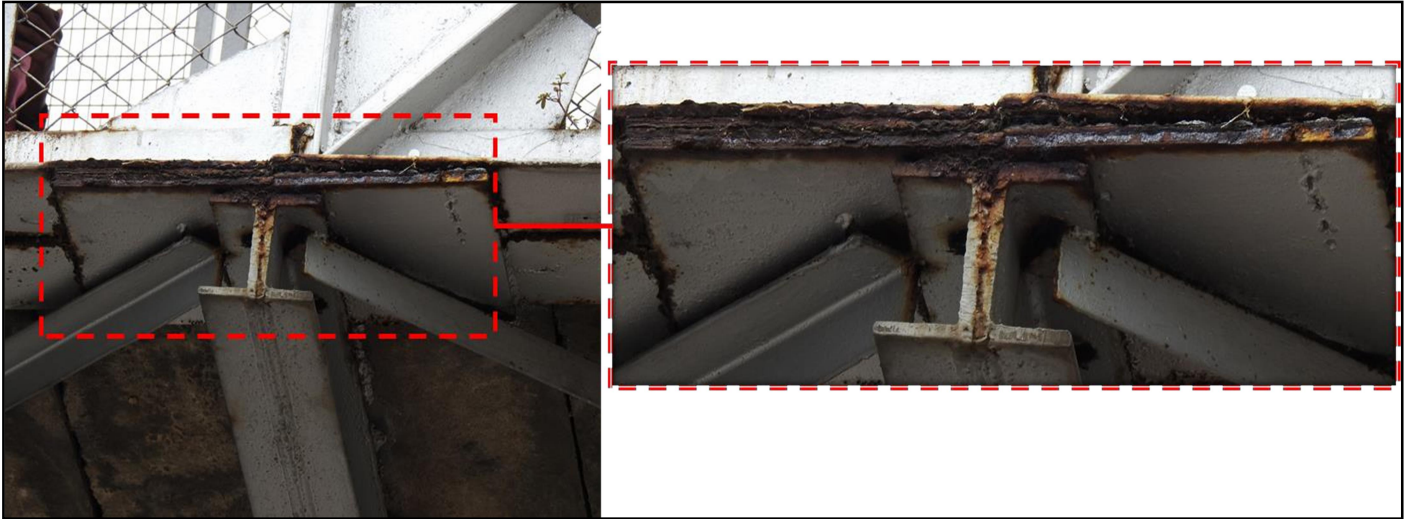
leaching effect observed at bottom of slab panels for 1st span of FOB



Rusting observed along the spans of FOB

4.2

- ✓ Corrosion is observed in gusset plate connecting main girders and secondary girder in 1st span of FOB



Major Corrosion observed at gusset plate connecting girders

4.3 ✓ Deformation in cast in-situ sacrificial plate at staircase landing up to 20 mm.



Deformation in MS plate below slab

PART 4 SURVEY OF SIGNS OF DISTRESS, DEFORMATION IN BRIDGES			
	Defects	Location	
	Cracking in steel members		No cracks are observed in Steel during visual inspection
	Cracking in RCC components	Slab Panels	cracks are observed in Pre-casted RCC slab panels
	Water seepage		No water seepage is observed
	Spalling	At Mid span	No spalling observed
	Rust straining	Beam – Column Joints	Rusting is observed at all the joints of FOB below deck slab (Refer para 4.1)
	Extent Of Corrosion	In Tie member	a. Distressing is observed in bottom Tie members along steel column joints b. Spacers in between secondary girders are completely distressed
	Corrosion in Gusset plate	near base slab	Rusting is observed in Gusset plates
	Corrosion in welded structures	near base slab	Corrosion is observed
	Corrosion at steel-Concrete joint		Major corrosion is observed at steel concrete joint.
	Condition of Painting of steel structure		Painting is affected at distressed places.

***Rust:** Rust is a part of corrosion and is a chemical process which results in the formation of red or orange coating on the surface of metals.

***Corrosion:** it is the process of deterioration of materials as a result of chemical, electrochemical or other reactions.



Fig 1: Cables and Roof truss



Fig 2: Pipeline – Utilities are observed along the span



Fig 3: load of advertising hoarding



Fig 4 Flooring and protective screen



Fig 5: Trestle details



Fig 6: Roof truss and roof elements of three spans



Fig 7: Shape of Secondary girder section



Fig 8: Bottom view of FOB



Fig 9: Cleat angles

5.0 Numerical Model

- Three-dimensional numerical model has been developed from the dimensions obtained by visual inspection and loads considered for foot over bridge is 5kN/m^2 obtained model and results are shown below.

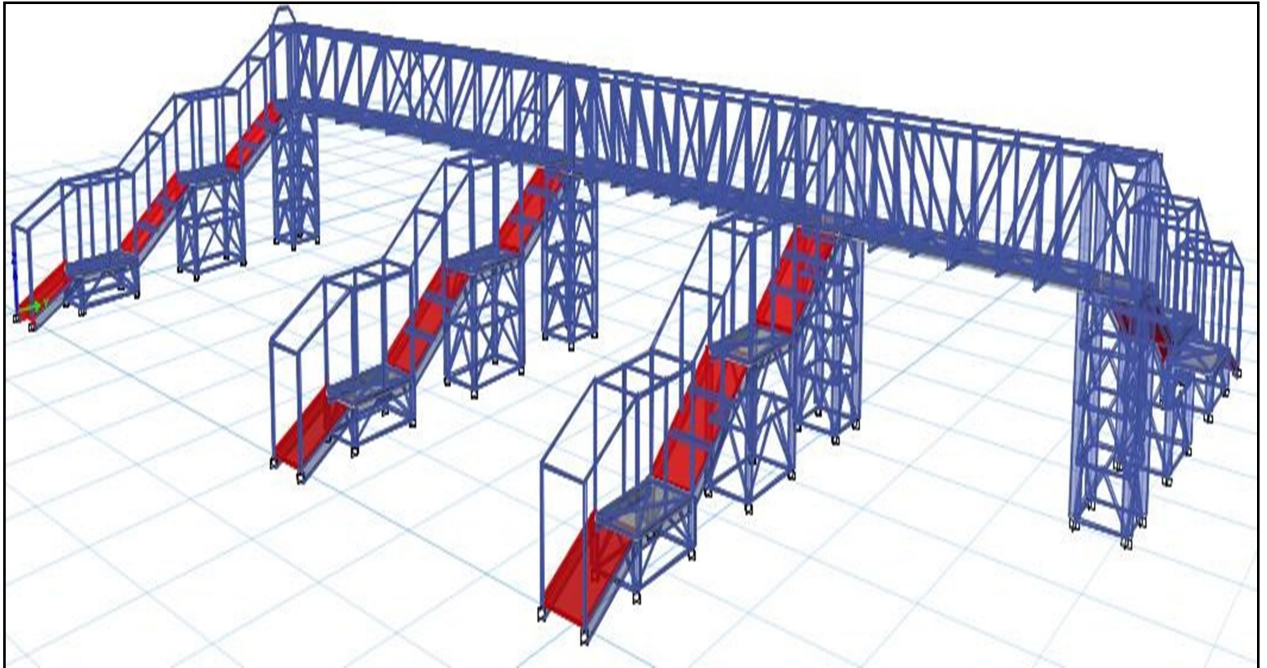


Fig: 5.1 Numerical Modeling of Lingampally Railway station FOB
(Developed from the Visual inspection)

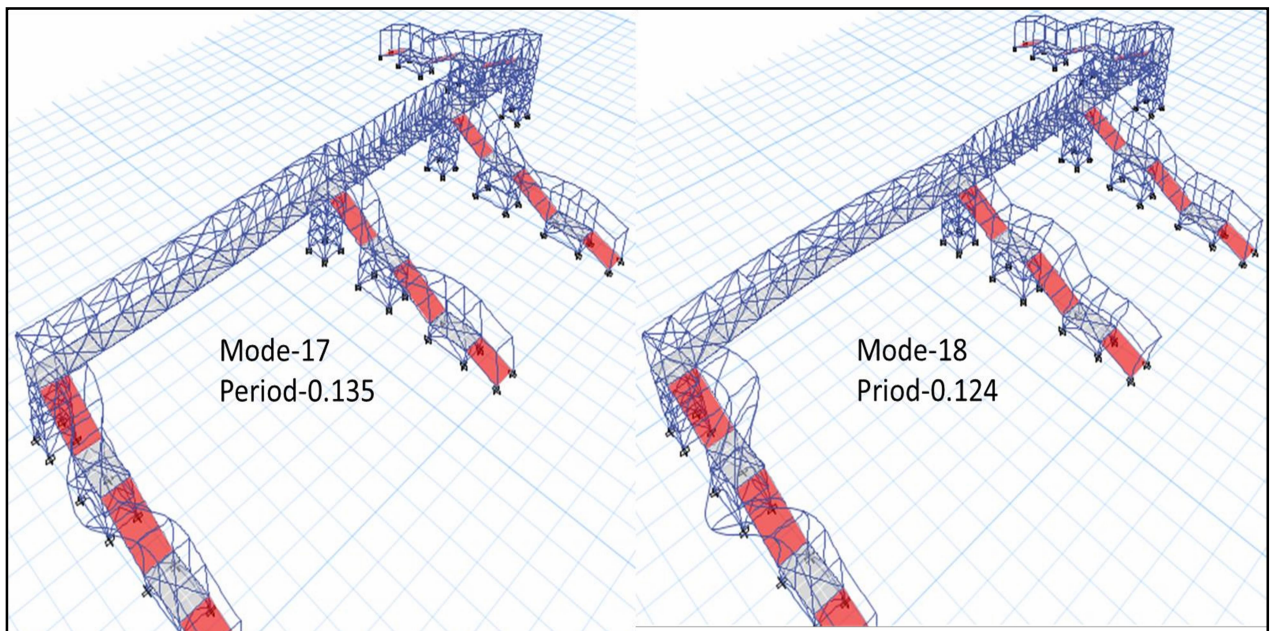


Fig: 5.2 Modal analysis of FOB

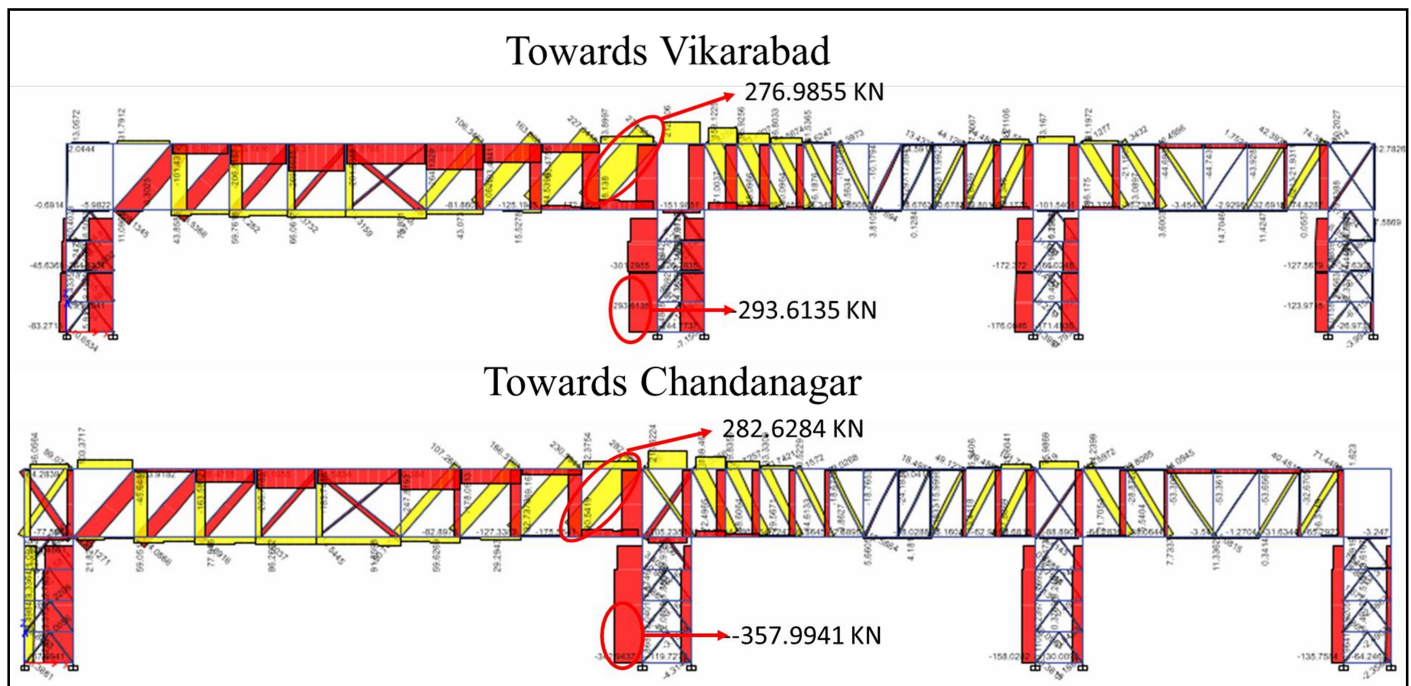


Fig: 5.3 Axial Forces of all Members

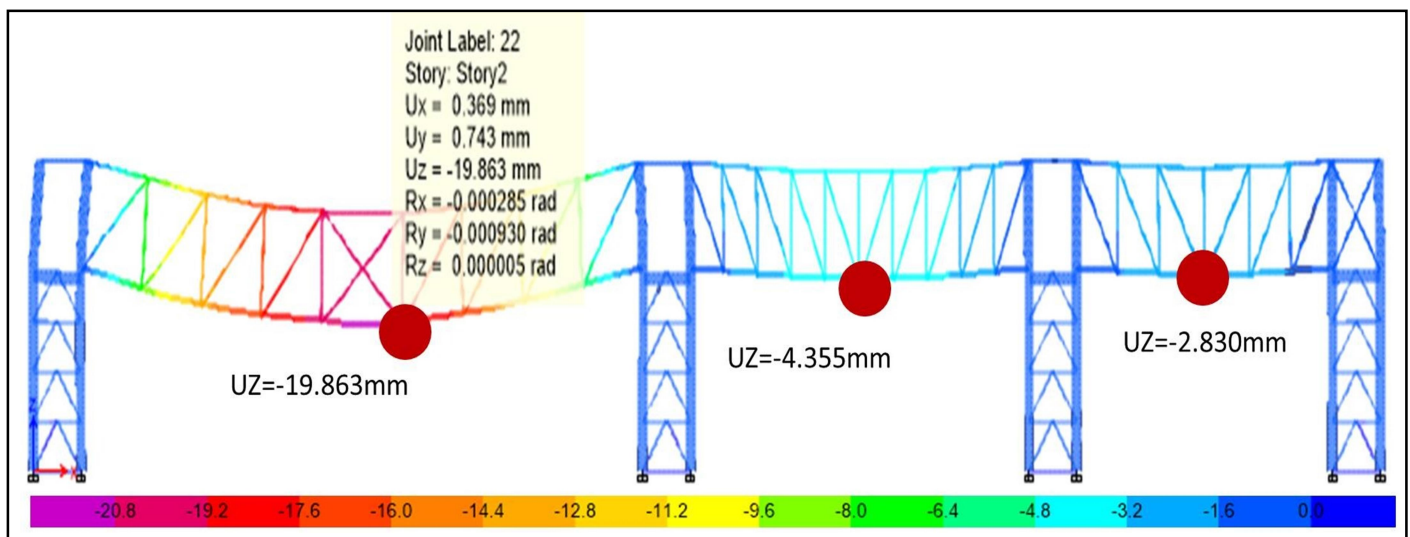


Fig: 5.4 Displacements in truss