

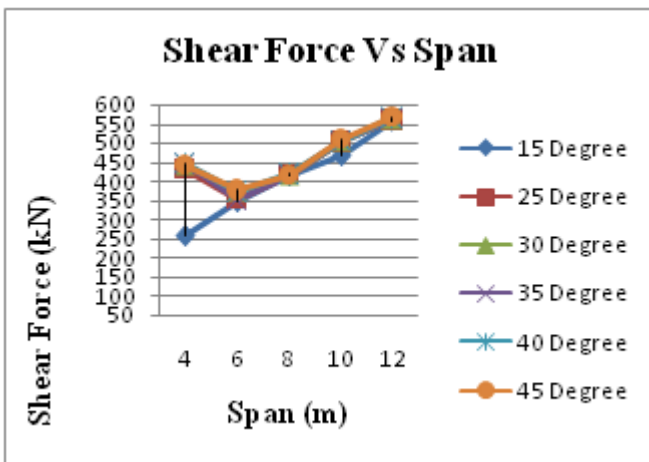
Figure 6: Skew Bridge with 30° angle

4. Result and Discussion

1) Shear Force

The maximum shear forces at each skew bridge with respect to their spans are presented in Graphical format. For better comparability the shear force of each graph contain the table of observed reading.

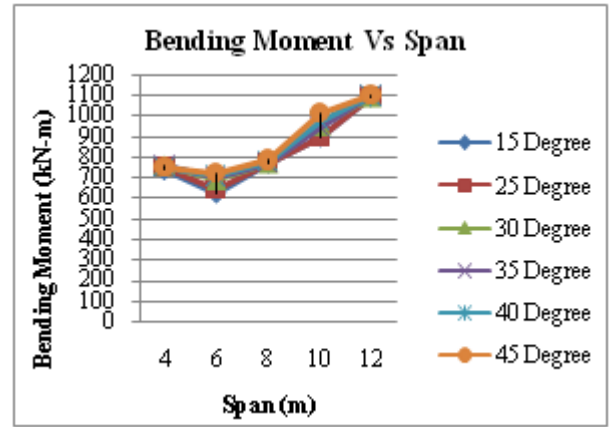
Skew Angle	SHEAR FORCE (kN)				
	Span				
	4	6	8	10	12
15°	257.43	346.25	413.94	465.82	557.92
25°	433.09	353.14	415.94	502.72	560.06
30°	443.6	375.18	416.98	503.74	561.75
35°	445.83	350.26	418.02	504.93	563.67
40°	448.37	372.45	419.18	506.83	565.01
45°	440.92	377.05	416.66	509.24	566.58



2) Bending Moment

The maximum bending moment is observed during increment in skew angle. Also increase in span length will cause effect of bending moment on bridges.

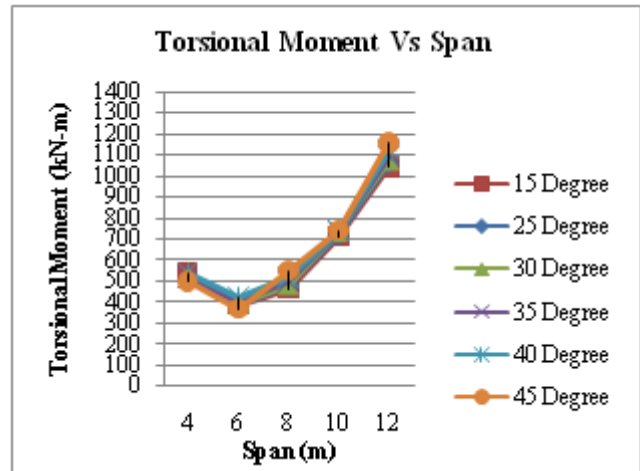
Skew Angle	BENDING MOMENT (kN-m)				
	Span				
	4	6	8	10	12
15°	535.48	382.73	461.77	709.91	1041.75
25°	522.19	387.36	477.33	721.4	1060.27
30°	514.04	397.25	480.24	734.18	1073.58
35°	509.5	407.25	495.52	734.98	1093.48
40°	541.56	420.02	514.33	738.28	1119.07
45°	494.11	365.02	545.39	736.87	1154.12



3) Torsional Moment

Torsional moment occurs due to effect of cantilever load transfer in skew slab. The increase of torsional moment is observed with increase in span length and skew angle.

Skew Angle	Torsional Moment (kN-m)				
	Span				
	4	6	8	10	12
15°	735.57	622.61	770.46	898.93	1090.39
25°	748.14	642.24	767.17	894.74	1092.82
30°	761.87	687.44	768.57	948.49	1094.21
35°	755.61	699.19	771.41	947.14	1095.78
40°	750.25	706.13	777.82	977.45	1097.47
45°	748.73	719.08	785.19	1010.11	1100.38



5. Conclusions

Based on analysis of different configurations of bridges, the following conclusions can be drawn:

- 1) For Class A Loading the increase in shear force for low skew angle (<15°) the shear force increases linearly. The pattern of increase of shear force with respect to span is straight in nature.
- 2) There is about 20% increase in shear force when span increases from 4m to 6m. As the skew angle is increase, shear force is decreased about 30% when span change to 6m from 4m from thereon, hear force for each span increase.
- 3) The bending moment increases with increase of skew angle and spans of bridges. For each span and skew

angle, the change of about 20% is observed in bending moment nature.

- 4) In case of torsional moment, the pattern of increment in torsional moment is similar to pattern of bending moment. There is about 10% of linear variation increase in torsional moment comparing to bending moment can be noticed broadly.

While adopting design under Class A Loading, designer must give proper attention to torsional moment as much as bending moment. High torsional moments are observed for skew angle more than 30°. There might be requirement of torsional reinforcement to counteract these torsional moments in bridges. There is sharp decrease in shear force response for low span bridges even with high skew angle. The bending moment increase with increase in skew angle and span length.

References

- [1] Vikash Khatri, P. R. Maiti, P. K. Singh & Ansuman Kar, "Analysis Of Skew Bridges Using Computational Methods" International Journal Of Computational Engineering Research. May-June 2012, Vol. 2, Issue No. 3, 628-636
- [2] Arindham Dhar, Mithil Mujumdaar, Mandakini Chowdhary, Somnath Karmakar, "Effect Of Skew Angle On Longitudinal Girder (Support Shear, Moment, Torsion) And Deck Slab Of An Irc Skew Bridge." The Indian Concrete Journal, December 2013, 47-52
- [3] M. Ameerutheen, Sri. Aravindan, "Study of Stresses on Composite Girder Bridge Over Square and Skew Span" International Journal of Civil Engineering and Technology (Ijciet), February 2014, Volume 5, Issue 2, 88-96
- [4] Mehrdad Bisadi, "Moving Load Analysis on Skewed Railway Bridge" Journal of Asian Scientific Research, 2013, 3(2), 198-203
- [5] Indian Road Congress, New Delhi IRC 6-2000, "Standard Specification and Code of Practice for Road Bridges", Section II "Loads and Stresses", Indian Road Congress, New Delhi.
- [6] M. S. Qaqish, "Effect of Skew Angle on Distribution of Bending Moments in Bridge Slabs", Journal of Applied Science 6 (2): 366-372, 2006
- [7] Essentials of Bridge Engineering by D. Johnson Victor, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi, Sixth Edition, PP 122-124