TO STUDY THE RESPONCES OF BRIDGE DECK FOR VARIOUS SKEW ANGLES

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ABSTRACT:

The objective of this study was to understand the meaning of skew bridge. To know the behavior of skew deck.   In this work, the effect of change of skew angles for right bridge deck is studied by finite element method. Bending moment, support reaction and torsional moment are computed by using FEM in CSI BRIDGE and results are compared for different skew angles. Simple supported single span bridge deck is considered for this study. The results by analysis shows that as the skew angle increases, support reaction increases, but bending moment decreases and torsion moment also increases. The effect of skewness on the behavior of bridge deck is studied for skew angle 15°, 30° and 45° and presented graphically using FEM method. Results are presented for analysis method for dead load and live load.

KEYWORDS: Skew bridge deck, Skew angle, Finite Element Method.

I. INTRODUCTION:

[1]The number of bridges which are built on the skew is very considerable. In England, is greater than the number of right bridges. Hence skew is of very considerable importance in analysis and design. Generally slabs are rectangular in shape as the piers are generally in one line. If the piers cannot be placed in one line then we have to use skew bridges. The use of skew bridges is increasing due to size limitations and limited planning freedom for structure. The planning criteria of each structure govern the skewness and serviceability properties of a slab.

II. CONCEPT OF SKEW BRIDGE:

[4]With present day of fast traffic, safety requirements require reasonably straight alignments for roads necessitating skew bridges instead of having a curved portion. The inclination of center line of traffic direction to the centerline of the river in case of a river bridges is called the skew angle.

With increase in skew angle, the stresses in the skew slab different from those in a straight slab. A load was applied on the slab travels to the support in proportion with the rigidity of various possible paths. Hence the major part of the load tends to reach the supports in a direction of normal to the faces of abutments and piers as a result the planes of maximum stresses are not parallel to the center line of the roadway and hence the slab tends to be warped. The reactions at the obtuse angled end at the slab are more than the other end

III. BEHAVOR OF SKEW DECK:

[1]The skew angle is the angle produced when the longitudinal members of a bridge are not perpendicular to the substructure; the skew angle is the acute angle between the alignment of the bridge and a line perpendicular to the center line of the substructure units.

Skew in a bridge deck has a considerable effect on its behavior. The special characteristics of a skew are,

a) Variation of direction of maximum bending moment across width;
b) Hogging moments near obtuse corner;
c) Considerable torsion moment of deck;
d) High reactions and shear forces near the obtuse corner;
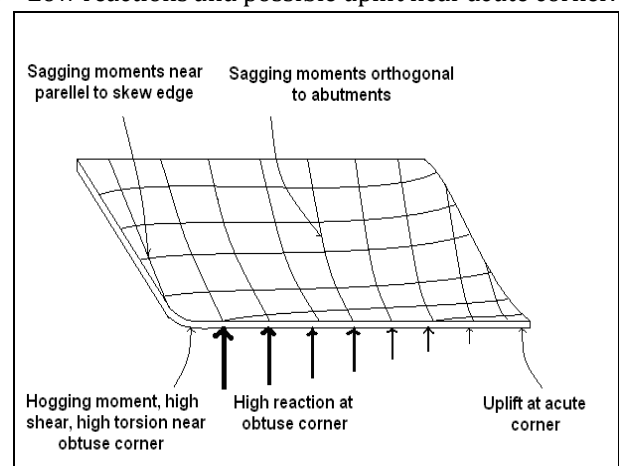e) Low reactions and possible uplift near acute corner.

Fig. 1 Characteristics of skew slab deck

IV. ANALYSIS OF BRIDGE DECK:

The effect of different skew angles on the behavior of bridge deck under dead & live load of 70R loading. By using FEM are analyzed. The skew bridge deck having 15°, 30° and 45° skew angle of carriage way 9.5m and span of deck 30 m is considered for present analysis i.e. support reactions, bending moment and torsional moment under dead load and live load. For the analysis, CSI BRIDGE software is used.
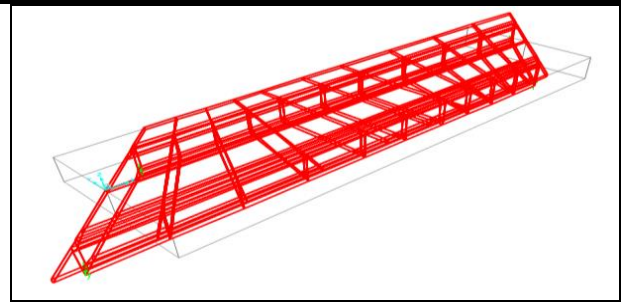
A. PROVISION OF SKEW ANGLE:

Fig 2 Provision of skew angles for bridge deck

B. SKEW BRIDGE DECK MODEL:

The model is generated in CSI BRIDGE software for 15°, 30° and 45° skew.
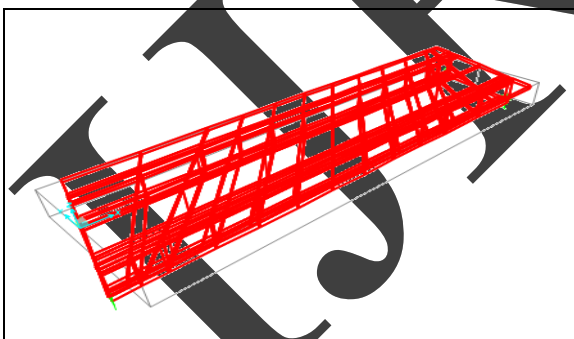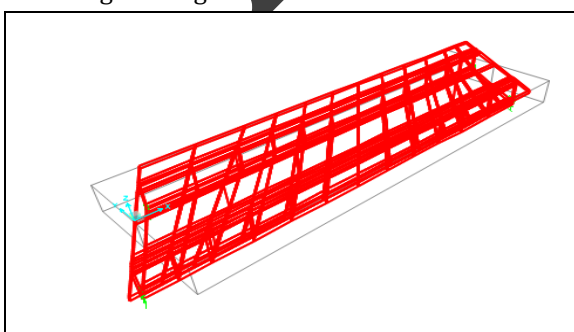

Fig. 3 Bridge deck model for 15° skew

Fig. 4 Bridge deck model for 30° skew

Fig. 5 Bridge deck model for 45° skew

C. RESULT AND DISCUSSION:

The bridge deck response was examined for skew of 15°, 30° and 45° for dead load and live load analysis as shown in below Fig.
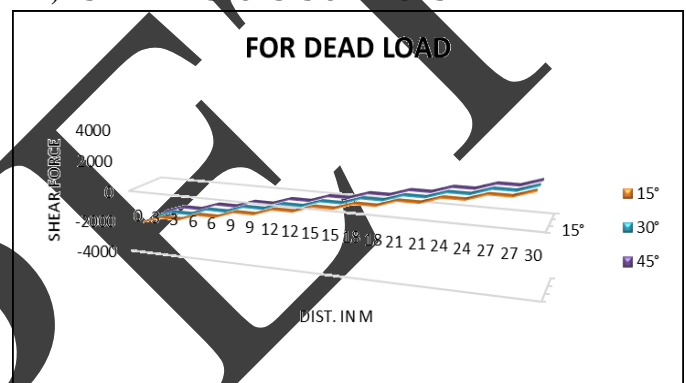
1) SHEAR RESPONSES OF DECK SLAB:

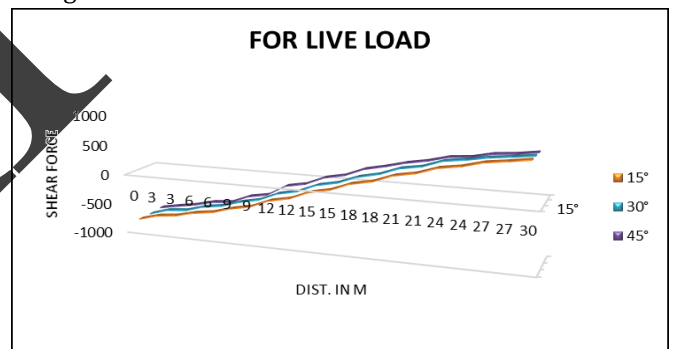Fig 6 Effect of skew on shear force for dead load case

Fig. 7 Effect of skew on shear force for live load case

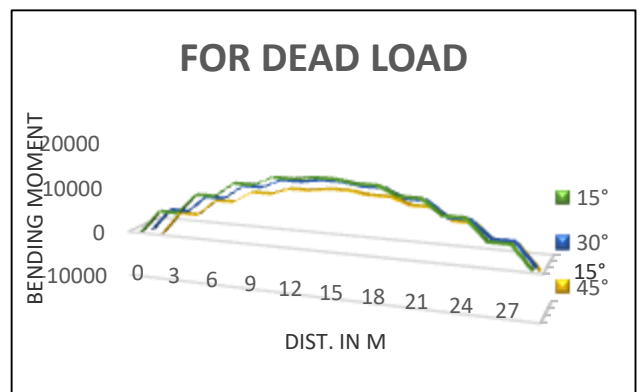### 2) *BENDING RESPONSE OF DECK SLAB:*

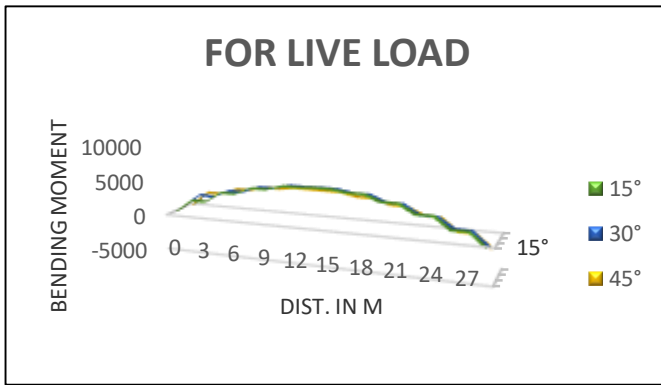Fig. 8 Effect of skew on Bending Moment for dead load case

Fig. 9 Effect of skew on Bending Moment when live load is consider

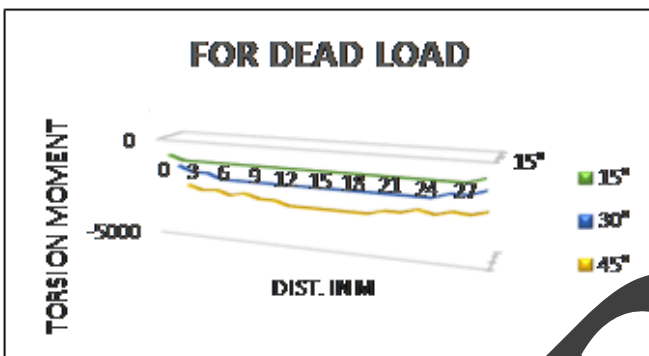### 3) TORSION RESPONSE OF DECK SLAB:

Fig. 10 Effect of skew on Torsion Moment for Dead load case
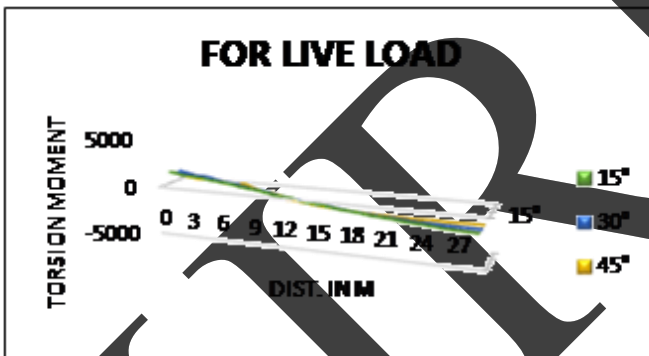

Fig. 11 Effect of skew on Torsion Moment for live load case

V. CONCLUSION:

Result obtained for effect of skew on response of bridge deck.

i. For dead load there is no change in shear force for increasing skew angle. For live load Increasing skew angle increases the shear force at mid span and decreases at end.

ii. Increasing skew angle decreases bending moment at mid span increases at end.

iii. Increasing skew angle increases torsional moment at mid span as well at end.

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