International Journal of Civil Engineering and Technology (IJCIET)
Volume 14, Issue 5, Sep-Oct 2023, pp. 1-7, Article ID: IJCIET_14_05_001
Available online at https://iaeme.com/Home/issue/IJCIET?Volume=14&Issue=5
ISSN Print: 0976-6308 and ISSN Online: 0976-6316

HOW TO PROTECT THE PRECAST GIRDERS FROM FALLING FROM THE PIER/ABUTMENT CAPS AFTER ERECTION AND BEFORE CASTING OF DECK SLAB/CROSS GIRDERS

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ABSTRACT

In the opinion of the author, the precast girders are falling from abutment/pier caps due to insufficient supports given to the girders after they have erected and before the casting of the cross girders/deck slab. This happens because no provision is available to support these girders except at ends of the girders on pier/abutment cap and these supports are insufficient due to the height, weight & length of the girder compared to its base. To avoid such mishaps, the author has evolved a procedure to protect those girders from falling and to avoid accidents and which is discussed in this paper.

Keywords: Precast Girders, Pier/Abutment Caps, Deck Slab, Falling Prevention, Girder Support

Cite this Article: KNSP Kamaraju, How to Protect the Precast Girders from Falling from The Pier/Abutment Caps After Erection and Before Casting of Deck Slab/Cross Girders, International Journal of Civil Engineering and Technology (IJCIET), 14(5), 2023, pp. 1-7. https://iaeme.com/Home/issue/IJCIET?Volume=14&Issue=5

1. INTRODUCTION

Now a days, it is a frequent scene in road projects that the precast girders are falling from the pier/abutment caps after erection and before the casting of slab or cross girders. Due to these accidents lot of casualties are happening along with loss of time and money. Unfortunately, there is no code available in the field to avoid these accidents till date.

Recently, the girders are fallen in Anandapuram to Anakapalle road in AP as shown in above photo. Three casualties are also happened. So, the author is writing this paper to avoid such accidents. This will be very much useful in the field to avoid such mishaps.

2. REASONS FOR ACCIDENTS

A. The girder is not stable laterally due to the lesser width (base) of the girder compared to the height of the girder.

B. The girder shall stand on its width as base for reasonable time till cross girders/deck slab is casted and it is very unstable laterally due to the height, weight & length of the girder.

C. The supports given to the girder are limited to the ends of the girder on pier/abutment caps and are not sufficient, when compared to the height of the girder.

D. Due to the height of the girder, the centre of gravity is reasonably high from the base and the lateral stability of the girder is in question due to its lesser base width.

E. The girders are designed safe after erection on pier/abutment caps if it stands on its base vertically. Once it is tilted, the girder fails for its self-weight it-self.

3. SOLUTION

A. Minimum of 2 girders shall be erected in a span consecutively (one by one) for the first instance, which are side by side.

B. During the design itself all the precast girders shall be provided with 34 mm dia keep holes *(like weep holes) along the width of the girder through the entire cross section from one side to the other side as shown in figure1. Accordingly, the keep holes shall be kept during the casting of the girder as prescribed in the design.

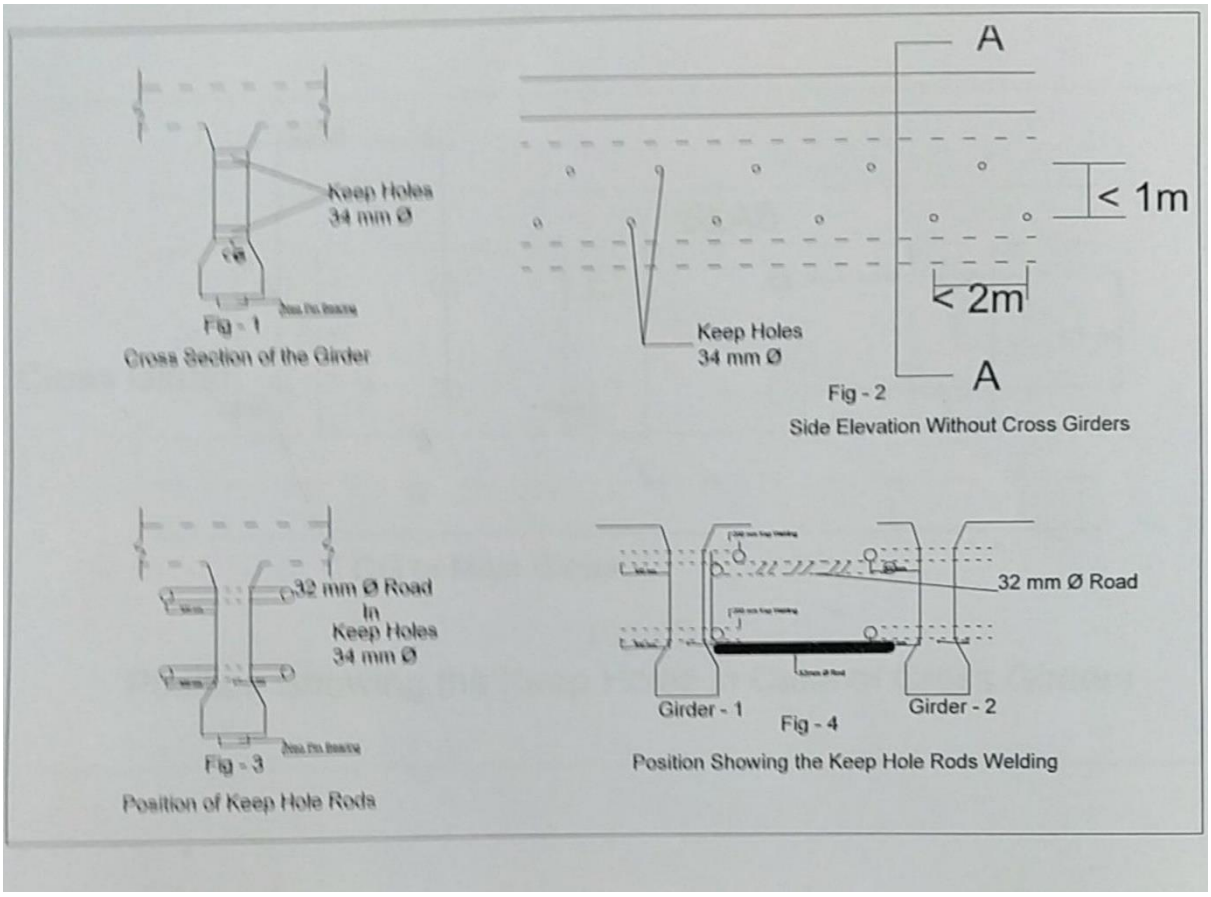
C. The location of those keep holes shall be like this.

i) Along the length of the girder the horizontal spacing between the two keep holes shall not be more than 2m as shown in fig 2. The length of the girder shall be distributed for keep holes in such a way that, the horizontal spacing between two keep holes shall not be more than 2m. (Fig2)

ii) The first horizontal line of keep holes shall be kept at centre of gravity of the cross section. (In case, if any pre-stressed cable sheathing is coming at that location, it can be shifted just about 50mm upwards as shown in fig1).

* Keep holes: The author has coined a word to keep the girder in position.

iii) The second line of keep holes shall be kept at one meter above the first line in zig Zag manner as shown in fig 2.



iv) If the top line is coming just in the flange or in haunch, it can be kept just below the hunch as shown in fig 3.

v) If the girder height is more than 3mtr above centre of gravity, then one more line of keep holes shall be provided at one meter above second line in zig zag manner as shown in fig6.

vi) Minimum of two horizontal lines of keep holes shall be provided including the line at centre of gravity, if the height of the girder above centre of gravity is more than the base (width of the girder)

vii) At no point of time the vertical spacing shall not be more than 1m and shall be kept as shown in fig 2, 5, 6 and 7. That means, the height of the girder above centre of gravity shall be divided into 2 or 3 lines based on the height of the girder. (Including the line at centre of gravity)

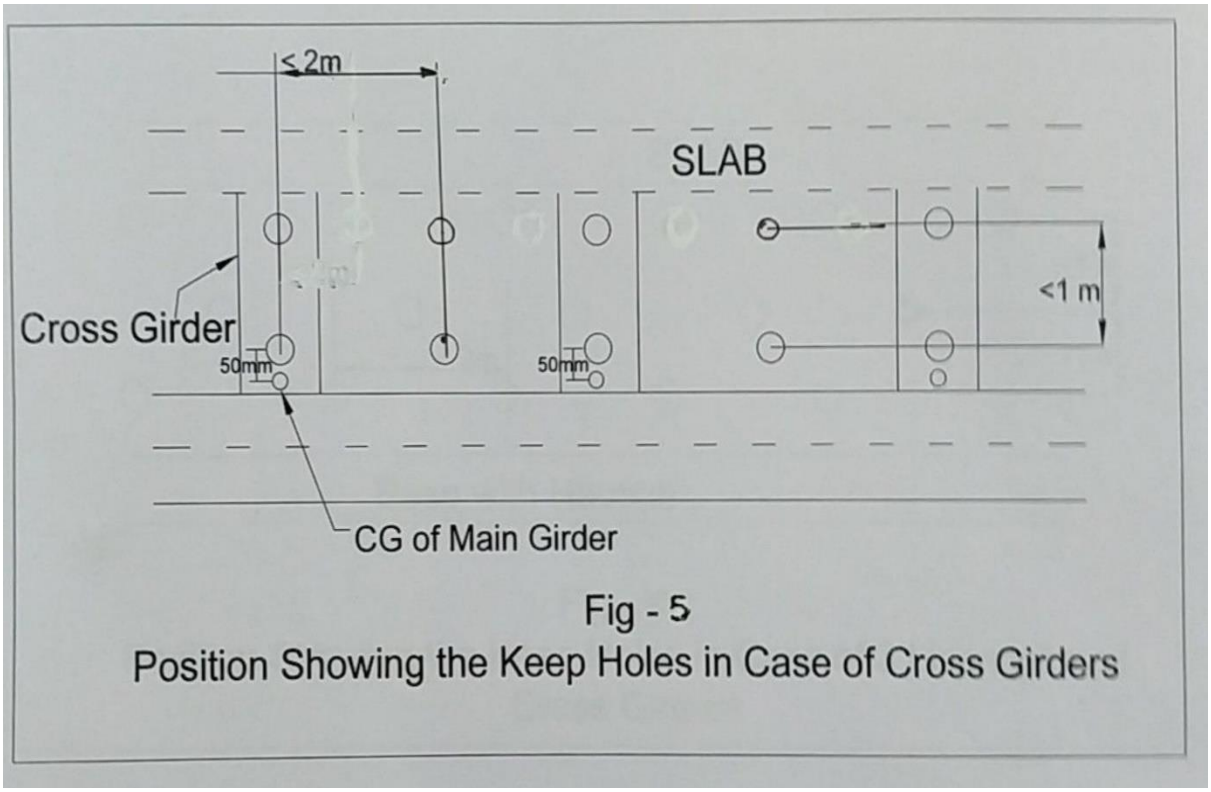


Fig - 5
Position Showing the Keep Holes in Case of Cross Girders

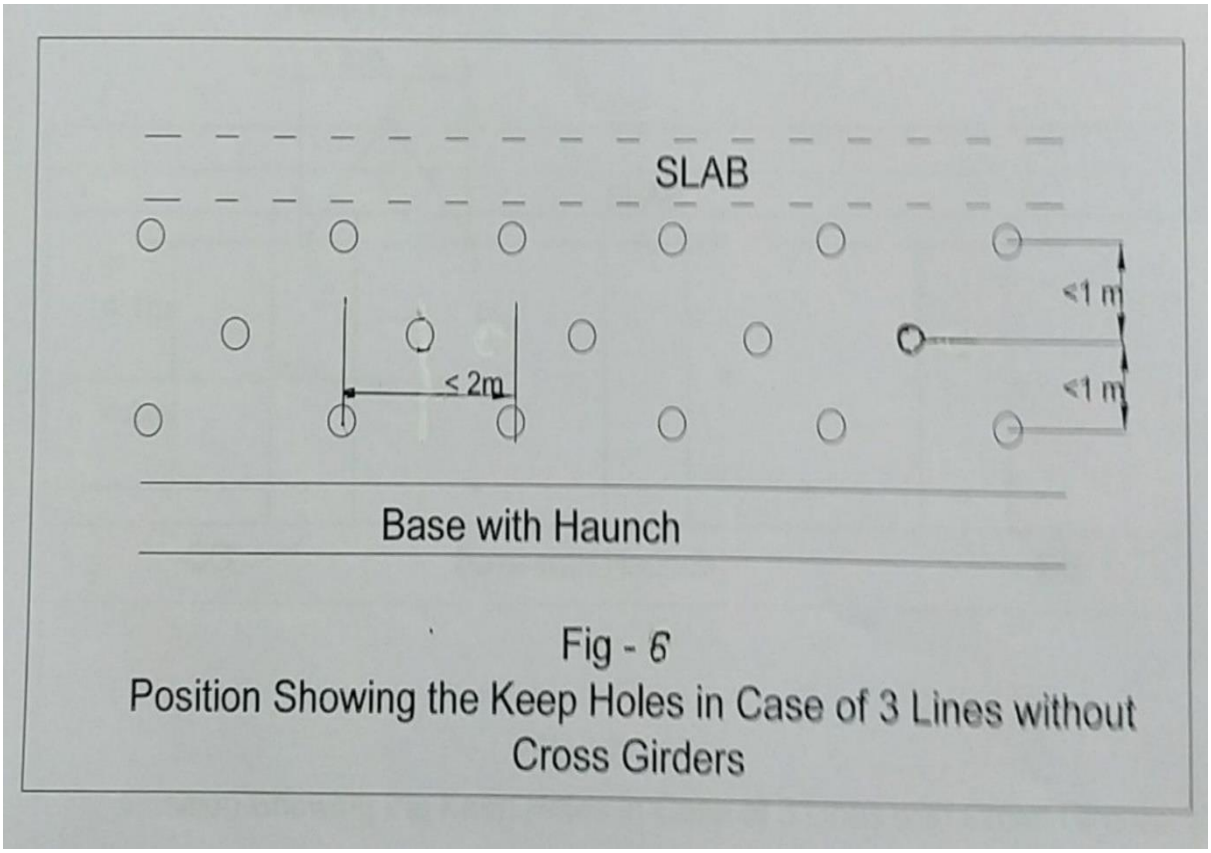


Fig - 6
Position Showing the Keep Holes in Case of 3 Lines without Cross Girders

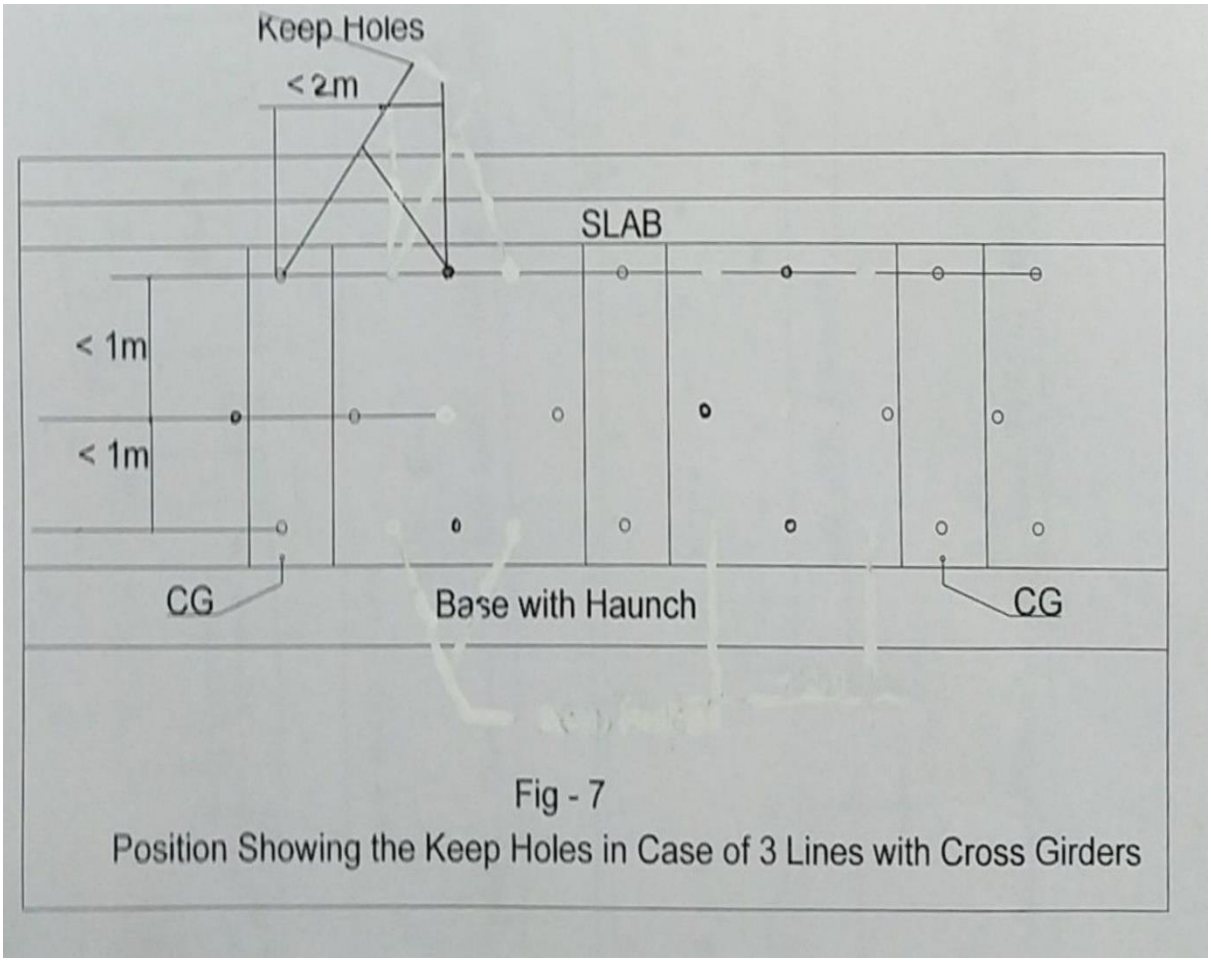


Fig - 7
Position Showing the Keep Holes in Case of 3 Lines with Cross Girders

viii) All the keep holes location shall be the same for all the girders in one span of the bridge as shown in fig 4. (That means a rod can be inserted through respective keep holes of all the girders after they had launched at the location)

ix) During the design stage of the girder itself, the coordinates of the keep holes shall be provided like pre-stressed cable profile as explained above.

E. Now, take two side by side girders and insert 32mm rod by applying epoxy on the surface of the rod to stick the rod to the girder as shown in fig 3. The length of the rod shall be enough to project at least by 300 mm on either side of the girder.

F. After attaining the strength of epoxy, two side by side girders can be erected in a single consignment one after the other.

G. Now, weld these respective keep hole rods with each other in the two girders with 32mm dia straight rod with a minimum of 200mm lap welding as shown in figure 4.

H. The portion of keep hole rods can be left as it is in the girder by cutting the keep hole rod just up to the surface of the girder on either side after casting of cross girders or deck slab is over.

I. Further, the girders which are having cross girders, the bottom line of keep holes shall be provided in cross girder location at centre of gravity and vertical spacing of those keep holes shall be kept as explained above and as shown in figure 5 and 7 respectively for 2 lines and 3lines.

J. When there are cross girders the length of main girder shall be considered as clear gap between the cross girders. Now, horizontal spacing of keep holes shall be kept as explained above in between cross girders as explained in point C (i).

K. At no point of time the horizontal spacing shall not be more than 2m. In case of cross girders, the gap between two cross girders shall be distributed, provided the spacing keep holes shall not be more than 2m.

L. The keep hole rods along with joining rod can be left in cross girders and casting of cross girder can be done.

4. PRECAUTIONS

A. Minimum of two side by side girders shall be erected in single consignment one by one consecutively in the first instance of one deck slab.

B. The girders shall not be erected till the Epoxy attained the full strength.

C. It shall be considered that the erection is completed only when all the respective keep hole rods are welded.

5. CONCLUSION

A. By adopting the procedure explained in the paper, more stability of girders can be achieved till the cross girders/ deck slab is casted and accidents can be avoided.

B. By avoiding accidents due to fall of girders, one can save lives, money & time.

REFERENCES

[1] M. M. Husain, Heba A. Mohamed and Ayman M. Aboraya, Seismic Analysis of Bridge Bearings using Different Shear Modulus, International Journal of Civil Engineering and Technology, 11(5), 2020, pp. 181-191

[2] Jyoti Yadav and Dr. G. Shravan Kumar, Investigation and Experimental Study on Elevated Metro Rail Bridge Girders Under the Special Reference of Bhopal Metro Rail Project, International Journal of Advanced Research in Engineering and Technology (IJARET), 13(10), 2022, pp. 1-12

[3] Hema Jayaseelan, Bruce W. Russell and Alanna Corelle Webb, Impact of Thermal Stresses on the Performance of Steel Girder Bridges Made Composite with Concrete Slabs, International Journal of Structural Engineering (IJSE), 4(1), 2022, pp. 8–29

[4] P. Chamundeswari and V.Ranga Rao, Effect of Activator Ratio on Strength Properties of Geopolymer Concrete. International Journal of Civil Engineering and Technology, 8(1), 2017, pp. 559–564

[5] KNSP Kamaraju, Points to be Noted While doing DPR for Hilly Terrain Road Project - Case Study, International Journal of Civil Engineering and Technology (IJCIET), 12(4), 2021, pp. 50-61.

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