International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 12 | Dec -2016 www.irjet.net p-ISSN: 2395-0072

EFFECT OF SEQUENTIAL CONSTRUCTION ON GIRDER SUBJECT TO FLOATING COLUMN

Rupali Bhuasaheb Tamnar1, Dr. R S Talikoti[2]

[1]M E Student, Civil Engineering Department,
Late G .N. Sapkal Engineering College, Anjaneri,
Nashik, India,
tamnar1991@gmail.com

[2]HOD, Civil Engineering Department,
Late G. N. Sapkal Engineering College, Anjaneri , Nashik, India

---

Abstract - *In structure some of the columns are not from ground and float from required storey level designed as floating columns with transfer girder support in multistoried buildings. In fact during construction, loads are applied in various stages as the floors are constructed storey by storey. In these paper two cases has been considered. Whereas in Case 1: The structure will be analyzed by comparison between with floating and without floating column by using ETAB software and in Case 2: The structure will be analyzed with reference to the girder subjected to floating column using sequential case by using ETAB software. A detailed study and comparison of the variation in bending moment in case of girder subjected to floating column and without floating column. The building is analyzed and designed using ETAB software.*

Key Words: floating column, girder, displacement, reactions, etc.

1. INTRODUCTION

Nowadays big cities are facing huge problem of parking space and basement area in multi storey building. Often ground floor of building is kept open to accommodate parking space and basement. To keep ground floor open floating column are used in the structure. Due architectural requirement some of the columns are designed as a floating column which rest on the transfer girder which rest on the shear wall in multi storey building. Two cases have been considered for study and comparison where as in case 1 the structure will be analyzed by comparison between with floating and without floating column by using ETAB software and in case 2 the structure will be analyzed with reference to the girder subjected to floating column using sequential case by using ETAB software.

Normally bending moment in construction is calculated for total building but in this project it will be calculating bending moment floor to floor separately by using modeling in ETAB. Bending moment is calculated separately because load on building is also increased floor to floor and therefore reactions also changes and it affects the bending moment. Bending moment for floor to floor is calculated separately by using ETAB software.

1.1 FLOATING COLUMN

A column is vertical member starting from the foundation level and transfer the load to the ground. Floating column is vertical member and it rest on beam which is horizontal member. Beams in turn transfer the load to other column below it. Floating column is used above the ground floor where girders are used so that open space is available in the ground floor. Open space can be used for parking vehicles, basement purpose or assembly hall. The transfer girder is designed and detailed properly is earthquake prone area. ETAB can be used for the analysis of floating column structure. Floating columns are competent enough to sustain the load but girder should be of adequate dimension.

1.2 METHODOLOGY

a) First select the residential building and study the architecture and structural drawings of the building.
b) Fix the column location and decide the cross sections of the element.
c) Modeling of regular structure, semi column and analyze it by static linear method.
d) Designing, optimizing and redesigning the structure.
e) Removal of column and make it floating column and assign girder to floating column.
f) Analyze the floating column structure and find the moment of girder for various load combination (total dead load is very important). Re-analyze with add sequential construction case.
g) Compare girder with and without construction case and various other comparisons like lateral storage, drift, displacement, reaction, etc.
h) Compare girder moment for dead load for sequential construction case.

2. LITERATURE REVIEW

Maison Bruce F. and Neuss Carl F et.al [1] says the total seismic base shear as experienced by a building during an earthquake is dependent on its natural period, the seismic force distribution is dependent on the distribution of stiffness and mass along the height. The behavior of a building during earthquakes depends mainly on its overall shape, size and geometry, in addition to how the earthquake forces are carried to the ground. The earthquake forces developed at different floor levels in a building need to be brought down along the height to the ground by the shortest path; any deviation or discontinuity in this load transfer path results in poor performance of the building. Buildings with vertical setbacks (like the hotel buildings with a few storey's wider than the rest) cause a sudden jump in earthquake forces at the level of discontinuity. Buildings that have fewer columns or walls in a particular storey or with unusually tall storey tend to damage or collapse which is initiated in that storey.

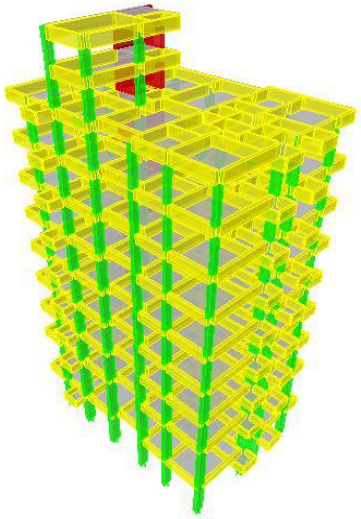
Kim H S et.al [2] says that multistoried buildings have been analyzed for years on the assumption that whole of the load is applied on the complete frame. Looking in to the mode of incidence of the load, it is evident that part of the load is applied in stages as the construction of the frame proceeds, whereas the remaining part of it is imposed on completion of the frame. The main factors affecting the limit state of serviceability of structure are:-1. Creep and shrinkage. 2. Span and cross section of the structural members. 3. Cycle time for floor to floor construction and strength of concrete. Staged construction allows defining a sequence of stages wherein one can add or remove portions of the structure, selectively apply load to portions of the structure, and to consider time dependent material behavior such as aging, creep, and shrinkage. Staged construction is variously known as incremental construction, sequential construction, or segmental construction. It is evidenced that simulation of sequence of construction in the analysis leads to considerable variations in deformations and design forces obtained by conventional one step analysis. It is, therefore necessary that for Multistoried building frames with transfer girders and floating columns system, the construction sequence effect shall be taken into consideration.

Sukumar Behera et.al [3] says in case structures to avoid earth quake damages, special arrangement needs to be made to increase the lateral strength and stiffness of the members. As per IS 1893 (part-1): 2002, Dynamic analysis (Linear or Non-linear) of building is carried out including the strength and stiffness effects and inelastic deformations in the members and the members designed accordingly. The lateral loads due to earthquake were calculated using Response spectrum method as per IS 1893 (part-1): 2002.

Kwak HG and Kim JK et.al [5] says Floating column is vertical member and it rest on beam which is horizontal member. Beams in turn transfer the load to other column below it. Floating column is used above the ground floor where girders are used so that open space is available in the ground floor. Open space can be used for parking vehicles, basement purpose or assembly hall. The transfer girder is designed and detailed properly in earthquake prone area.

TECHNICAL WORK

The below figure shows the 3D image of the structure and second figure shows the column position of the multi storey building.



3D IMAGE OF STRUCUTRE

TYPICAL FLOOR IN MODEL

In paper the concept of sequential girder is used. A sequential girder is a main structural member lying horizontally as in

building. It supports vertical wall and consist of single piece or consist of more than number of pieces bound together. Girder is primary beam that are used at the place where wide space is available. These main beams which are also called as bridge girder in case of bridges. It supports smaller beams and other structure components. Girders are made up of built up sections and carry heavier loads over large spans

Floating column is vertical element which rest on a beam which is horizontal element. Beam in turn transfers the load to other columns below it. Floating column is usually adopted above the ground storey level so that the space available can be used as parking space, basement area, etc.

In this paper regular structure (Without floating column) is used to find the reaction of column no 12, 15 and 19. Reactions are included in results given below. In next part project will consist structure with floating column to find reactions and also the girders are used. Also next part will include comparison sheet.

EXPERIMENTAL CALCULATIONS AND RESULT

Case 1: The building will be analyzed by without floating column and no girder beam by using ETAB software.

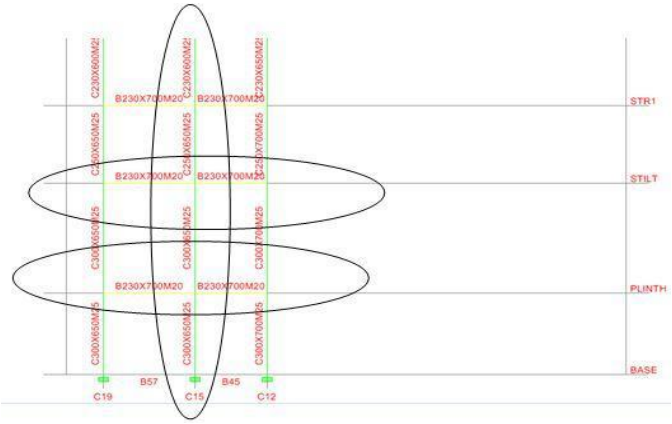


Fig -1: WITHOUT FLOATING COL 15 AND NO GIRDER BEAM

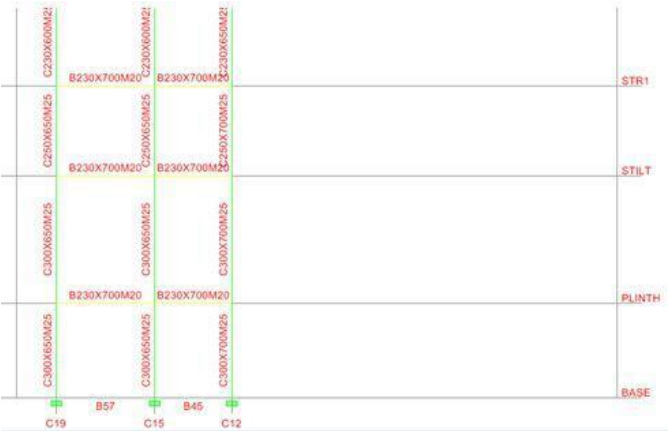


Fig -1: WITHOUT FLOATING COL 15 AND NO GIRDER BEAM

Below is the reaction table of column number C12, C15 and C19

Table -1:

Reaction Table					
Story	**Point**	**Load**	**LOAD**	**Mx**	**My**
BASE	12	1DLLL	93.7	0.3	0.7
BASE	12	ENVP15 MAX	111.2	1.0	4.7
BASE	12	ENVP12 MAX	124.3	1.0	4.7
BASE	15	1DLLL	125.4	0.3	-0.3
BASE	15	ENVP15 MAX	129.8	0.9	5.2
BASE	15	ENVP12 MAX	147.5	1.0	5.0
BASE	19	1DLLL	122.6	1.7	-0.6
BASE	19	ENVP15 MAX	113.2	6.5	1.4
BASE	19	ENVP12 MAX	129.4	6.7	1.1

Case 2: In next stage building will be analyzed with reference to the girder subjected to floating column using sequential case by using ETAB software.

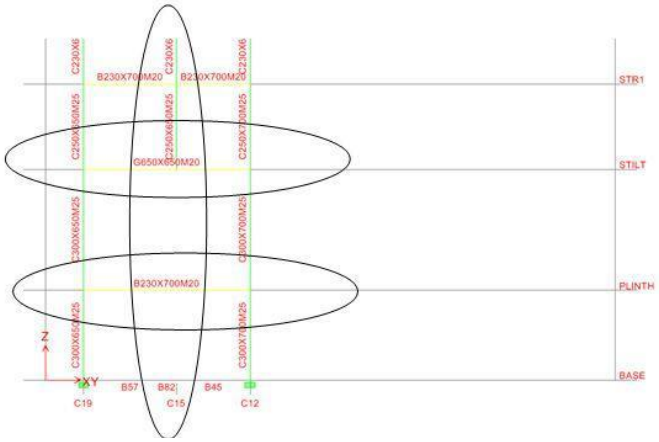


Fig -1: WITH FLOATING COL 15 AND GIRDER BEAM

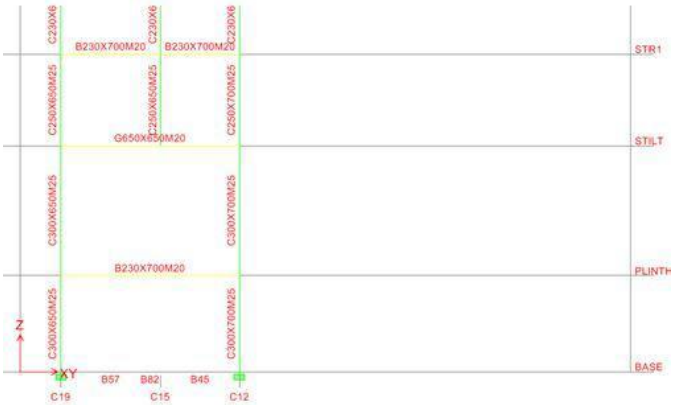


Fig 2-: WITH FLOATING COL 15 AND GIRDER BEAM

3. CONCLUSIONS

Transfer girder is safe in sheer and bending. Provision of floating column is yet not disclosed or provided any detailed description in Indian standard codes. Construction sequential case has more bending movement and sheer force value when compare to other combinations. Rise of approximately 46.17% in bending moment was observed.

REFERENCES

[1] Maison Bruce F. and Neuss Carl F., "Dynamic analysis of a forty four story building", Journal of Structural Engineering, Vol. 111, No. 7, Page No:1559- 572,July, 1985

[2] Kim HS, Column shortening analysis of tall buildings considering the restraints of rebars and horizontal members, Journal of the Architectural Institute of Korea, 2008, Vol. 24, Pages 35-42.

[3] Sukumar Behera, "Seismic Analysis Of Multistory Building With Floating Column" A Thesis Of NationalInstitute Of Technology Rourkela, (2012), Pp. 21-93

[4] Amit V. Khandve. (2012), "Seismic Response of RC Frame Buildings with Soft Storeys", International Journal of Engineering Research and Applications (IJERA), vol 2, Issue 3, pp 2100-2108.

[5] Kwak HG and Kim JK, Time-dependent analysis of RC frame structures considering construction sequences, Building and Environment, Vol. 41.

[6] C M Wanga, Z Y Taya, Department of Civil Engineering,National University of Singapore,Kent Ridge, Singapore 119260