Effect of Shear Wall on Transfer Girder for High Rise RC Building

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Abstract

In high rise structure shear wall provided at different locations to resist earthquake load. Floating column provide to develops space at below floor for assembly hall ,parking space etc. purposes. Shear wall also resist earthquake load and other lateral loads such as wind load. but in specific high rise building floating column and transfer girder provide for parking purposes or any other purposes. In that structure we don't know best position of shear wall to resist earthquake load as well as structural responses on transfer girder.

For this purpose, we analyse several models for different shear wall location and different storey cases such as 10,15,20,25 and 30 storey building with the help of EATBS V 2015 software. Each model is analyse for construction stage analysis, conventional analysis with earthquake load and wind analysis.

In construction stage and conventional analysis earthquake zone IV is consider for Delhi city. For Delhi city terrain category 4 consider for wind analysis and check behaviour of transfer girder for three types of analysis in the form of shear force, bending moment and displacement and then decide suitable positions of shear wall for each storey case.

Keywords — *Shear wall, EATBS V 2015,wind analysis, transfer girder.*

I. INTRODUCTION

Today many residential and commercial structure constructed with transfer girder and floating column for making open space for different purposes. But in this type of structure transfer girder more critical for earthquake load and other load also. Tranfer girder take the load from floating column in the form of point load.

In earthquake prone area these type of structure almost critical to transfer earthquake load to ground. It is discontinuity for lateral load path. In high rise building shear wall provide to resist lateral loads, they can have minimum thickness of 150-600mm. For high rise structure contain floating column and transfer girder, we also provide shear wall to reduce lateral movement of structure. For these type of structure shear wall, floating column and transfer girder provide simultaneously we decide that best position of shear wall to reduce structural responses of transfer girder.

Wind analysis is most important for high rise building. Because increasing building height, laterally movement of building also increases.
Construction stage analysis gives more precise behaviour of structure because in this analysis load acts as like a real situation. This type of analysis is useful in high rise structure having long time construction loading occurs. For construction of high rise building wind analysis and construction stage analysis is essential for building structure.

II.LITERATURE REVIEW

Tabassum G. Shrihatti and Vanakudre S.B.(2015), reviews the behaviour of transfer girder under sequential analysis and conventional analysis for RCC and steel building for zone-V, check the behaviour of transfer girder by shear force, bending moment and displacement.

Viji R. Kumar and Binol Varghese (2017), research on behaviour of transfer girder under different nonlinearities such as material nonlinearity, geometric nonlinearity for G+29 storey building at four loacation.

Yousuf Dinar, Munshi Md. Rasel, Muhammad Junaid Absar Chaudhary, Md. Abu Ashraf (2014),investigate about RC and steel girder for different analysis method for 5,10,15,20,25,30 storey building and check shear force, displacement and bending moment by using ETABS 9.7.2software.

Meghna B.S and T.H Sadashiva Murthy (2016),investigate behaviour of RC and composite girder for G+5 storey building for construction stage analysis and conventional analysis and comparison done on bending moment, shear force and displacement by analysis method and two material by using EATBS software.

Sri Harsha B and Vikranth J (2014), reviews behaviour of RC transfer girder under the action of sequential analysis and conventional analysis for high rise structure and comparison done on that for two analysis in the form of shear force, displacement and bending moment.

III.OBJECTIVES

- To study the behaviour of RC girder for wind analysis, stage analysis and conventional analysis for different storey cases for different locations of shear wall.
- To compare shear force, bending moment and displacement of girder by both method
- To investigate best location of shear wall to reduce structural responses on transfer girder under different loading.

IV.METHODOLOGY

The RC building 10,15,20,25,30 storey is analyse for conventional analysis, construction stage analysis for earthquake zone-IV and wind analysis for terrain category 4 with the help of ETABS V 2015.

Total No. of Models:-

TABLE –I: TOTAL NO.OF MODELS

Storey	Without SW	SW at Core	SW at Corner	SW at periphery
10	Case-1	Case-2	Case-3	Case-4
15	Case-5	Case-6	Case-7	Case-8
20	Case-9	Case-10	Case-11	Case-12
25	Case-13	Case-14	Case-15	Case-16
30	Case-17	Case-18	Case-19	Case-20

V.BUILDING DESCRIPTION

The building consider here is a residential apartment having plan dimension 25m×25m.In present work 10,15,20,25, and 30 storey buildings analyse for earthquake zone IV for Delhi city. The height of parking floor is 2.8M and typical floor height is 3M.Bay spacing in both direction is 5M. For wind load IS: 875 1987 part-3 is used and IS: 1893(part-1) 2002 is used for seismic loadings and IS: 14687 1999 is used for construction sequence analysis.
Shear wall provided at corner, core and periphery for resisting of building for lateral loads.

Dimension of building	25m×25m
Number of stories	10,15,20,25,30.
Height of each storey	3m
Height of ground floor	4.3m
Dimension of beam	300×450mm
Dimension of transfer girder	300×1800mm
Dimension of columns	2000×2000mm
Dimension of floating column	230×600mm
Thickness of slab	150mm
Thickness of exterior wall	230mm
Thickness of interior wall	115mm
Seismic zone	IV(Delhi)
Zone factor	0.24
Importance factor	1
Response reduction factor	3
Live load	$3kN/m^2$
Floor finish	$1kN/m^2$
Live load on roof	$1.5kN/m^2$
Density of masonry wall	$19kN/m^3$
Thickness of shear wall	300mm
Type of soil	Medium
Wind speed	47m/s
Windward coefficient	1.25
Leeward Coefficient	0.5
Risk coefficient	1
Topography Coefficient	1
Grade of steel	Fe550
Grade of concrete	M60

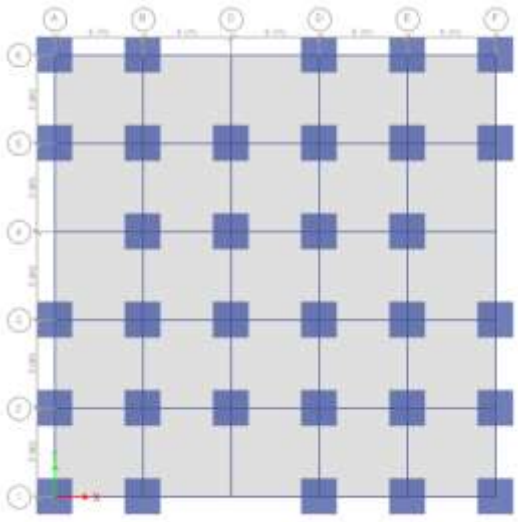

Fig.-1: Plan view with floating column at exterior side of frame

*TABLE-II:*STRUCTURAL DATA OF RC FRAMED STRUCTURE

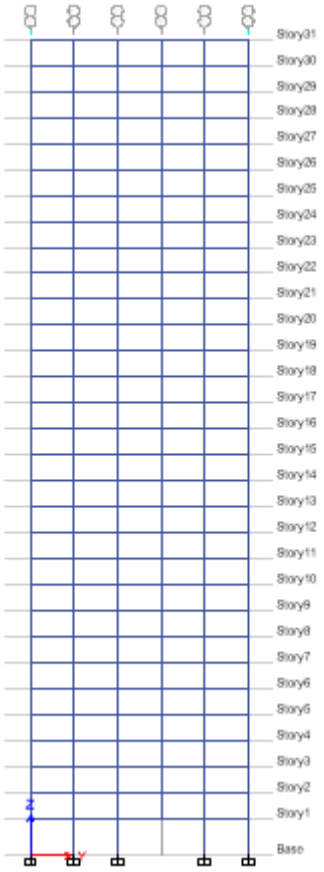

Fig.-2: Elevation of typical 30 storey building

VI. RESULT AND DISCUSSION

Shear force of transfer girder at different cases:

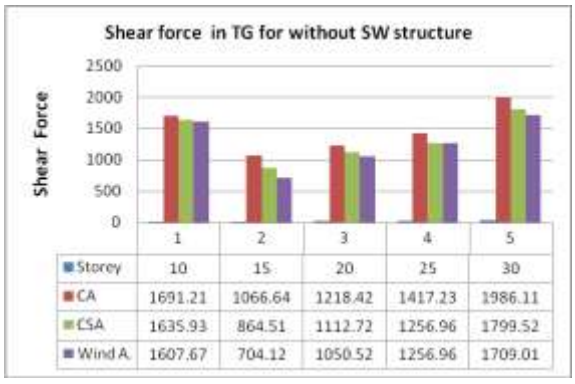

Fig.-3:Shear force in TG for without SW structure

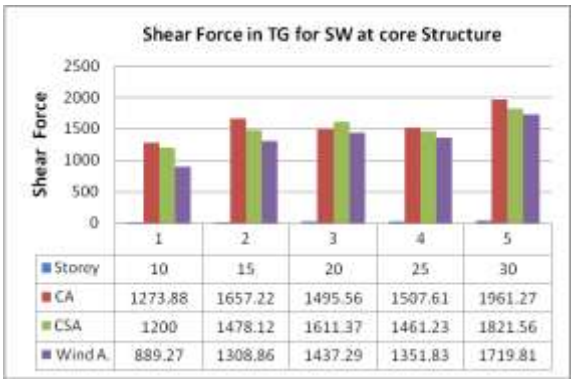

Fig.-4: Shear force in TG for SW at core structure

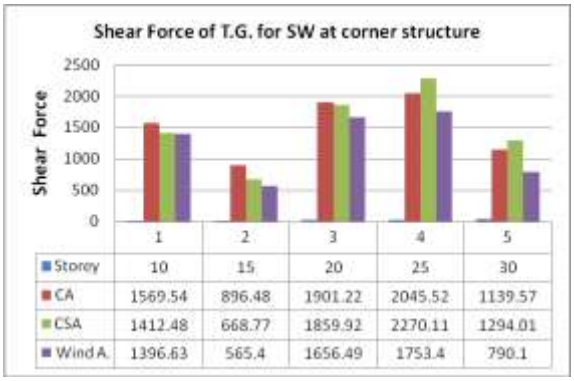

Fig.-5: Shear force of TG for SW at corner structure

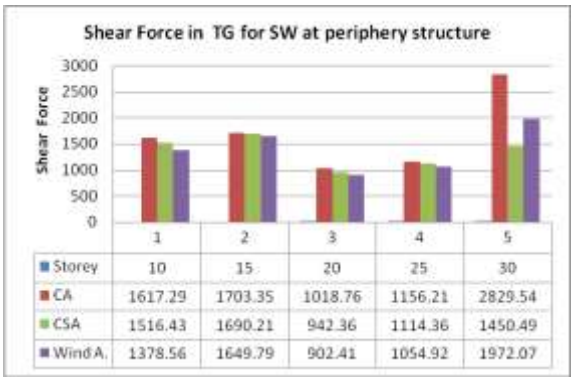

Fig.-6: Shear force of TG for SW at periphery structure

The shear force of transfer girder by three analysis method is greater than conventional analysis and then stage analysis.

Bending moment of transfer girder at different cases:

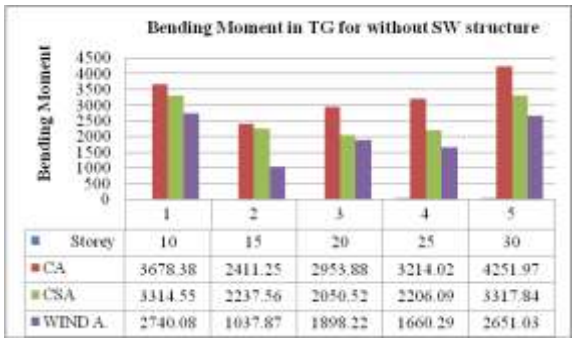

Fig.-7: Bending Moment in TG for without structure

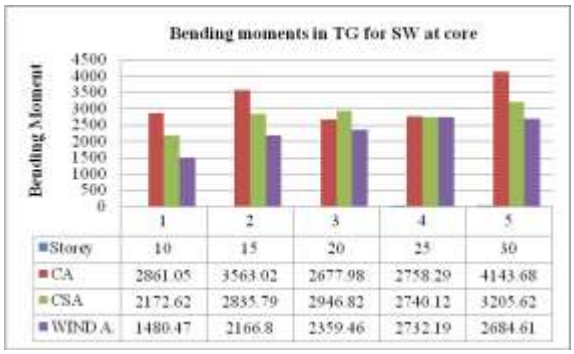

Fig.-8: Bending Moment in TG for SW at core

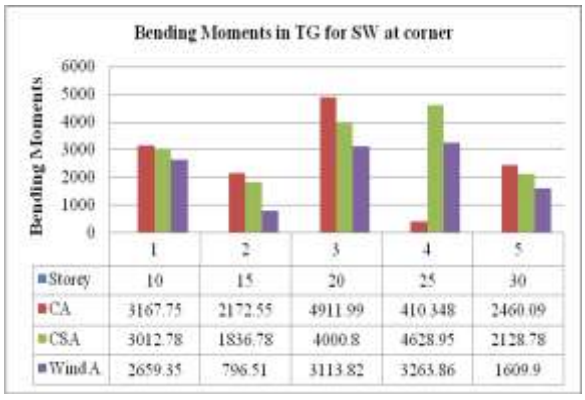

Fig.-9: Bending Moment in TG for SW at corner

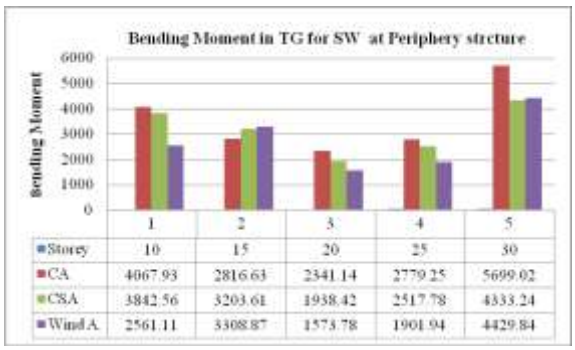

Fig.-10: Bending Moment in TG for SW at corner

From above chart, its clear that bending moment is maximum for conventional analysis and then for wind analysis. for safety of structure ,building is design for conventional analysis considering earthquake forces.

VII.CONCLUSION

- Transfer girder give less shear force at 15 and 30 storey cases, when shear wall provide at corner.
- Transfer girder give less shear force at 20 and 25 storey cases, when shear wall provide at periphery.
- Transfer girder give less shear force at 10 storey case, when shear wall provide at core.
- Transfer girder give less bending moment at 10 and 20 storey cases, when shear wall provided at core.
- Transfer girder give less bending moment at 15 and 30 storey cases, When shear wall provide at corner.
- Transfer girder give less bending moment at 25 storey case, for without shear wall.

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