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Comparative Study of Non-Infilled and Infilled Framed Structure

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Abstract

In the present study 5 story typical building is considered and analyzed using different methods and finally analyzed with using E-Tabs 2015 Software. In this project the in-filled and non in-filled frame structures are analyzed and compared. The Infilled frame structures are provided with bricks in between beams and column while analysis which is not generally done by consultants & the designers. It is emphasized to show the benefits of providing the brick element before analysis of structure or portal frame. The design process of structural planning and design requires not only imagination and conceptual thinking but also sound knowledge of science of structural engineering besides the knowledge of practical aspects, such as recent design codes, bye laws, backed up by ample experience, intuition and judgment. The purpose of standards is to ensure and enhance the safety, keeping careful balance between economy and safety.

Keywords: - structure geometry, beam and columns, non-in filled, in filled

1. INTRODUCTION

Buildings come in a wide amount of shapes and functions, and have been adapted throughout history for a wide number of factors, from building materials available, to weather conditions, to land prices, ground conditions, specific uses and aesthetic reasons. A Multi-Stored is a building that has multiple floors above ground in the building. Multi-storey buildings aim to increase the floor area of the building without increasing the area of the land the building is built on, hence saving land and, in most cases, money (depending on material used and land prices in the area). The design process of multi-stored building requires not only imagination and conceptual thinking but also sound knowledge of science of structural engineering besides the knowledge of practical aspects, such as recent design codes, bye laws, backed up by ample experience, intuition and judgment. The purpose of standards is to ensure and enhance the safety, keeping careful balance between economy and safety. This project

the in-filled and non in-filled frame structures are analyzed and compared. The Infilled frame structures are provided with bricks in between beams and column while analysis which is not generally done by consultants & the designers. It is emphasized to show the benefits of providing the brick element before analysis of structure or portal frame. There are several methods for analysis of different frames like kani's method, cantilever method, portal method, Matrix method. The present project deals with the analysis of a multi storeyed residential building of 5 storeys. The dead load &live loads are applied and the design for beams, columns, footing is obtained.

2. RELATED WORK

The project work has been done using E-Tabs 2015 Software and the analysis was done on both the frames Infilled frame structure and non Infilled frame structure. In which the parameters considered are Deflection, bending moment and the shear forces in the beam are focused. The typical load distributions from the slab to beam and from beams to column are done manually and verified with software. The magnitude of deflection is compared in the consecutive frames both Infilled and non Infilled frame structure. The brick element is taken as the filling material in Infilled frame structure.

3. IMPLEMENTATION

Structure geometry

The following fig shows the render view of the structure showing about the positions and the vertices of the beams & columns along with slab. This is non in-filled frame structure.

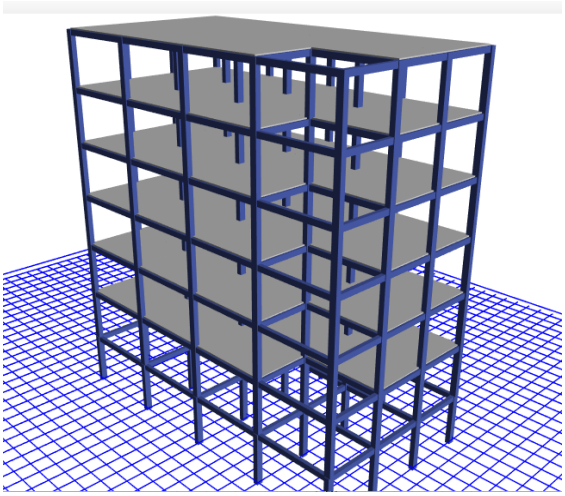

Fig 1 Render View of the structure

The above view is obtained from the software, the particular view is known as the Render View of the structure. The figure shows the 3D view of structure.

Location of beam and columns

The System of Columns and Beams have been used in Construction since Ancient Egypt (Which lasted from about 3100BC until it was finally absorbed in to the Roman Empire in 30 BC) Ancient Greece and Ancient Rome. In modern day construction, Column-Beam-Slab System is been used in all superstructures with new technology, and construction materials. Generally the load of the slab is transferred to the columns or walls through the beams, down to the foundation, and then to the supporting soil beneath.

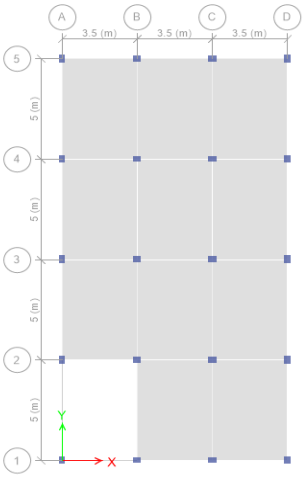

Fig 2 Location of Columns

This is the top view of the plan with different positions of columns and beams as in grid system.

Spacing between the columns along Y-direction is 5 m & spacing between the columns along the X- axis is 3.5m

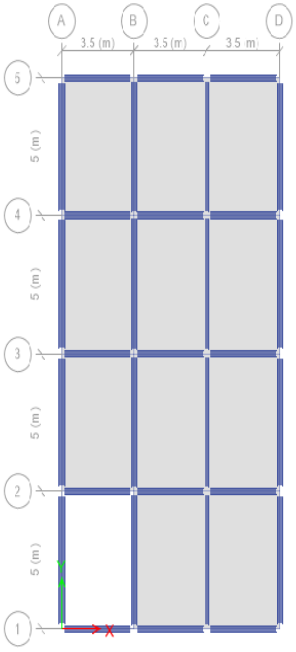

Fig 3 Location of Beams

The above figure shows the different positions of the beams. With their dimensions.

4. MATERILA PROPERTIES

As per Is 456:2000

Grade of concrete=M20, M25, M30

As per Is 456:2000

Characteristic compressive strength of M20 grade :20N/mm²

Grade of steel: Fe 415

Density of concrete: 25 KN/m³

Assumed load : (as per Is 875:1987)

live load=2KN/m

dead load=3KN/m

floor finish=1KN/m²

factored load=10.5KN/ m²

Materials

Name	Type	E MPa	N	Unit Weight kN/m³	Design Strengths
A615 Gr60	Rebar	199947.98	0.3	76.9729	Fy=413.69 MPa, Fu=620.53 MPa
HYSD 415	Rebar	200000	0	76.9729	Fy=415 MPa, Fu=485 MPa
M20	Concrete	22360.68	0.2	24.9926	Fc=20 MPa
M25	Concrete	25000	0.2	24.9926	Fc=25 MPa

Material Properties – Summary

5. EXPERIMENTAL RESULTS

The shear force, Bending Moment & the Deflection are observed of several beams

and are studied for the comparative purpose along with non-in-filled frame structure.

B1 at story 5 (Floor beam)

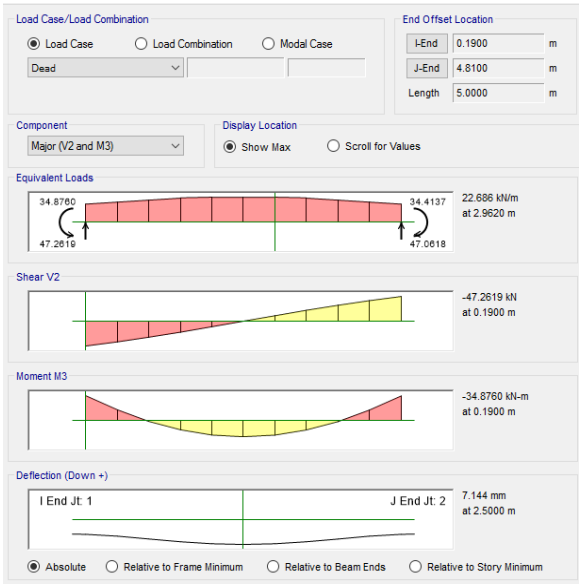

Fig 4 Characters of beam (B1@storey5) after analysis)

B14 at story 4 (Floor Beam)

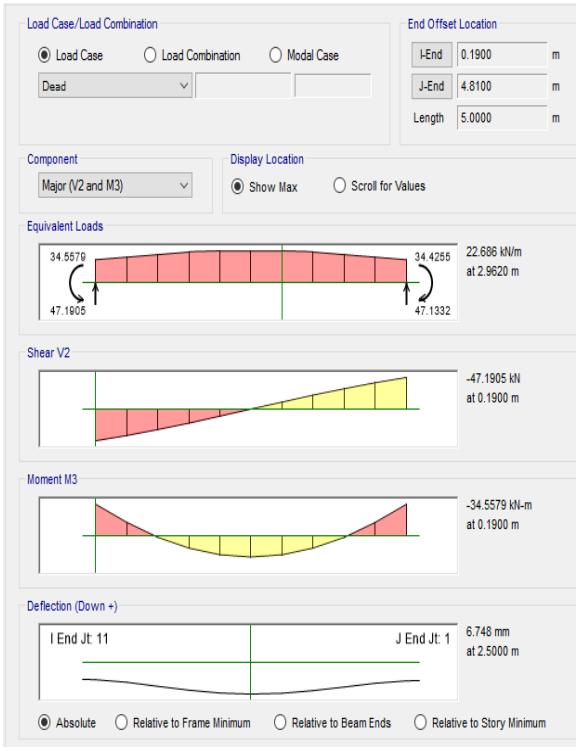

Fig 5 Characters of beam (B14@storey4) after analysis)

B13 at story 3 (Floor beam)

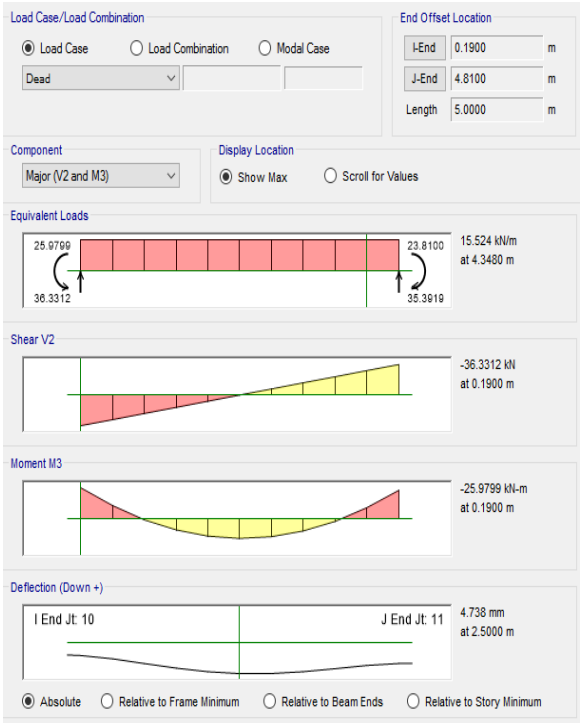

Fig 6 Characters of beam (B13@storey3) after analysis

B13 at story 5 (floor beam)

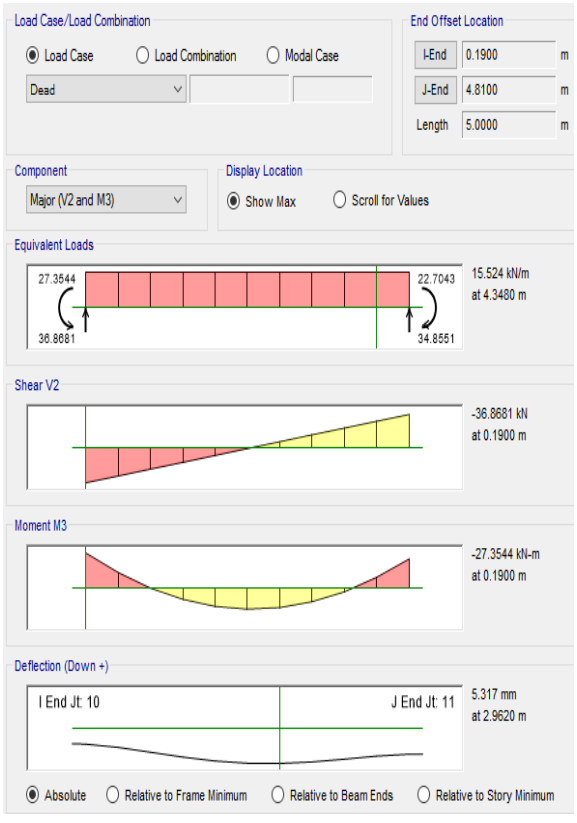

Fig 7 Characters of beam (B13 @story 5) after analysis)

6. CONCLUSION

The brief discussion about the analysis and the comparative study is done in on The location of beam and column and the details of structure ,structure geometry, elevation, grid line marking, material property are explain in chapter 2with different figure from the software the entire work is done on E-TABS 2015 The gravity loads analysis has been done using the software and the different factors like shear force, bending moment, deflection are calculated manually and obtained from software using the yield line method the distribution of loads from slab to beam is done and the distribution of loads in various beams is shown by using portal frames the tabular data is arranged on the basis of various loads in different beams in at different storey. Comparative study of filled and non infilled structure we have taken the different beams randomly from the frames after the analysis of the frame the magnitude of bending moment and magnitude of deflection and magnitude of shear force are compared and the results are shown below.

Comparison of deflection

BEAM	NON-INFILLED	INFILLED
B1 at story 5	2.8mm	7.14mm
B14 at story 4	2.87mm	6.8mm
B13 at story 3	2.05mm	5.9mm
B13 at story 5	2.05mm	6.3mm

Comparison of deflection in both frames)

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