INVESTIGATION THE EFFECT OF BRICK PARTITION WALL ON BUILDING FRAME

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ABSTRACT: ***Structural analysis of building frames represents an important field of application of digital computers to use stiffness approach in order to evaluate their complete stress and deflection behavior. Generally, a frame is analyzed without the brick wall present in the frame. In the present study, if the brick walls present in the frame whatever the variation of reaction, bending moment, shear force, displacement or deflection of the frame which is then compared to the absent the brick wall in the frame. In the present investigation a three storied building frame has been analyzed under various load combinations. The frame analysis has been found that if no nodes of brick wall are coinciding with the nodes of beam and column then whatever its result and its effect. If brick wall nodes is coinciding with beam and column nodes, then what its variation on results. The whole work has been performed by using computer software STAAD-PRO from which different parameters are computed.***

Keywords: ***Brick Partition Wall, Reaction, Bending Moment, Shear Force, STAAD PRO.***

I. INTRODUCTION

In the world it has a growing trend towards construction of multi storied buildings. It is very important to choose an appropriate structural form for the multi storied buildings. In addition to satisfy nonstructural requirements, the principal objectives in choosing a building's structural form is to arrange to support the gravity, dead and live load and to resist at all levels the external horizontal load and shear, moment and torque with adequate strength and stiffness. These requirements should be achieved as economically as possible. Structural analysis can be viewed more abstractly as a method to drive the engineering design process or prove the soundness of a design without a dependence on directly testing it. To perform an accurate analysis a structural engineer must determine such information as structural loads, geometry, support conditions, and materials properties. The results of such an analysis typically include support reactions, stresses and displacements. This information is then compared to criteria that indicate the conditions of failure. Advanced structural analysis may examine dynamic response, stability and non-linear behavior. The aim of analysis is the achievement of an acceptable probability that structures being designed will perform satisfactorily during their intended life. With an appropriate degree of safety, they should sustain all the loads and deformations of normal construction and use and have adequate durability and adequate resistance to the effects of seismic and wind [1].

II. BACKGROUND LITERATURE

For the analysis of a structure to be complete and correct, an appropriate model must be chosen to represent the structure and an adequate analysis procedure must be chosen to reflect the system's response to applied loads. A first-order analysis, in which equilibrium and kinematic relationships are taken with respect to the deformed geometry of the structure, is simple to perform but is not a thorough analysis since it neglects additional loading caused by the deflection of the structure. For most structures, a second-order analysis, which imposes equilibrium and kinematic relationships on the deformed geometry of the structure, is required for stability analysis [2].

III. MATERIALS &ANALYTICAL PROCEDURE

A. Partition Wall [3].

A partition wall is a wall that separates rooms, or divides a room. Partition walls are usually non load-bearing. Partition walls are constructed of many materials, including steel panels, bricks, blocks of clay, terra cotta, concrete or glass blocks.

There are different types of partition wall such as:

- Brick Partitions
- Clay block partitions
- Concrete Partitions
- Glass partitions.
- Metal lath partitions
- Asbestos sheet
- Stone Partitions
- Metal Partitions.

Brick Masonry Properties used to assign[4].
FOR BRICK:
Young's modulus =1875 kip/in^2
Poisson's ratio=0.2
Density of Brick =6.94*10^{-5} kip/in^3
Thermal coefficient=5.5*10^{-6}
Critical damping=0.03
Shear modulus=0

FOR MORTAR:
Young's modulus =1390 kip/in^2
Poisson's ratio=0.25
Density of Mortar =26*10^{-5} kip/in^3
Thermal coefficient=1.5*10^{-6}
Critical damping=0.03
Shear modulus=0

FOR CONCRETE:
Young's modulus =3150 kip/in^2
Poisson's ratio =0.17
Density =8.68 *10^{-5} kip/in^3
Thermal coefficient=5.5000000429
Critical damping=0.05

B. Staad pro software [5]
STAAD-PRO was born giant. It is the most popular software used now a day. Basically it is performing design works. There are four steps using STAAD-PRO to reach the goal.
a. Prepare the input file.
b. Analyze the input file.
c. Watch the results and verify them.
d. Send the analysis result to steel design or concrete design engines for designing purpose.

IV. RESULT AND DISCUSSION

The effect of partition walls on building frame has great significant which is analyzed with the help of computer software staad.pro for performing and showing different variations. Different analysis has been performed and compared to obtain the actual effect of partition wall.

CASE- When brick partition walls present on building frame and also have properly connected with the beam and column which is compared to when brick partition walls not present on building frame but equivalent load applied:

Variation of shear force in beam -

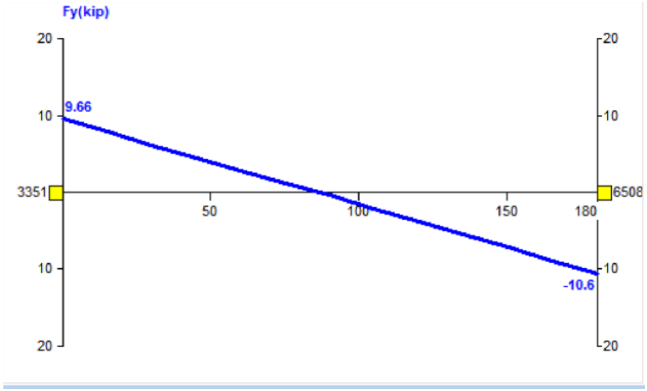

Fig. Shear Force Diagram (brick wall absent)

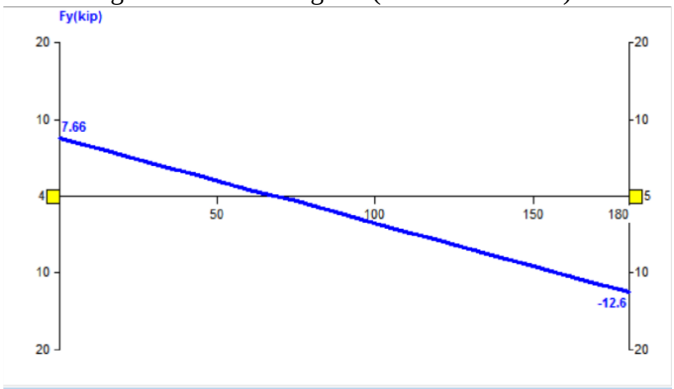

Fig. Shear Force Diagram (brick wall present)

Table- Compression of shear force in beam

Beam no.	When brick wall is absent		When brick wall is present		% change in maximum shear
	Left end shear (k)	Right end shear (k)	Left end shear (k)	Right end shear (k)	
5	7.59	12.7	9.25	11	13.38
6	8.19	12.1	9.63	10.6	12.4
7	8.31	12	9.83	10.4	13.33
12	7.16	13.1	9.77	10.5	19.85
13	7.84	12.4	10.2	10.1	17.74
14	7.8	12.5	10.7	9.62	14.4

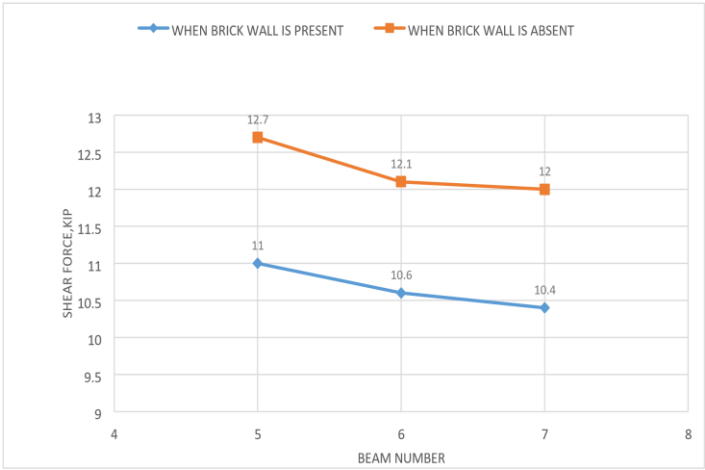

Fig. Graph for compression of Shear Force

Above shown graph represents a comparative analysis for the shear force value when brick partition walls present and absent on a building frame.

Variation of bending moment in beam –

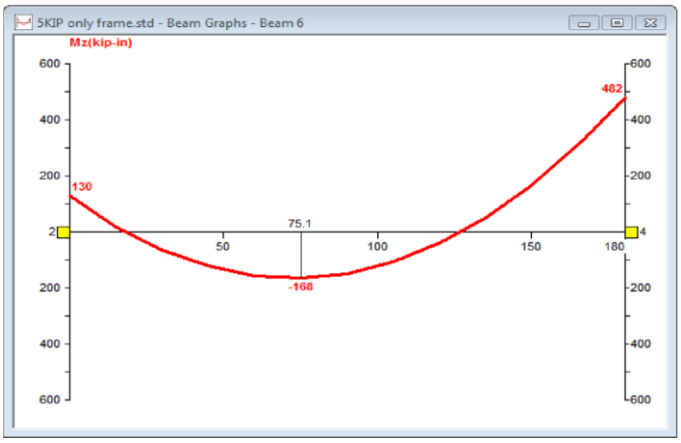

Fig. Bending Moment Diagram (brick wall absent)

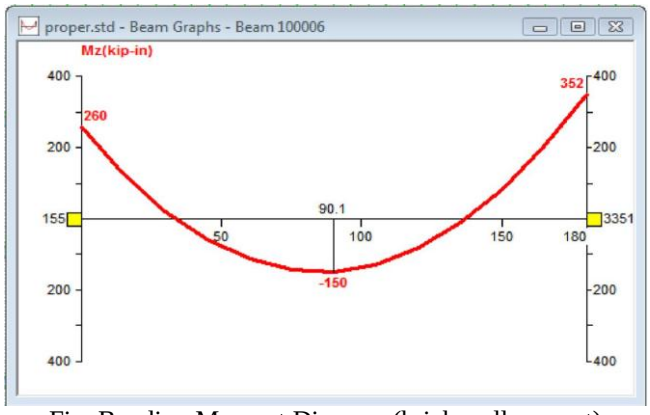

Fig. Bending Moment Diagram (brick wall present)

Table- Compression of bending moment in beam

Beam no.	When brick wall is absent		When brick wall is present		% change in maximum moment
	Left end moment (k-in)	Right end moment (k-in)	Left end moment (k-in)	Right end moment (k-in)	
5	53	513	209	370	27.86
6	130	482	260	352	26.97
7	133	463	267	322	30.45
12	7.95	544	255	321	41
13	99.6	513	311	303	40.93
14	89.7	511	333	239	34.83

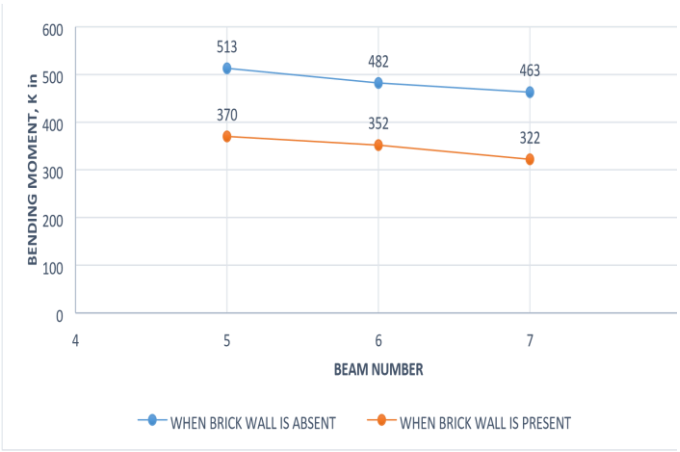

Fig. Graph for compression of bending moment

Above shown graph represents a comparative analysis for the bending moment value for beam when brick partition walls present and absent on a building frame.

V. CONCLUSIONS

The behavior of partition wall has been investigated by "STADD PRO" software. Form the analysis the following conclusions can be drawn:

- It is found that there are proper connection among the brick wall with beam and column will be developed lower amount of shear and moment in the structure.
- Changing in load pattern also changed the percentage of moment and shear.
- The design moment can be reduced to analyze considering the brick wall effect on the frame which is economical practically.

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