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Seismic Analysis of Interlocking Blocks in Walls

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ABSTRACT-. Brick walls aremade of interlocking bricks that do not use mortar to connect the blocks. The interfacial connection of inter connected blocks subjected to lateral loading was investigated in this work by modelling 1m*4m masonry wall. This masonry wall is analyzed by determining the shear load in a plane of various sizes and comparing the results with an existing masonry wall. The individual dimensions for each block of both types are detailed in modelling. This models are analyzed in the ANSYS workbench module. Total deformation, Equivalent stress (von- mises), Equivalent strain (von-mises) wasobserved for both normal masonry andmasonry walls, and thus stress strain and deformation under load diagrams were constructed. As a result, there is a percentage deviation in deformationunder a certain load compared to conventional masonry.

INDEX TERMS- Conventional bricks and Interlocking bricks.

I. INTRODUCTION

Housing is in short supply in most developing countries with grown population. Due to rapid urbanization, prices for land and building materials are rising rapidly. As a result, the poor cannot afford adequate housing. A new building element that need to be developed during the construction of masonry is the mortar block for mortar block light mortar load bearing walls built from blocks differ from conventional brick system in that they do not contain mortar, but instead each block is connected by planting and a canopy blocks placed in compacted stable soil are good resistant to fire and thermal insulation properties. When there is a dry climatic condition it will possess a good Compressive strength. One of the best technology to produce the low cost construction element is this new interlocking block in such a case it found that lateralloads act upon a building walling construction element comprises of total 22% of its overall cost of the building during construction find the best material available in the market.

I.I INTERLOCKING BRICKS

This interlocking bricks does not need any mortar joints like conventional bricks and also reduce the construction cost, well stabilized interlocking blocks will be artistically in nature. Blocking isa method of erecting solid walls without mortar. It consists of fly ash, M-Sand, Cement and 6mm Course aggregate. Interlocking concrete blocks are uniquely shaped precast concrete blocks are designed to be connected to each other using pre-measured holes and slots. They consist of unique profiles and features that blend perfectly withoutmortar. Brick is used to build a house, and the mortar is not needed.

II. METHODOLOGY

This present study deals with ANSYS FEM software is used for seismic analysis , and the conventional bricks and interlocking bricks are designed using NEX11 software. Here the model from NEX11 software is imported to ANSYS software through IGES format. Here the masonry wall is modeled as 1m*4m is taken and then for the loading conditions for different magnitude are checked the plot the graph for mode vs frequency, for both the bricks and then compare the result and conclude that which is the better building masonry block for theconstruction.

I. Modal analysis and its shapes: Modal analysis is the main type of dynamic analysis and determines the natural frequency at which the structure vibrates. Modal analysis helps to determine the vibrational properties(mode shapes and natural frequency) of a structure or component and can be used under dynamic loading condition. Eg: Lateral seismicforces

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Table 1. Mode withfrequency in Hz forboth the walls

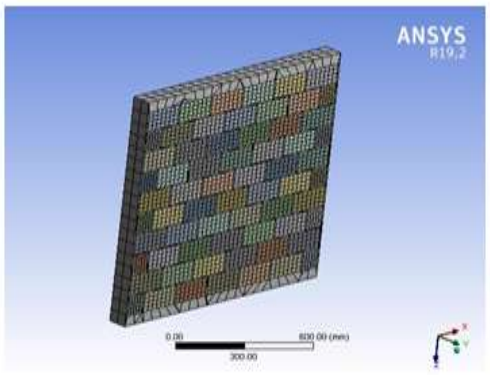
MODES	CONVENTIONAL BRICK	INTER-LOCKING BRICK
1	0	0
2	0	0
3	0	0
4	0	3.3469e-004
5	1.2773e-003	4.5334e-004
6	1.6382e-003	6.0777e-004
7	60.064	33.57
8	85.209	43.86
9	111.7	64.229
10	146.14	78.69

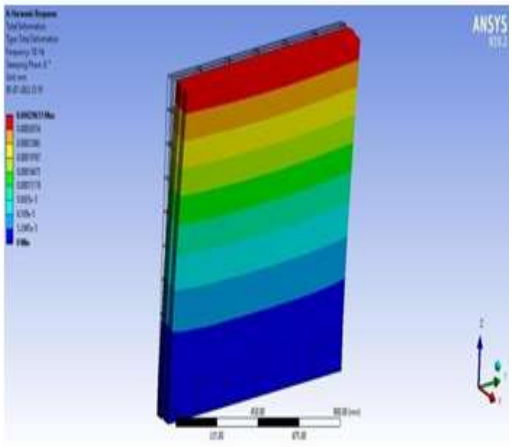
LATERAL LOADING OF ASTRUCTURE

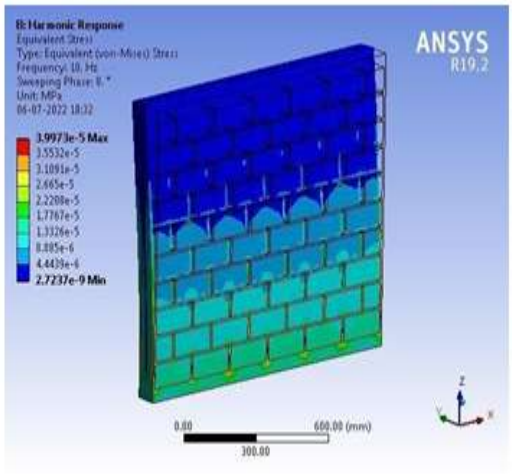
After importing the models into the ANSYS software, both the conventional and interlocking walls are analyzed with the assigned lateral seismic waves with the magnitude of 17480 N and for different ranges of frequency. Here in this wall structure the lower part of the wall is fixed and the loads are assigned on the horizontal side of the brick wall as the seismic waves propagates in the horizontal way. Here the total deformation of the structure, equivalent elastic strain (von-mises), equivalent stress (von-mises) is observed in both theparameters.

After importing the models into ANSYS software, for conventional brick model dimension is taken as 190mm*90mm*90mm with 10mm thicknessaddition to cement mortar 200mm*100mm*100mm and the interlocking bricks dimension are 230mm*120mm*125mm and the material property of them are assigned.

Here is the model of conventional brick and interlocking brick of load 17480N for frequency 10Hz for Total deformation, Equivalent stress(von-mises), Equivalent strain(von-mises) are shown.







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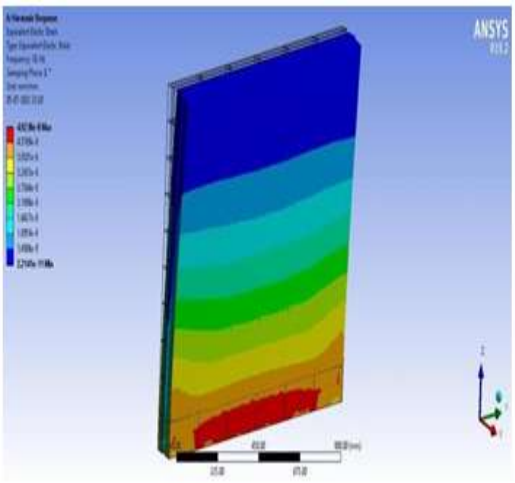
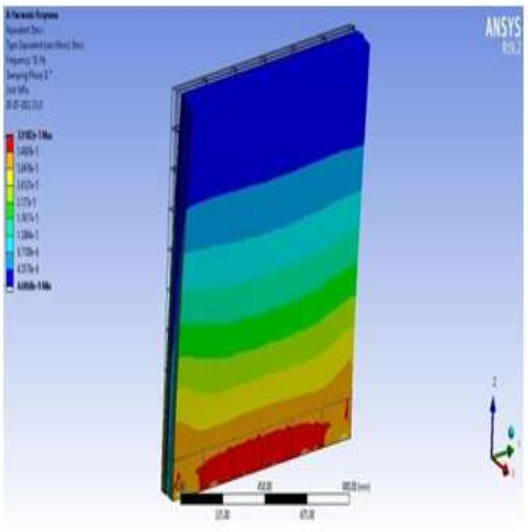
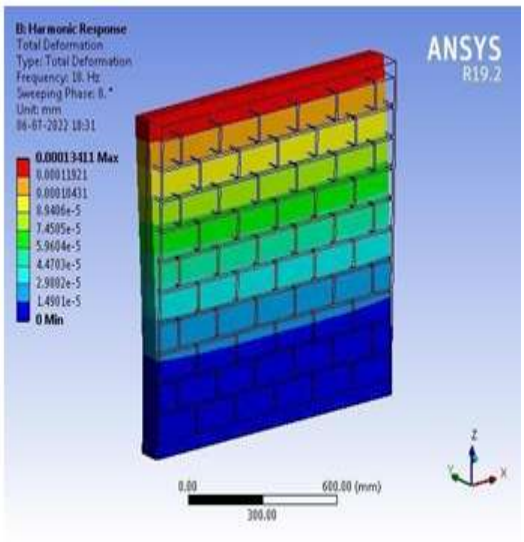


Fig shown above is for conventional bricks



Figures for Interlocking Brick



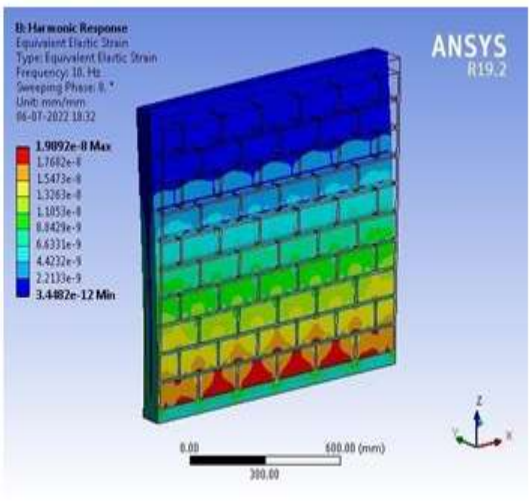


Table for frequency 10Hz

Parameters	Conventional Brick	Interlocking Brick
Total Deformation	0.0002965 1 mm	0.0001341 mm
Equivalent Stress (von-mises)	3.9973 e-5 MPa	3.91825 e-5 MPa

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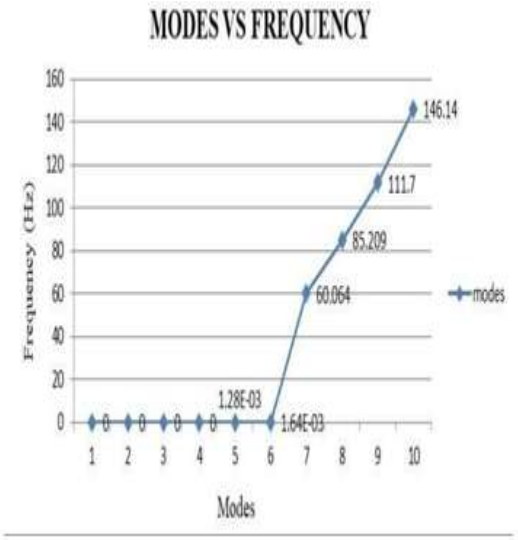
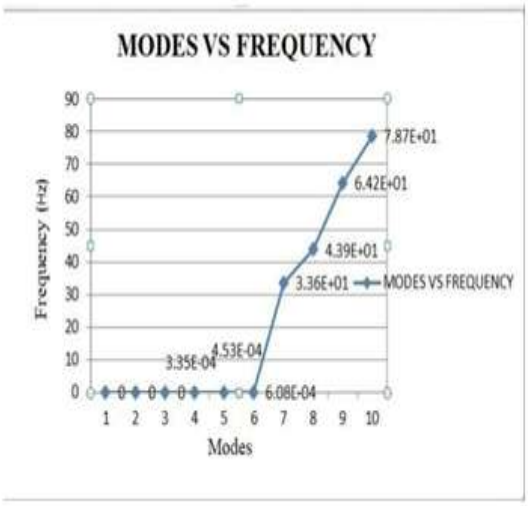
Equivalent strain (von-mises)	4.9238e-8	1.9892e-5



Graph for conventional brick



Graph for Interlocking brick

III. CONCLUSION

The lateral seismic loads when applied on both conventional and interlocking brick wall are subjected to, the total deformation, equivalent stress(von-mises), equivalent strain(von-mises) are checked where total deformation, equivalent stress of interlocking brick show lesser value when compared to conventional brick. Hence interlocking bricks are cost effective and can resist seismic load than that of the conventionalbrick.

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