



# Performance of Evaluation of Wall Constructed by Self Interlocking Blocks.

Borude Dhananjay Anil<sup>1</sup>, Gaikwad Tejas Dharmaraj<sup>2</sup>, Garad Abhishek Arjun<sup>3</sup>, Ghadge Prasad Ashok<sup>4</sup>, Ithape Rushikesh Sandeep<sup>5</sup>

<sup>1</sup>Assistant Professor, Adsul's Technical Campus, Chas, Ahilyanagar  
<sup>2,3,4,5</sup> Student, Adsul's Technical Campus, Chas, Ahilyanagar

**Abstract**— A rise in demand for infrastructure has led the way towards requirement of fast construction practices while maintaining the quality of construction and at a low cost. Construction of practice walls with conventional and aerated cement blocks is common practice in India. Hence, change in the system of partitioning wall by making alterations in the blocks was made to develop a new system of partition wall. A system of self-interlocking blocks was developed which enabled easy construction and provided the required bond in absence of mortar which in turn helps in reducing the cost of construction of walls. Selfinterlocking blocks were developed by digital modelling and dimensions were fixed for the blocks. Further, physical model was casted with help of customized moulds.

**Index Terms**—Interlocking blocks, conventional brick, Ansys

## I. INTRODUCTION

With the growth in population, housing facilities are typically insufficient in developing nations. Land and building supplies are becoming more expensive quickly as a result of the high rate of urbanisation. As a result, the lower classes in society cannot afford decent homes. It was desired to use the newly designed structural element in the construction of masonry structures with new interlocking mortar concrete masonry blocks. According to earlier research, interlocking bricks help to cut down on both the cost and time needed for building. The construction of a mortar less load bearing wall employing interlocking blocks differs from conventional mortar brick work systems in that there are no mortar layer and instead of that blocks were joined by grooves and protrusions. Compressed stabilised soil will produce interlocking blocks with good fire resistance and insulation qualities.

A wall built with stabilised soil provided good compressive strength in a dry region. One of the best technologies for producing inexpensive building materials is the expansion of interlocking earthen blocks. The load bearing system of the building partition wall will also play a significant role in preventing lateral loads from acting on the structure. Therefore, fencing materials are crucial for building.

It was discovered that it represents around 22% of the building's overall cost. Finding a material that is economical is therefore crucial. By minimising the mortar connections, interlocking stabilised earth bricks have successfully decreased building costs. If the interconnecting blocks are properly stabilised, they will also act as a decorative element. All across the world, several interlocking block kinds are being produced.

Bricks consisting of stabilised and compacted soil which join fit tightly provide the structure strength. Depending on the supplier, interlocking bricks are available in a variety of sizes and locking mechanisms. The blocks with designs that fit together. Each brick is depressed on one side and projects on the other. Individual block turns perfectly into the depression of the following because of its interlocking design. Without employing cement mortar for bonding, walls will be constructed.

Interlocking bricks made of stabilised and compacted soil provide the structure's strength. Depending on the supplier, interlocking bricks are available in a variety of sizes and locking mechanisms. Interlocking bricks are typically not baked and are created by mechanically combining and compressing sand, soil, and cement. They can also be created using stone dust and cement. Building walls with interlocking bricks is faster and requires less skilled labour than with traditional bricks because they don't require mortar during the bricklaying process. These bricks are fastened against each other without cement mortar to build walls that are structurally sound and take less time and money to build. Making interlocking bricks: These bricks are made by mixing cement, sand, and stone dust in the right proportions.

## II. OBJECTIVES

1. To design the interlocking blocks with varying depths.
2. To study the behaviour of interlocking blocks.
3. To evaluate strength of interlocking blocks in earthquake zone.
4. To evaluate displacements of interlocking blocks in earthquake zone.
5. To evaluate comparison between interlocking blocks.
6. FEM analysis will be used to analyse the model.

### III. MODELLING AND ANALYSIS

Any type of analysis highly depends on modelling. Any analytical software can be used for modelling, or CAD software for either. All modelling for this article was completed using Ansys 2015(16.2) version. Before being assembled at the assembly session, the numerous parts of the brick wall are built one at a stage in Ansys 2015. These components are all modelled in millimetres, which are the conventional units (mm). The interlocking blocks used in brick walls have different depths, such as 130mm, 140mm, and 150mm, and they are made with measurements of [(0.4X0.15X0.13m) (length X breadth X height)]. There is a pattern for each stabilised interlocking block that is separated into three volumes, with projections and depressions in the central volume of the brick. Out of three volumes, the end volumes' width differs greatly from the centre volume. While the main volume has a 270mm width, the ends of the volume have a 150mm width. This design is intended to interlock with other designs. The distance between the projection and depression is 1 cm. With these dimensions, several wall components were modelled, and has already indicated, all of these components are put together during a meeting to make a 1m x 1m wall. Some half bricks with the dimensions 0.2mX0.15mX0.13m must be modelled in order to construct this wall (length X breadth X height). With these measurements, the bottom layer consists of 4 bricks stacked lengthwise, while the top layer consists of 8 complete bricks. The evaluation of interconnecting blocks is carried out using the finite element method, a flexible technique that can accommodate the structure of complicated shapes and limiting conditions. To simulate any particular physical phenomena, the numerical method of FEA is applied (FEM). Depending on how you look at it, FEA can be traced all the way back to Euler's work in the 16th century. However, papers by Shellback (1851) and Courant provide the earliest mathematical article on FEA (1852). To address structural mechanics issues in civil and aeronautical engineering, engineers from many industries independently developed FEA. Distinguish and Conquer: Simulations need the construction of a mesh made up of up to millions of minuscule elements that collectively create the geometry of the building. Each individual component is given a calculation, and the final outcome of the structure is produced by adding the individual outcomes. The aforementioned approximations are actually interpolations over the element and are often polynomial in nature. Instead of referring to values everywhere, this is referring to values at particular points inside the components.

The accuracy with which the variable varies as indicated by an approximation, such as linear, quadratic, cubic, etc., is specified as the nodal points, which are typically found at the edge of the elements. FEM applications have just recently begun to realise their full potential in other sectors, such as fluid-structure interaction in the thermomechanical, thermochemical, piezoelectric/ferroelectric, electromagnetic, and other related fields. A FE model of an interlocking block was made using the software ANSYS Workbench 16.2. A commercial finite element modelling (FEM) tool called ANSYS has capabilities that range from straightforward linear static analysis and complex nonlinear transient dynamic analysis.

1. Establish and distribute material properties.
2. Using the ANSYS 16.2 software, model infill walls made of interlocking blocks of various depths and ordinary brick.
3. Combining
4. Apply loads and boundary conditions.
5. Result Evaluation

### IV. RESULTS

The results of the experimentation carried out until detection of failure are given. The mode of failure and the reason behind it is stated for the test.

- 1) The failure was detected after 2 minutes of vibration.
- 2) The mode of failure was observed to be shear.
- 3) The failure took place in the vertical grooves of interlocking system.
- 4) The failure took place because of the test of the groove and key provided in the vertical interlocking system.
- 5) The groove and key are at 90 degree to the horizontal and have circular cross section. This causes development of shear stresses at the joint of the groove and top surface of the block. Sample paragraph Define abbreviations and acronyms the first time they are used in the text, even after they have been defined in the abstract. Abbreviations such as IEEE, SI, MKS, CGS, sc, dc, and rms do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

### V. CONCLUSION

The interlocking system designed works satisfactorily. Upon application it was observed that the blocks failed in the vertical interlocking system. The cause of failure was observed to be shear.



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Shear took place due to the shape of the protruding portion of vertical interlocking system and the top surface of the block. The reason for shear was found out to be the cylindrical shape of the protruding portion. Hence changes must be made in the shape to eliminate the failure. The horizontal interlocking system on the other hand worked efficiently. Yet during transportation of blocks from casting area to testing area some blocks got damaged in places where dimensions of portions were less than dimensions of rest of the blocks. Hence, we can conclude that the blocks may work effectively in a wall as a group but are susceptible to damage as individuals. Also, natural frequency the constructed wall was not calculated. Hence more work needs to be done on method of testing. The process of making wall was eased due to the system of interlocking. It assisted in linear progression of brick laying and also helped in maintain plumb in vertical progression. In the end it can be concluded that adoption of interlocking system instead of conventional masonry is beneficial in terms of economy, time taken for construction. But more work needs to be done on the interlocking system itself to improve the performance of wall and also on the tests to check the performance of the wall.

Compared with conventional masonry, the dry assembly of interlocking blocks saves construction time and a large amount of mortar, which would otherwise be required for the horizontal and vertical joints.

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