
Alternate Materials for Wall Construction

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ABSTRACT

*The Paper aims to study the replacement of red bricks for wall construction with various materials. Although there are many materials such as bangalore stone, bamboo, aac blocks, clay blocks, hollow clay bricks, etc. But in this paper we would like to throw some light on two materials i.e. **aac blocks** and **hollow core interlocking blocks**, which are widely used for wall construction due to their eco friendly and time saving qualities.*

In the fast changing environment, 50% of a nations GNP goes into construction. The largest single factor contributing to environmental degradation is the inappropriate use of building technologies. So, to be effective in practice, an appropriate technology which is easy to maintain, effective for many people and which has a wide impact and affordable should be used.

INTRODUCTION

A. HOLLOW CORE INTERLOCKING BLOCKS:

Hollow concrete blocks are substitutes for conventional bricks and stones in building construction. Hollow masonry wall interlocking systems are usually partially grouted after dry stacking and they function as hollow masonry walls only during construction period. At that time only wind load and other constructions load is considered under load mechanism. These units are made in such a manner that we can provide horizontal and vertical reinforcements including grouting. The cells are filled with grout to enhance axial load capacity and allow transverse as well as shear resistance. Moreover it reduces the use of shuttering.

A.1 ADVANTAGES:

- ✓ They are lighter than bricks,
- ✓ Easier to place and also confer economics in foundation cost and consumption of cement. In comparison to conventional bricks,
- ✓ They offer the advantages of uniform quality,
- ✓ Faster speed of construction,
- ✓ Lower labour involvement and
- ✓ Longer durability.
- ✓ Non Erodible diaphragm (Refer Fig.1)
- ✓ Dependence on skilled labour is reduced. (Refer Fig.2)
- ✓ Erection during cold winter is possible.
- ✓ Ductility can be improved.
- ✓ Unlike mortared joint construction, use of smaller units does not consume more material but does take more time.
- ✓ Units can be manufactured on site using local aggregate and soil.

- ✓ Units can be reused.
- ✓ Least energy intensive and environmentally friendly technology.

In view of these advantages; hollow concrete blocks are being increasingly used in construction activities.

A.2 DISADVANTAGES:

- ✓ System may be unstable to resist certain type of load during construction, thus external barricading or grouting shall be provided at regular intervals.
- ✓ Architecturally restrictive due to limited bond patterns.
- ✓ Difficulty in curve wall construction.
- ✓ Manufacturing as well as handling cost might increase.

A.3 COMPARISON BETWEEN CONVENTIONAL SYSTEM AND HOLLOW CORE INTERLOCKING BLOCKS:

S.NO.	EVALUATION CRITERIA	CONVENTIONAL MASONRY	INTERLOCKING BLOCKS
1.	AESTHETICS (Refer Fig.1)	Achieved using mortar and joint treatment	By introducing specific finishing to the bed and edges by pointing
2.	SOCIAL AND POLITICAL	Skilled labour required	Demand for skilled labour reduced, thus providing job opportunities to wider range of people in developing countries where skill labors is rare.
3.	TOLERANCE	Nominal tolerance of work is $\pm 10\text{mm}$	Nominal tolerance of work is $\pm 1.5\text{mm}$ proving as a biggest challenge for manufacturers.

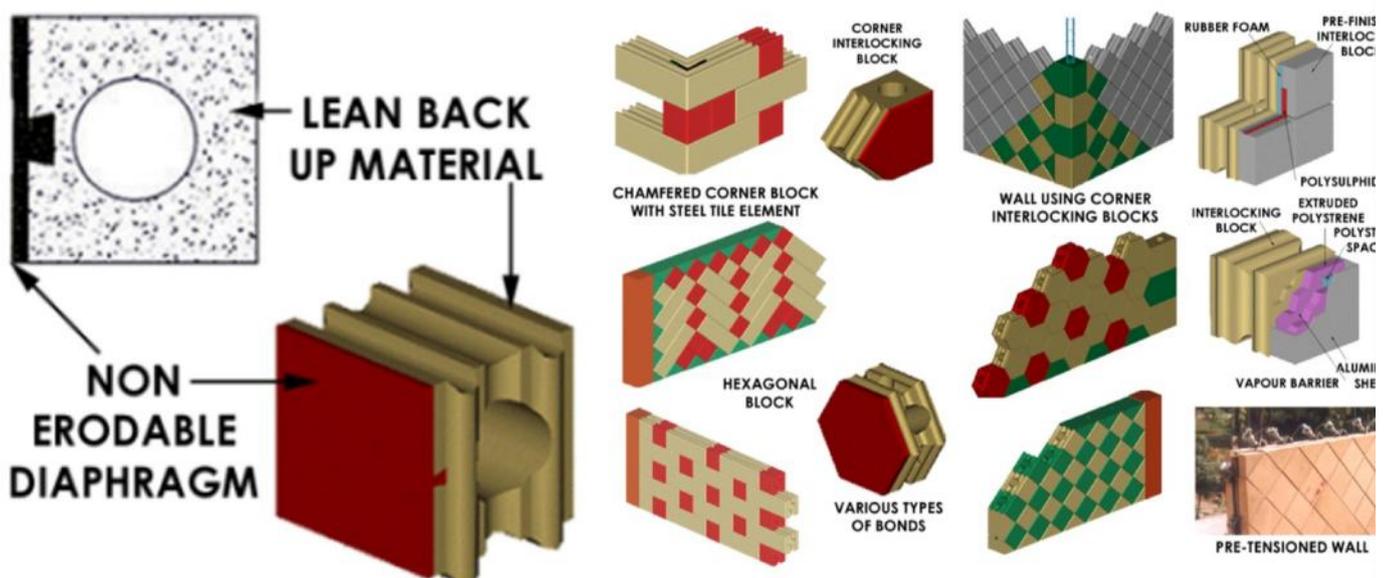


Fig.1: NON ERODABLE DIAPHRAGM & DIFFERENT TYPES OF BONDING



Fig.2 : WOMEN EMPOWERMENT

A.4CASTING OF THE BLOCKS:

- ✓ Mixture of block is prepared using cement, sand, aggregate and other waste materials (Refer. Fig.3)
- ✓ Coating of burnt oil on mould so that that the concrete mix does not stick (Refer. Fig.4)
- ✓ Finishes laid on plastic sheet inside mould (Refer. Fig.5)



3a.



3b.

Fig.3: MIXTURE PREPARATION



Fig.4: COATING OF BURNT OIL



Fig.5: PLASTIC SHEET FINISHING

- ✓ Rich cement slurry in the ratio 1:6 is poured over the finishes to form the first impermeable diaphragm. (Refer. Fig.6)
- ✓ The concrete mix is filled with compaction done at regular intervals. (Refer. Fig.7)
- ✓ Once the mould is half filled, a hollow tube is passed through the holes for creating the hollow core. (Refer. Fig.8)



6a.



6b.

Fig.6: POURING OF CEMENT SLURRY

- ✓ The remaining mould is filled and the mixture compacted. (Refer. Fig.9)
- ✓ Surface is smoothed and a layer of rich cement slurry with or without other finishes is poured.
- ✓ After initial setting, the moulds are carefully removed from the diagonal edges few minutes after casting and left for drying for about 48 hours to attain strength.



Fig.7: COMPACTING OF MIXTURE



Fig.8: HOLLOW CORE CREATION



Fig.9: FILLING OF REMAINING MOULDS

B. AAC BLOCKS:

Autoclaved Aerated Concrete is a Lightweight, Load-bearing, High-insulating, Durable building product, which is produced in a wide range of sizes and strengths. AAC Blocks is lightweight and compare to the red bricks AAC blocks are three times lighter. AAC is produced from the common materials lime, sand, cement and water, and a small amount of rising agent. After mixing and molding, it is then autoclaved under heat and pressure to create its unique properties. AAC has excellent thermal insulation and acoustic absorption properties. AAC is fire and pest resistant, and is economically and environmentally superior to the more traditional structural building materials such as concrete, wood, brick and stone. Its main ingredients include sand, water, quicklime, cement and gypsum (Refer Fig.10). The chemical reaction due to the aluminum paste provides AAC its distinct porous structure, lightness, and insulation properties, completely different compared to other lightweight concrete materials.

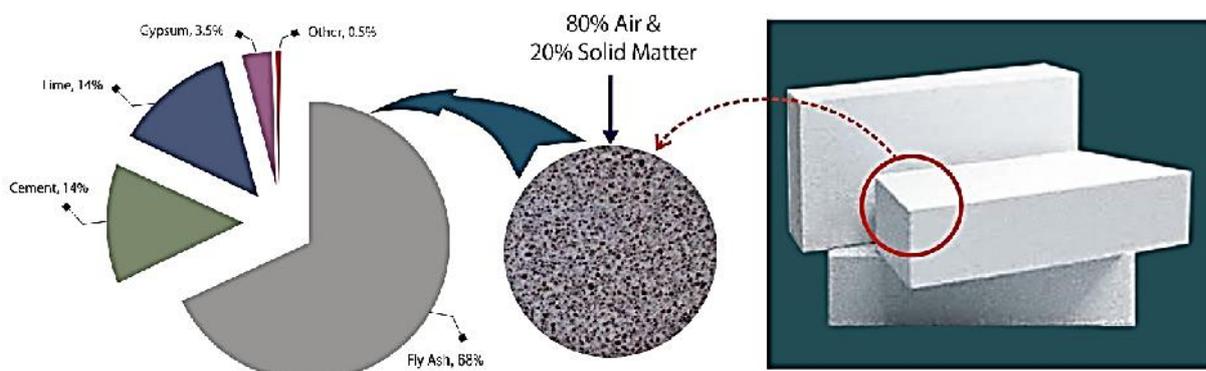


Fig.10: MATERIAL COMPOSITION OF AAC BLOCKS

B.1 ADVANTAGES:

- ✓ Offer fire resistance from 4 hours up to 6 hours thus making them highly suitable for areas where fire safety is of great priority.
- ✓ Offer pest resistance due to inorganic material constitution which helps preventing damages, termites.
- ✓ Proves to be sound proof due to its porous structure.
- ✓ Provides earthquake resistance due to light weight property which results in higher steadiness of structure of building (Refer Fig.11)
- ✓ Easy to handle
- ✓ Use of ordinary tools for cutting such as drill could easily be used to cut and align blocks.
- ✓ Installation time is reduced resulting in faster construction
- ✓ Long lasting property since they are manufactured from non-biodegradable materials.
- ✓ Cost saving due to light weight.
- ✓ Attractive appearance and easily adapt to any style of architecture.
- ✓ Have exceptional thermal insulating properties, which helps keeping indoors warm in winters and cool during summers.
- ✓ Absorption of water is minimal.
- ✓ Environment friendly and allows reuse of waste material.
- ✓ Light weight
- ✓ Comes in perfect shape and sizes, thus internal walls can easily be finished by direct pop reducing the use of plaster.
- ✓ High compressive strength.
- ✓ Provides high resistance to water penetration.



Fig.11: FOUNDATION DEPTH LESS AS COMPARED TO BRICKS

B.2 DISADVANTAGES:

- ✓ Cost of production per unit is higher.
- ✓ If plaster is opted for finishing, it might not stick properly because of its smooth surface.
- ✓ Needs care during production process to avoid breakage.

B.3 COMPARISON BETWEEN CONVENTIONAL SYSTEM AND AAC BLOCKS:

S.NO.	EVALUATION CRITERIA	CONVENTIONAL BRICKS	AAC BLOCKS
1.	RAW MATERIALS	Local material: clay	Cement, water, fly ash, other materials
2.	COST BENEFIT	Beneficiary for low rise building due to easy availability in local market.	Reduction in cost for high rise due to reduction in dead load which allows saving of concrete and steel.
3.	FIRE RESISTANCE	Up to 2 hours	Up to 4 hours
4.	QUALITY OF PRODUCT	Locally made product so quality depends on quality of raw material and manufacturing.	Factory made product, so quality of end product is good.
5.	AVAILABILITY	Available locally	Setup of manufacturing unit is high, not much factories so availability is an issue.
6.	JOINING PROCESS	Traditional mortar is used	Chemical mortars can be used, thus reducing consumption of cement and avoids curing.

B.4 CASTING OF THE BLOCKS:

STEP WISE MANUFACTURING PROCESS IS EXPLAINED IN THE IMAGE BELOW. (Refer Fig.12)

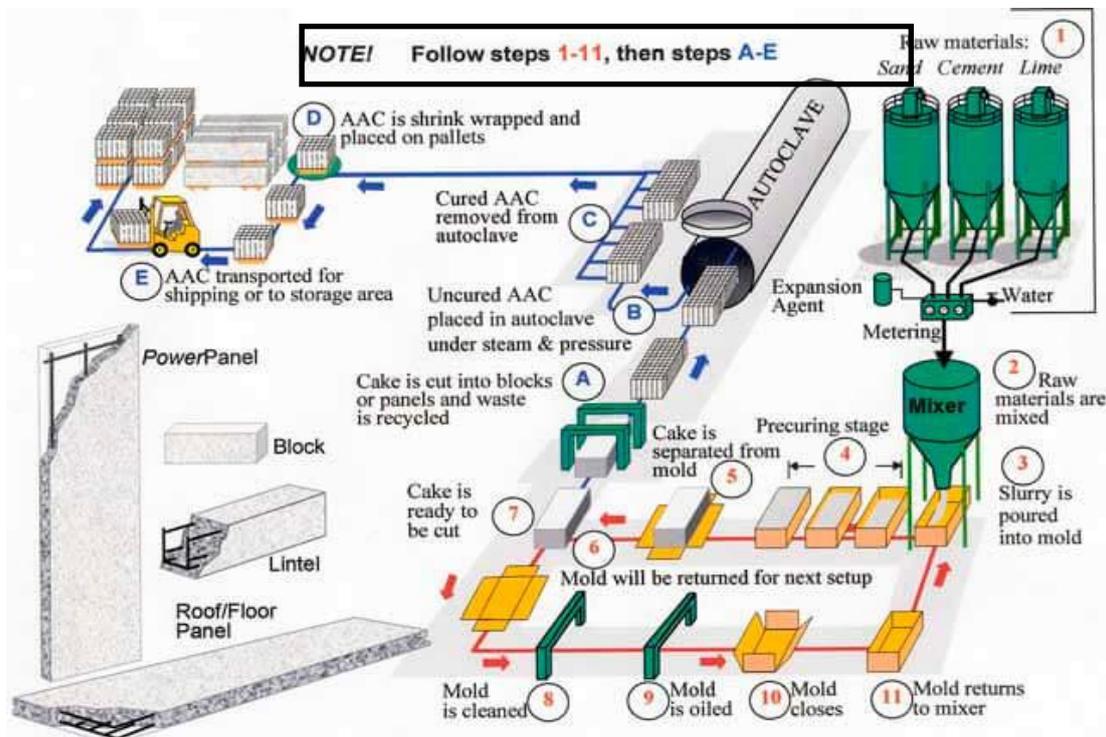


Fig.12: MANUFACTURING OF AAC BLOCKS

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