Auto claved aerated concrete block : An alternate of brick

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Autoclaved Aerated Concrete (AAC) is a precast structural product made with all-natural raw materials.

Autoclaved aerated concrete block is also known as autoclaved cellular concrete (ACC) or autoclaved lightweight concrete.

It is produced by the substitution of a uniform cellular structure of air voids for some or all of the aggregate particles found in traditional concretes (air voids of up to 80 percent of total volume are common).

Because of the thermal mass of AAC and its ability to store and release energy over time, AAC may be beneficial in climates where outdoor temperature fluctuates over a 24-hour period from above to below the indoor temperature conditioned air set point.
Objective

➢ To check compressive strength of AAC block over regular brick.
➢ To increase the durability of structure.
➢ To make the structure economical.
➢ To use the AAC block as green building material.
Properties of AAC block

- Workability
- Stability
- Durability
- Flow-ability
- Self-levelling
- Self-compaction
- Thermal insulating
- Fire resistance
- Sound absorption
- Seismic resistance
- Permeability
- Energy absorption
- Low Density
- Strength
Why we go for AAC

- Improved thermal efficiency of AAC reduces the heating and cooling load in buildings.
- Workability allows accurate cutting, which minimizes the generation of solid waste during use.
- Resource efficiency gives it lower environmental impact in all phases of its life cycle, from processing of raw materials to the disposal of AAC waste.
- Due to light weight also saves cost & energy in transportation.
- Light weight of AAC saves labour.
- Bigger size of AAC leads to faster masonry work.
- Light weight increases chances of survival during seismic activity.
Collection of good literature.

List out the material used for casting the autoclaved aerated concrete brick.

Casting the aerated concrete brick.

Apply different test on brick after 7 & 28 days.

Comparison of result with regular brick.

Analysis.
Materials used for making AAC

1. Ordinary Portland cement
2. Quartz sand
3. Fly ash
4. Lime
5. Hydrogen peroxide
6. Bleaching powder
7. Water
Materials used:

- Sand
- Hydrogen Peroxide
- Cement + Fly ash
- Bleaching Powder
- Lime Powder
1) Fly ash:
   It is one of the mineral admixtures.
   It is an industrial waste product which has pozzolanic and cementitious properties.
   It is used for durability, economy and energy saving considerations.
   It is also known as flue-ash, is one of the residues generated in combustion and comprises the fine particles that rise with the flue gases.
   Fly ash is a heterogeneous material. SiO2, Al2O3, Fe2O3 and occasionally CaO are the main chemical components present in fly ashes.

2) Lime Powder:
   Lime possesses good plasticity.
   It has good workability.
   It has good adhesion with masonry.
   It stiffens quickly.
   It has resistance to moisture.
   It has low shrinkage.
Cont...

3) Water:
   It distributes the cement evenly.
   It reacts with cement chemically
   and produces calcium silicate hydrates
   (C-S-H) gel.
   It provides workability to concrete.
## Proportion of materials used in brick:

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Materials used</th>
<th>Type-I</th>
<th>Type-II</th>
<th>Type-III</th>
<th>Type-VI</th>
<th>Type-V</th>
<th>Type-IV</th>
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<td>4</td>
<td>Bleaching powder(in gm)</td>
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<td>5</td>
<td>H$_2$O$_2$(in ml)</td>
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<td>8</td>
<td>Water(in ml)</td>
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Methodology

1. Storing and supplying of raw materials of AAC.
2. Casting
Removing air voids by vibration
Pre-curing

- Temperature should be 50° to 70°.
- For gas forming.
Testing
# Results

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<tr>
<th>TYPE</th>
<th>SAMPLE</th>
<th>COMPRESSION STRENGTH (Kg/cm²)</th>
<th>Weight (Kg)</th>
<th>Average Weight AAC Brick (Kg)</th>
<th>Average Weight Of Standard Brick (Kg)</th>
<th>AVERAGE COMPRESSIVE STRENGTH (Kg/cm²)</th>
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<td>27</td>
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Cont...

Fig. 1: 7 & 28 day strength

Fig. 2: weight comparison
Advantages

1. Cost:
   Due to light weight easy transportation is possible causing less cost.

2. Structural capability:
   The compressive strength of AAC is very good and load-bearing structures up to three storeys high can be safely erected.

3. Resources:
   AAC is made from naturally occurring materials that are found in abundance – lime, fine sand, other siliceous materials, water and a small amount of aluminium powder (manufactured from a by-product of aluminium).

4. Environmental impact during production & use:
   The manufacture of AAC requires less energy than for all other masonry products, thereby reducing use of fossil fuels and associated emissions of carbon dioxide (CO2). Reduces the need for space heating and cooling in buildings.
5. It can be reused and recycled.
6. Fire resistance:
   Due to its purely mineral composition, AAC is classified as a non-combustible building material. It is both resistant to fire up to 1200oC and heat resistant.
7. Sound insulation
8. Durability
9. Toxicity:
   There are no toxic substances and no odour in the final product.
Disadvantages

- projects far from manufacturing facilities will suffer from higher initial costs.
- Few contractors are currently familiar with the product, and trained masons must adjust to using thin-set mortar as opposed to traditional cement-based mortar, which requires less precision in its application.
Application

- Firewalls
- Pipeline and culvert installation
- Retaining wall backfill
- Sound absorption for partition walls
- Fire-proofing panels
- Protective structures for military weaponry
- Tunnel lining
- Crash & target range bullet barriers
Conclusion

- It does not contain coarse aggregates. It is a good insulator of heat and sound and thus can be used in place of conventional bricks or at the places which does not bear any load.
- Autoclaved aerated concrete (AAC) was some kind of new, space-age environmental miracle.
- AAC Structures are Well-Suited to withstand fires, earthquakes, and other Natural Disasters.
- AAC construction has very low air infiltration and is mold resistant, indoor air quality of AAC structures is improved relative to competitors.
- Autoclaved aerated concrete is further considered a sustainable building product because of its excellent insulating qualities resulting in increased energy efficiency.
- AAC is also termite and mold resistant, and nearly fireproof. This extreme durability makes the product virtually maintenance free, eliminating the need for repair materials, pesticides, and chemical treatments, while also lowering operating costs.
- The aerated nature of the material facilitates breathability. There are no toxic substances and no odor in the final product.
- According to above calculation use of AAC construction saves up to 40% of overall project cost.
- Blocks are one-fifth of the weight of concrete and are produced in a variety of sizes, but although AAC is relatively easy to work, is light and easily carved, cut and sculpted, it generally requires careful and accurate placement.
- The highest compressive strength is of 40 kg/cm² at of type 5 of specimen having cement 0.800 kg, quartz sand 2 kg, 200 grm bleaching powder 120 grm, H₂O₂ 60 ml, lime powder 800 gram, water cement ratio 0.35, water 875 ml.
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Thank You