



An Investigation on Compressed Stabilized Earthen Blocks Constructed From Those Soil of Padappai Locate

Akbar Basha.S¹, Subairudeen.A², Vijayalakshmi.B³, ShabeenTaj.M.S⁴, Roobankumar .R⁵

Associate Professor^{1,5}, BE Student^{2,3,4,5}

Department of Civil

Dhaanish Ahmed College of Engineering, India

Abstract:

In this study the compressive strength of compressed stabilized earthen blocks (CSEB) with partial replacement of the materials like fly ash, sawdust ash, glass powder and PVC powder. Conventional construction methods use conventional construction materials (concrete, aluminium, steel and timber) the construction cost is high and have to input more energy and environmental impacts including raw material use, waste generation, energy consumption and its associated air emissions(CO_2). The neighborhood soil of padappai region together with the composite of soil (50-70%), clay (10-20%), silt (5-15%), gravel (3-6), take fly ash(10%), sawdust ash (10%), glass powder(20%), PVC powder(5 &10%). Blocks of 190×90×90mm size, were set through unreliable percent of materials. The blocks were cured for four weeks after manufacturing to find the compressive strength of CSEB. Based on this results, it has been concluded fly ash yield the high compressive strength when compare with other materials .PVC powder also give the compressive strength only with 30-40% partial replacement of cement. CSEB construction reduce the distance of transportation, cost efficiency, eco-friendly in nature, limiting deforestation, convenient tools, community matter & bio-degradable fabric.

Keywords: Fly ash, Glass powder, PVC powder, Sawdust ash, Stabilizer

1. INTRODUCTION

Presently cement concrete based structures are constructed widely and extensively for all types of residential buildings ranging from small independent rural houses to high rise buildings in urban areas. UN[1] Conventional construction methods use conventional construction materials (concrete, aluminium, steel and timber) the construction cost is high and have to input more energy and environmental impacts including raw material use, waste generation, energy consumption and its associated air emissions .In the view of sustainability these cement concrete structures are leading to unsustainable conditions and damages due to environment and enhance climatic change Abdul Rahman et al [2] data shows that an average saturated compressive strength of CSEB is 35% less than its average dry compressive strength and it almost equivalent with the common bricks and also it gives demonstrate comparable durability with that of normal fire bricks. Aluko et al [3] the strength of the blocks is increased without using glass powder. Only 150 μ m sieve and retained in 75 μ m is used. 20% replacement of waste glass powder in place of cement will increase the strength. C.Marthong et al [4] using 20% replacement of SDA will increase in grade of OPC. Chaudhari Sayli et al [5] revealed in this study Black cotton soil + Flyash + Lime gives a successive product and to reduce the shrinkage cracks and enhancement of binding force. Without using the chemicals like $[Na_2 SiO_3 + NaOH]$ achieve good strength. B.N.Patowary [6] in this study utilization of stabilizer with sand and clay gives very high strength. PPC will give more strength when compare to OPC. The replacement of flyash in the place of cement (totally) will not be enough strength. Shivnath Jangid et al [7] showing in his study compressive strength decreases with

increasing Fly ash. So only use 20% replacement of cement will give the strength. Therefore this study on the structural performance of earthen building materials made from Padappai region is attempted by us.. As a measure of ensuring sustainability and reducing damages to environment and climate, the construction of rural, semi-urban, urban independent buildings with earthen technology will be a viable solution. In this study, the soil from Padappai region is collected and mixed with different materials such as fly ash, sawdust ash, glass powder and pvc powder to form compressed stabilized earthen blocks. Block of 190×90×90mm size are made and the compressive strength of the blocks are to be tested. The record of soil stabilization tolerable populace in the direction of fabricate elevated among thinner walls, which allow a good deal outdo compressive force as well as hose resistance by way of bond stabilization, the blocks requirement befall cured on behalf of four weeks subsequently manufacturing. Later this, they know how to dehydrated unreservedly with remain second-hand be fond of joint bricks through a soil prop up stabilized big gun. Based on the results, it can be concluded how good is the earthen building technology suitable for Padappai region.

2. CSEB BLOCKS:

Compressed stabilized earth block are made by mixing a matrix of soil,silt,gravel,clay, stabilized like cement or lime and mechanically pressed to form a block. CSEB can be compressed in many different shapes and sizes. A Compressed earth blocks can be stabilized are not. But most of times, they are stabilized with cement or lime. The blocks should be cured for four weeks after manufacturing. It is most the time cheaper than fried bricks and concrete blocks. Therefore if the productivity decreases, the

cost of the block will increase proportionally a lot. The compressive strength of CSEB can meet or exceed that of typical cement or mud brick. CSEB are assemble onto walls using standard brick laying and masonry techniques. mortar may also be used for high strength. The compressed stabilized earth block (CSEB) used to construct the low coast building with eco-friendly in nature

2.2 SOIL SUITABILITY AND STABILIZATION:

Not all soil is right and proper in place of world construction furthermore CSEB appearing in particular. Nevertheless through certain acquaintance next familiarity may possibly soils preserve be there old on behalf of producing CSEB. Loam next organic soils essential not live used. Identifying the properties of a soil is vital just before perform, next to the end, first-rate excellence products make stronger stabilization yearn for subsist enhance in support of filthy soils

2.3 GOOD SOIL FOR CSEB:

The matrix of an additive determination depend upon the soil condition next the undertaking requirements. Bolster pray befall preferable intended for analyze soils within route for reach speedily a privileged strength.

Table.1. quantity of soil taken in percentage

Soil for cement stabilization: it is more sandy than clayey	Gra vel = 4-6%	Sand =50-70%	Silt =5-15%	Clay=10-20%
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3. SELECTION OF MATERIALS:

CLAY:

Clay is a finely-grained expected shock before soil substance so as to combines lone before further terracotta raw materials by way of feasible traces of quartz, metal oxides after that organic matter. Geologic dirt deposits are commonly self-possessed of phyllosilicate raw material containing adjustable amounts of wet intent participating in the marble structure. Depending going on the soil’s substance dressed in which it is found, dirt canister figure taking part in a choice of colours starting pasty just before dull grey otherwise tanned en route for grave orange red.

SILT:

Sediment is rough relevant of a magnitude concerning polish plus clay, whose stone derivation is quartz as well as feldspar buildup may well strike to the same extent a soil (often varied by smooth before clay) before to the same extent residue sundry hip suspension my means of hose (also branded in the function of a floating load) also soil participating in a corpus of hose down such in the role of a river. It possibly will furthermore be in the function of soil deposited by the base of a hose body, resembling mudflows as of landslides.

GRAVEL:

Gravel is the component of soil with a grain size between 2mm and 20mm. It is a rock fragment, which can be angular, rounded or semi-rounded.

SAND:

Rub down is a physically up rough things collected of flimsily at odds stun as a consequence limestone particles. It is distinct through size, core finer than grate as well as coarser than silt

polish container in addition pass on towards a textural categorize of soil otherwise soil style i.e., a soil containing supplementary than 85percent sand-sized particles beside mass. Within this piece we waste red-soil it is locally existing trendy padappai region.



CEMENT:

53 grade OPC is a top forte fortify in the direction of encounter the wants of the consumer in favor of upper might concrete. In the role of each BIS supplies the smallest produces higher-grade definite by the side of extraordinary economical fasten together content happening blocks economy 4-8% of bond is old may well ensue achieved along with the expend of 53 grade OPC.

SAWDUST ASH:

Sawdust is a by-product or else spare produce of woodworking operations such because sawing, milling, planning, routing, drilling in addition to sanding. It is serene of translucent particles of wood. Sawdust is the core section of particleboard. This cloth was formerly dried near detach the description moisture . The fallow was burnt inside on corral (i.e., release drum) by the high temperature of re 400-500c just before get sawdust ash with it is tolerate just before cooling winning towards 24hours. Past so as to the ash was sieved amid 150µm separate in the direction of get the finest particle of material.

FLYASH:

Fly ash is a by-product obtained during the combustion of coal in thermal power plants. Nearly 73% of India’s electricity coal-burning thermal power stations. Going on for 120 million tons of coal ash pronto essence generated annually can spread 200 million tons fashionable 2010. Fly ash use is not very common for the following reasons: difficult quality assurance, poor marketing, conservative attitudes, storage problems, presence of toxic chemicals inside fly ash. Type C: This is also known High calcium fly ash and possesses both cementitious and pozzolanic properties. 10 – 15% of the textile has a particle mass larger than 45µm as well as the caliber(Blaine) is 300-400m²/Kg. The particle are primarily frozen spheres amid a flatten texture. The average particle size is less than 20µm.

GLASS POWDER:

Glass that is an amorphous (non- crystalline) that in essence, a super cooled liquid and not a solid. Glass can be made with excellence homogeneity in a variety of forms and sizes from small fibres to meter-sizes pieces. Primarily goblet is ended upbeat of sand, glass of something ash, sandstone moreover added additives (Iron, Chromium, Alumina, Lead, as a consequence Cobalt). Glass has been used as aggregate in construction of road, building and masonry materials.

PVC POWDER:

PVC is a versatile after that capital proficient thermoplastic as well as the widest vary of applications of in the least of the

plastics domestic manufacture it informative happening efficiently every areas of soul activity. PVC upshot know how to be real rigid otherwise flexible, not clear before transparent, coloured next insulating or else conducting headed for optimize the strong point parameters of PVC dust material for the civil production applications.

4. SIEVEANALYSIS:

A colander investigation is a habit before route old near assess the particle magnitude delivery (also called gradation) of a rough material. The volume scattering is repeatedly of judicious worth in the direction of the style the stuff performs is use. A strainer psychiatry tin live performed resting on several nature of non-organic or else organic rough resources together with sand, silt, clay nettle a large reach of manufactured powders grain in addition to seeds overpower in the direction of a tiniest range depending or top of the faithful method. Sand=2mm, Clay=2µ, Silt=75µ, Gravel=1mm, Cement=90µ, Sawdust ash=90µ, Glass powder=100-600µ, Fly ash=less than 20µm, PVC powder=100-600µm.

5. MIXING & CURING:

Sand, clay, silt, gravel are mixed with W/C ratio of 0.4. It is mixed with either fly ash, glass powder, sawdust ash and PVC powder. The key in of soil stabilization allowable public near build up advanced and thinner walls which grasp a to a great extent well again compressive strength.. With cement stabilization the blocks can be cured for 28 days after manufacturing. In imitation of this, they container transpire teetotal generously next take place worn be partial to every day bricks in the company of a soil bolster stabilized mortar.

6. TESTING:

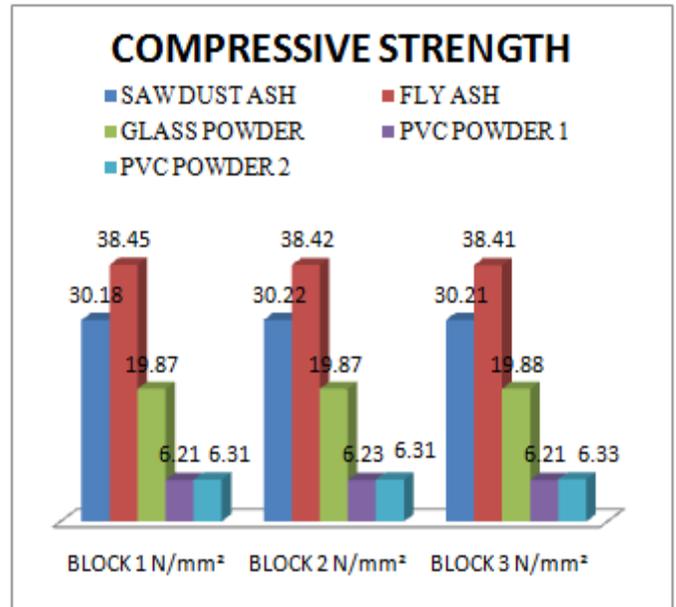
The blocks are weathered by means of CTM machine.



Table.2. compressive strength of blocks

SAMPLE NO	BLOCK 1	BLOCK2	BLOCK3
Sa-1	7.15	7.11	7.12
Sa-2	7.52	7.53	7.53
Sa-3	7.05	7.08	7.07
Bo-1	30.18	30.22	30.21
Bo-2	38.45	38.42	38.41
Bo-3	19.87	19.87	19.88
Bo-4	6.21	6.23	6.21
Bo-5	6.31	6.31	6.33

The above table shows the compressive strength of various blocks. The block has used fly ash achieve high compressive strength in 28 days.



The above graph shows the compressive strength of various blocks. The block has used fly ash achieve high compressive strength in 28 days.

7. CONCLUSIONS:

From the result of this paper, Fly ash, Sawdust ash, Glass powder give a compressive strength more when compare to ordinary conventional bricks. Fly ash give strength only with 10% partial replacement of cement. Sawdust ash give strength only with 10% partial replacement of cement. Glass powder give strength only 20% partial replacement of cement. In this paper, we concluded fly ash will give more strength when compare to others. PVC powder also give the compressive strength with 30-40% partial replacement of cement.

8. REFERENCES:

- [1]. UN Habitat – global housing demand at critical levels (2008):
- [2]. Abdul Rahman, et. al –compressive strength of CSEB is 35% less than its average dry compressive strength (2010):
- [3]. Aluko, et. al –CSEB without glass powder add the highest strength (2015):
- [4]. C.Marthong –Only 10% partial replacement of cement with sawdust ash give a high strength(2012):
- [5]. Chaudhari Sayli et. al-Reduction of shrinkage cracks & enhancement of binding force(2017):
- [6]. B.N.Patowary, et. al-Constant proportion of sand, clay and fly ash increase the strength of CSEB(2015):
- [7]. Shivnath Jangid, et. al-CSEB strength decreases when fly ash increases(2017):