MANUFACTURING OF BRICKS BY USING PHOSPOGYPSUM

T.Kamala Keerthana, A.Anusiya, Mr.S.Kamaraj
Kings College Of Engineering
Punalkulam,Thanjavur.

ABSTRACT

Nowadays there is an increase in the innovations in concerning methods by replacing the materials used in manufacturing of bricks. In the manufacturing of bricks soil plays a vital role in increasing the strength of the brick. As far we are replacing gypsum and m-sand for manufacturing of bricks. Here we are analyzing the strength of bricks manufactured using replaced materials. Gypsum, the wastage from fertilizer industry is utilized as a construction material. The process involves fully replacing of clay soil from manufacturing of bricks. The materials m-sand, phospogypsum, cement are used in manufacturing of bricks. There are four samples with various ratios of m-sand and gypsum, cement are used in the manufacturing process. They compressive strength of manufactured bricks were tested using compressive strength machine. The compressive strength of gypsum, m-sand brick is compared with burnt clay brick.

Keywords:- phospogypsum, M-sand, brick.

1. INTRODUCTION

Environment in nowadays get polluted due to various reasons. Among these reasons a great impact that have been made by construction and usage of construction materials. Even the demolition of construction waste can also pollute environment.

Various environmentally polluting waste materials can be converted into composite materials for c

1.2 PHOSPO GYPSUM

Phosphogypsum refers to the calcium sulfate hydrate formed as a by-product of the production of fertilizer from phosphate rock. It is mainly composed of gypsum ($CaSO_4 \cdot 2H_2O$). The long-range storage is controversial. Phosphogypsum is a side-product from the production of phosphoric acid by treating phosphate ore (apatite) with sulfuric acid

fig 1.2 phospogypsum

1.3 M-SAND

Manufactured sand (M sand) is sand made from rock by artificial processes, usually for construction purposes in cement or concrete. It differs from river sand by being more angular, and has somewhat different properties. It is well graded in the required proportion.It does not contain organic and soluble compound that affects the setting time and properties of cement, thus the required strength of concrete can be

maintained. It does not have the presence of impurities such as clay, dust and silt coatings.

Fig 1.3 M-SAND

1.4 CEMENT

Cement is a binder, a substance used in construction that sets, hardens and adheres to other materials, binding them together. Cement is seldom used solely, but is used to bind sand and gravel together. Cement is used with fine aggregate to produce mortar for masonry, or with sand and gravel aggregates to produce concrete.

fig 1.4 cement

2. MANUFACTURING OF BRICK

Size of mold = 22 X 11 X 7 cm

Volume of sand = 1.18 kg / meter ^{3}

Density of phospogypsum = 1. 30 kg / meter^3

Volume of cement = 0.4 kg / meter ^{3}

- The dry phosphogypsum was sieved through 0.456 micron meter sieve.
- The weighed quantity of phosphogypsum, M-sand, and cement were first thoroughly mixed in dry state for a period of 10 minutes to uniform blending.
- The required water was then gradually added and the mixing continued for another 5 min. And it is ready for moulding.

Fig 2.1 brick mould

2.1 TEST ON BRICKS

2.1.1 COMPRESSIVE TEST

The compressive and flexural strength and speed of sound of phosphogypsum-based bricks were tested after 7,14 days of curing.

Fig 2.1.1 compressive test

compression strength = load / area

SAMPLES	7 DAYS	14 DAYS
S1	3.2	4.6
S2	3.3	3.7
S3	3.8	4
S4	4	4.3

2.1.2 WATER ABSORBTION TEST

Water absorption test were determined on bricks tested after 14 days of casting.

$$\textbf{water absorption} = \frac{W2 - W1}{W1} \times 100$$

were W1 – weight before water absorption and W2 – weight after water absorption.

Fig 2.1.2 water absorption test

3. RESULT AND CONCLUSION

3.1 RESULT

From the results it was inferred that, among the four proportions the maximum optimized compressive strength is obtained for optimal mix percentage of sample 4.

3.2 CONCLUSION

Based on the experimental study following conclusions can be regarding the strength behavior of PG brick.

The study was conducted to fine the optimum mix percentage of brick. However the brick specimen of size 220mm x 110mm x90mm were cast for different mix percentage of CG, cement, m-sand. However the specimens have been tested for four mix proportions. The mechanical properties such as compressive strength were studied for different mix proportions, at different curing ages. From the results it was inferred that, among the four proportions the maximum optimized compressive strength is obtained for optimal mix percentage of sample 4.

4. REFERENCES

[1] Dalia Nizeviciene, Danute Vaiciukyniene(2018)- "The treatment of phosphogypsum with zeolite to use it in binding material" Construction and Building Materials 180 (2018) 134–142

[2] Francisco Maciasa, Rafael Perez Lopez-" Environmental assessment and management of Phosphogypsum according to European and United States of America regulations" Procedia

Earth and Planetary Science 17 (2017) 666 – 669

[3] G M Sadiqul Islam, Fazlul Habib Chowdhury-“ Effect of Phosphogypsum on the Properties of Portland Cement” Procedia Engineering 171 (2017) 744 – 751

[4]. Alaa M. Rashad-“ Phosphogypsum as a construction material” S0959-6526(17)31769-9

[5]. M.I. Romero-Hermida, A.M. Borrero-Lopez-“ Phosphogypsum waste lime as a promising substitute of commercial limes: Archeological approach” Cement and Concrete Composites 95 (2019) 205–216

[6] Weiguo Shen, Mingkai Zhou-“ Study on lime–fly ash–phosphogypsum binder” Construction and Building Materials 21 (2007) 1480–1485

[7] Safa Zemni, Mounir Hajji-“ Study of phosphogypsum transformation into calcium silicate and sodium sulfate and their physicochemical characterization” S0959-6526(18)32072-9

[8] Cristina Nuccetelli , Yiannis Pontikes-“ New perspectives and issues arising from the introduction of (NORM) residues in building materials: A critical assessment on the radiological behaviour’- Construction and Building Materials 82 (2015) 323–331

[9] Konstantin Kovler-“ Radiological constraints of using building materials and industrial by-products in construction” Construction and Building Materials 23 (2009) 246–253

[10]. N. Azimi Resketi, V. Toufigh-“ Enhancement of brick-mortar shear bond strength using environmental friendly mortars” Construction and Building Materials 195 (2019) 28–40