ISSN (Online) 2456-1290
International Journal of Engineering Research in Mechanical and Civil Engineering (IJERMCE)
Special Issue
National Conference on Advances in Civil and Mechanical Engineering (NCACME 17)

Construction of Economic Concrete Using Waste Burnt Bricks and Mangalore Tiles

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Abstract:- **Brick waste is common in the form of over burned bricks at the time of its manufacturing and also in form of broken bricks during its transportation at the time of construction work. To manage this brick waste, it can be used as partial substitute for stone aggregate in concrete. The main objective is to provide optimum % of replacement. In India, large quantities of construction and demolition waste are produced every year in metropolitan cities. Analysis of both fresh and hardened concrete with partial replacement of brick waste can be studied from various tests like slump, compaction factor test, unit weight, compressive strength, tensile strength, flexural strength. At present approximately 5% of bricks taken from demolition sites are being separated and recycled. While the proportion of concrete being recycled is up around 90% these low rate of brick recycling is due to a lack of research into the performance of crushed brick material in applications such as concrete aggregates and road base.**

Keywords:-- **Compressive strength, Tensile Strength, Mix Proportion.**

I. INTRODUCTION

Currently India has taken a major initiative on developing the infrastructures such as express highways, power projects and industrial structures etc., to meet the requirements of globalization, in the construction of buildings and other structures concrete plays the rightful role and a large quantum of concrete is being utilized. A brick is a material used to make walls, pavements and other elements in masonry construction. Burnt bricks are one of the longest lasting and strongest building materials and have been used since 5000B.C.

Concrete is one of the most important materials employed in public works and building construction projects. Concrete is a solid, hard material produced by combining Portland cement, coarse and fine aggregate (sand & stone), water and sometimes admixtures in proper proportions. Concrete is an artificial material similar in appearance and properties to some natural lime stone rock. The use and performance of concrete made with broken brick as coarse aggregate are quite extensive and satisfactory for ordinary concrete.

Mangalore tiles are usually preferred over concrete due to their good quality. These tiles are not only eco-friendly but also cheap, durable and costs only one third that of cement. Analysis of both fresh and hardened concrete with partial replacement of brick waste and Mangalore tiles can be studied from various tests like slump, compaction factor test, unit weight, compressive strength, tensile strength, flexural strength.

The objectives of present study are:

1. To compare the effect on workability and compressive strength due to the addition of Mangalore tiles and burnt bricks.
2. To provide an alternative light weight material. Its importance is, it will be the economic concrete which can be used for light civil structures constructions.
3. The major importance of this concrete is, it does not require any coarse aggregate, hence there is no need of quarry because here we use waste burnt bricks and Mangalore tiles as the coarse aggregate.
4. Use of these wastages as an alternative for coarse aggregate in concrete will become one of the best waste management practice.

II. MATERIALS AND METHOD

Cement: In this experiment, 43 grade ordinary Portland cement (OPC) with brand name Ultra tech cement was used for all concrete mixes. The testing cement was done as per IS 8112:1989. The specific gravity of cement was found to be 3.10.

***Fine Aggregate*:** The sand used for the experimentation was locally produced and was confined to zone-II. The specific gravity of fine aggregate was found to be 2.59. The testing of fine aggregate was done as per IS 383:1970.

Coarse Aggregate: The coarse aggregate used in this experimentation where 20mm and 10mm size and was confirming IS 383:1970. The specific gravity was found to be 2.12.

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Water: The water used was clean and free from oils, salts and acids. The portable water available in the laboratory was used for the casting all specimen in this investigation. The quality of water was found to satisfy the requirement of IS 456:2000

***Mangalore Tiles*:** These tiles are not only eco- friendly but also cheap, durable and costs only one- third that of cement.

***Mix proportion*:** M40 grade of concrete with the mix ratio (1:1.67:2.39) was adopted with and water cement ration was 0.45.

3.1 Tests for Fresh Concrete

Slump test: slump test is used in this study to investigate the workability of the fresh concrete according to IS: 1199-1959.

Compaction Factor : compaction factor test for fresh concrete is done to determine the workability of fresh concrete by compacting factor test as per IS 1199-1959. The apparatus is used compacting factor apparatus.

Normal Consistency Test: Normal consistency is defined as the amount of water required to convert dry cement into paste. It is expressed as percentage water by weight of cement. The normal consistency helps in determining the water required (to be mixed with cement) for tests like setting time and strength test.

Setting Time Test: In order that concrete may be placed in position conveniently, it is necessary that the initial setting time of cement is not too quick and after it has been laid, hardening should be rapid so that the structure can be made use of as early as possible. The initial set is a stage in the process of hardening after which any crack that may appear will not reunite. The cement is said to finally set when it has obtained sufficient strength and hardness.

3.2 Test for Hardened concrete

***Compressive Strength Test* : For** the compressive strength test, the specimens of size 15cm X 15cm X 15cm cylinder specimen of length 30cm and diameter 15cm where casted and tested on compressive testing machine of capacity 2000KN as per IS 516:1959.

Mix proportion and water cement ratio: A constant mix proportion of 1: 1.67:2.39 was used for all the sample tested. The water cement ration adopted was 0.45 and was kept constant for all the mixes.

FIGURES AND TABLES

Tabel 4.1 Compressive Strength Test On Mangalore Tiles(M_{30})

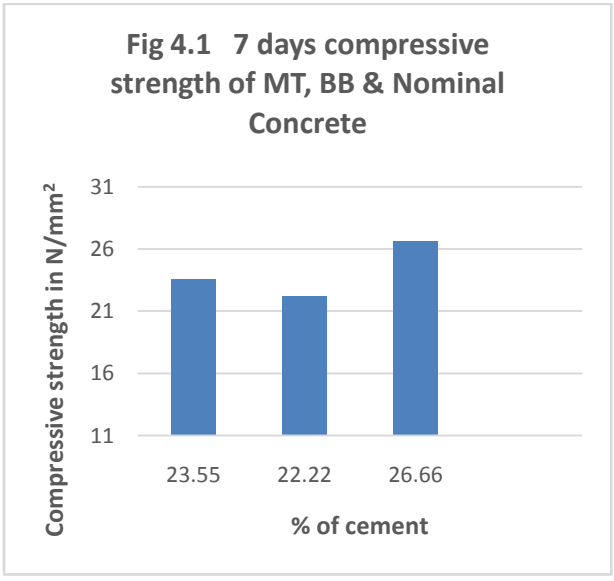
DAYS	WEIGHT IN (gms)	FAILING LOAD IN (T)	FAILING LOAD IN (N)	COMP. STRENGTH (N/mm^2)
07	7584	53	530×10^3	23.55
14	7601	61	610×10^3	27.11
28	7576	68	680×10^3	30.22

Table 4.2Compressive Strength Test On Burnt Bricks (M_{30})

DAYS	WEIGHT IN (gms)	FAILING LOAD IN (T)	FAILING LOAD IN (N)	COMP. STRENGTH (N/mm^2)
07	7234	50	500×10^3	22.22
14	7437	59	590×10^3	26.22
28	7450	65	650×10^3	28.88

Tabel 4.3Compressive Strength Test On Nominal Concrete (M_{30})

DAYS	WEIGHT IN (gms)	FAILING LOAD IN (T)	FAILING LOAD IN (N)	COMP. STRENGTH (N/mm^2)
07	7350	60	600×10^3	26.66
14	7500	64	640×10^3	28.44
28	7666	70	700×10^3	31.11



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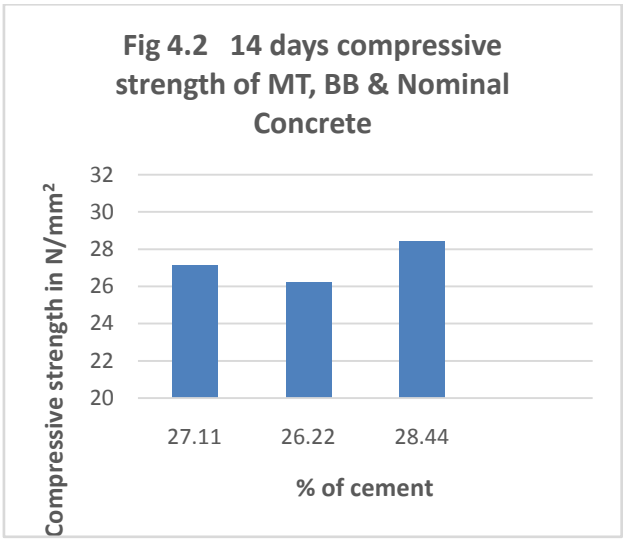

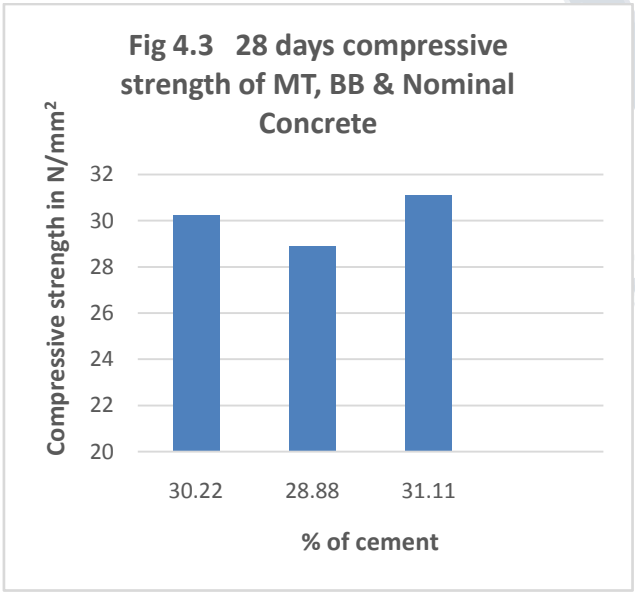

CONCLUSION

1. Use of waste materials results in the formation of light weight concrete.
2. The incorporated concrete does not require any particular attention regarding mixing, placing, and finishing.
3. It serves economical and behaves light in weight because of less unit weight.
4. A good bond is achieved between the brick aggregates and the cement paste, this is because the brick aggregates are angular that means they have a large surface area to bond with the paste.
5. Up to 30% brick aggregate replacement for natural coarse aggregate was found feasible and economical.
6. The waste material of brick industry was efficiently used for the manufacturing of concrete.
7. Use of such waste materials not only cuts down the cost of construction, but also contributes in the safe disposal of waste materials.
8. The Compressive Strength of concrete using Mangalore tiles is almost same as nominal concrete at 28 days.

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