Utilization of Surkhi as a Partial Replacement of Sand in Concrete

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***Abstract*— Concrete is the most trusted and widely used building material in today's world. Concrete is made by mixing coarse aggregate, fine aggregate, binding material and water in definite proportion. To meet the strength characteristics and other properties of concrete for special purposes, efforts have been made to improve some special properties by adding pozzolanic material. Some of the materials have been effectively which improve fresh properties like workability, consistency, settlement and bleeding. plastic shrinkage etc. and various hardened properties such as strength, durability, porosity and density, thermal and acoustic insulation, impact resistance etc, of concrete.For achieving above properties and make environment eco-friendly .we used additive as a surkhi (red brick crush) in concrete .**

Index Terms: **Sand, Aggregate, Water, Cement, Compressive Strength.**

INTRODUCTION

Due to the increasing demand of natural resources as a construction material, these materials have become very costly which increases the overall cost of the project. In order to sustain the building materials for coming generations and reduce the cost of materials we need to replace the building materials by some other materials. Efforts are being made to use the waste materials in concrete, which are hazardous to environment, easily available and reduce the overall cost of project. Ground brick powder has been potentially used as a partial replacement of fine aggregate.

Concrete is the best suitable material which is used. Today's world leading towards advancement edges for more comfort has led to innovation and revolutions in each and every field of life. But on the other hand it has put some negative impacts on environment, as natural resources get depleted. As concrete is most commonly used building material across the world and consumes most of the natural resources in the form of coarse and fine aggregates. After studying all these research papers we concluded that if we can use some materials other than basic ingredients of concrete which do not have negative impacts, rather have positive effects on various fresh and hardened properties of concrete, partial replacement of these ingredients of concrete with waste material will largely impact environment and will lead to pollution free and soothing environment. This waste creates air pollution and land pollution by dumping and also causes water pollution so by using this material in concrete we can save our atmosphere and land.

Our ultimate goal is to produce economical and eco-friendly concrete which will possess strength and other desired properties which one achieves by basic concrete ingredients. By using locally available waste like brick powder as partial replacement, it may prove more economical than traditional concrete and dumping of such waste. produced by brick industries is also solved Also construction cost is very high by using conventional materials due to unavailability of natural materials We have the only option of partially replacing its ingredients by locally available waste materials. Over 3.3 billion tons of cement was consumed globally in 2010 based on survey of world coal association and also cement production emits CO2 in to the atmosphere which is harmful to the nature. Also for producing 1 kg of cement we require 372 Kilo joules of energy while we require only 19

kilo joules of energy to produce 1 kg of brick powder (surkhi). If we can partially replace the cement with the material with desirable properties then we can save natural material, reduce emission of CO2 in to the atmosphere and save the energy for the coming generations. The industrial waste dumping to the nearest site which spoils the land and atmosphere as well as it also affects aesthetics of urban environment so use of this waste material in concrete is economical as well as environment friendly way to disposal of waste. This Use of brick powder or surkhi has been used as pozzolana in India for many years. This material is used as a partial replacement of cement to produce mortar or concrete, which results in improved concrete properties which include reduction of permeability and resistance to sulphate attack and alkali-aggregate reaction. It has been used in Europe since ancient times, where powdered brick was mixed with hydrated lime to produce mortars. There are many examples across Europe of Roman buildings bearing the fact that these mortars have time in past been used since long and hence, the fact that these materials are durable is proved.

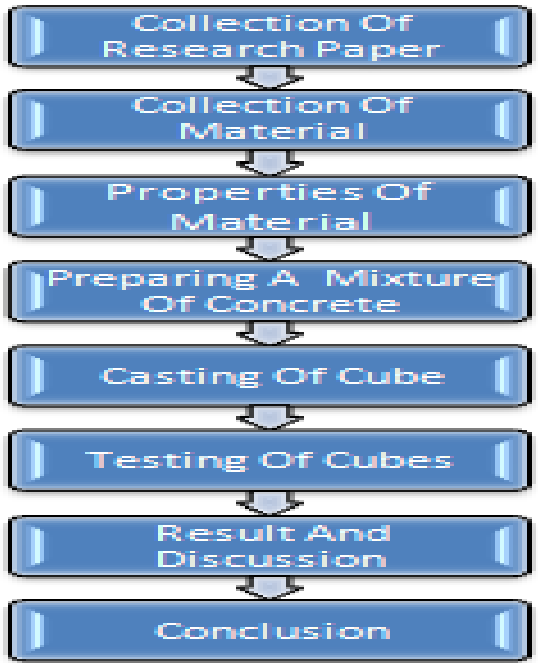
So potential use for ground brick powder is possible, not only for repair of important historic buildings where compatibility of materials is important, but this can also be used for the production of durable and impermeable concrete or mortars. The pozzolanicity of brick powder depends upon the burning or calcining temperature of clay. The most reactive state of clay is when the burning temperature results in loss of hydroxyl and a collapsed and distorted clay structure, the burning temperature to produce this active state is usually in the range f 600-900°C. The material used in this study.

OBJECTIVE

1 We have Estimate the utility of crushed brick as a partial replacement of sand in concrete.
2 We have study and compare the performance of conventional concrete.
3 We understand the effectiveness of brick as in strength enhancement.
4 Effective disposal of red brick waste material from the environment.
5 Concrete becomes more workable as the water percentage increases.

Methodology

In this chapter briefly explain the methodology adopted for this research



Material Properties:

1. CEMENT

Cement is a binder, a substance used for construction that sets, hardens and adheres to other materials to bind them together. Locally available 53 grade ordinary. Portland cement is used in the present investigation for all concrete mixes.

Properties of Cement

Sr. No.	Property	Result
1	Fineness Modulus	3%
2	Initial setting time	100 min
3	Final setting time	210 min
4	Consistency	32.5%

2) FINE AGGREGATE -

Aggregates for the concrete were obtained from approved suppliers conforming to the specifications of IS 383:1970 and were chemically inactive (inert), spotless and robust. The fine aggregate was tested as per the limits which is specified in IS: 2386

Properties of Fine Aggregate

Sr no	Property	Result

1	Fineness Modulus	2.87%
2	Specific Gravity	2.61
3	Silt Content	1%

3).COARSE AGGREGATES:

Coarse aggregates will be machine-crushed done of black trap or equivalent black tough stone and shall be stiff, robust, dense, durable, spotless or procured from quarries approved by the consultant. Coarse aggregate can be defined as inert granular materials obtained after crushing a stone. Coarse aggregate is use of size 20mm. coarse aggregates passing through 20mm sieve and retained 12.5mm sieve are used in this experiment.

Properties of Coarse Aggregate

Sr.no	Property	Result
1	Los Angeles Abration	14.7%
2	Specific Gravity	2.8
3	Crushing Value	12%
4	Impact Value	11.76%

4). WATER

A good Tap water available in the Project is used for the construction purpose which conforming to the requirements of water for concreting and curing as per IS: 456-2009. Ph value of water is 8.56.

5). Surkhi

About 1-5% of waste bricks are generally produced in all brick companies, which add to quantity of waste materials considerably. This varies from 50,000 tons for a large scale company to 100 tons for a small scale company. Recycling of these waste bricks is one of the most challenging problems worldwide with the extraordinary growth of the world population. The waste from these companies is crushed and sold as low grade aggregate at prices varying between Rupees 129 to 430 Rupees per ton. Although this is a much lower cost than cement (4300 Rupees per ton) however there will be added cost of crushing if this is to be used as cement replacement. It is the waste material produced from brick kilns which is of no use adds to the waste to environment, which is to be landfilled. The landfilling of this material degrades the quality of soil and also contaminates the ground water of that area. It is finely ground bricks, orange in color and Specific gravity 2.52. Particle size of brick powder is about 20 to 60 microns. Calcination temperature of bricks ranges from 900 to 1000 degree Celsius. The SiO2 content in brick powder is about 54.8% and A1203 content is about 19.1%. in construction worldwide.

Literature Review

1. Utilization of surkhi as a partial replacement of sand in concrete. (2020-21)

Published by- Zamir Irfan[1], Syed Zeeshan Shafi[2] International Journal for Research in Department of Applied Science & Engineering Technology.

This paper incorporates the physical properties and chemical composition Surkhi as well as workability, and compressive strength properties of concrete produced by replacing 10%, 15%, 20% Surkhi, by weight of sand.

Slump test was carried out on the fresh concrete and compressive strength test on hardened concrete. The concrete cubes were tested at the ages of 14 days and 28 days. The result showed that the slump decreased as the surkhi content increased. Slump value increased on the addition of admixture (FOSROC 440). The compressive strength increased with increasing surkhi replacement. The compressive strength of concrete with surkhi was lower at early stages but improves significantly after 28 days.

2. A Survey on Partial Replacement of Sand with Crushed Brick Powder in concrete.

Published by-Sruthi H G[1], Gowtham Prasad M E2, Harsha Urs K M[3]. International Journal of Innovative Research in Science, Engineering and Technology

Concrete is the most important material being used in infrastructure development throughout the world. Sand is a prime material used for preparation of mortar and concrete and which plays a major role in

mix design. Natural or River sand are weathered and worn out particles of rocks and are of various grades or sizes depending upon the amount of wearing. Now-a-days good sand is not readily available, it is transported from a long distance. Those resources are also exhausting very rapidly. The non-availability or shortage of river sand will affect the construction Industry; hence there is a need to find the new alternative material to replace the river sand, such that excess river erosion and harm to environment is prevented. Many researchers are finding different materials to replace sand. This study aimed to investigate the suitability of using crushed brick in concrete. Crushed brick originated from demolished masonry was crushed in the laboratory and added partial sand replacement. Five replacement levels, 10%, 20%, 30%, 40%, 50%, were compared with the control. The tests on concrete showed that the mechanical properties (compressive strengths) of concrete containing crushed brick were well comparable to those of the concrete without ground brick.

3. The Study of Compressive Strength on Concrete by Using Surkhi . Published by- Bibekkumar Kushwaha[1], Lijom Padu[2]. International Journal for Research in Applied Science & Engg.

This research paper presents the result of an experimental investigation carried out to evaluate the compressive strength of high strength concrete. The investigation states that high strength concrete is made by partial replacement of sand by surkhi. In this study, surkhi is replaced 100% by balancing weight of sand. The mix proportion of concrete had a constant water binder ratio of 0.60. The concrete specimens were cured on normal moist curing condition on the normal atmospheric temperature. The compressive strength was determined. The results indicate concrete made with this proportion generally exhibits excellent fresh and hardened properties. In conclusion, the addition of surkhi is the replacement to sand but the concrete was found to increase the compressive strength of concrete at all levels of experiment when compared to reference concrete made with sand.

4. An Experimental Study on Partial Replacement of Sand with Crushed

Published by : M. Usha Rani', J. Martina Jenifer P[2] International Journal of Science Technology & Engineering

Concrete is the most material being used in infrastructure development throughout the world. sand is a prime material used for preparation of mortar and concrete and which plays a major role in mix design. Natural or River sand are weathered and wom out particles of rocks and are of various grades or sizes depending upon the amount of wearing. Now-a-days good sand is not readily available , it is transported from a long distance. Those resources are also exhausting very rapidly. The non-availability or shortage of river sand will affect the construction industry, hence there is a need to find the new alternative material to replace the river sand, such that excess river erosion and harm to environment is prevented. Many researchers are finding different materials to replace sand.

This study aimed to investigate the suitability of using crushed brick in concrete. Crushed brick originated from demolished masonry was crushed in the laboratory and added partial sand replacement. Three replacement levels, 15%, 20% and 25%, were compared with the control. The tests on concrete showed that the mechanical properties (compressive, flexural and splitting tensile strengths) of concrete containing crushe brick were well comparable to those of the concrete without ground brick.

Percentage of Mixing In (Kg)

Mix Design for M-25

Sr. no	Percentage	Cement	Sand+surkhi	Aggregate
1	25%	1.87	1.40+0.467	3.74
2	30%	1.87	1.309+0.561	3.74
3	35%	1.87	1.2155+0.6545	3.74

Casting of Cubes

- For a casting of cubes, we required and 20mm aggregate, cement, water as per the warious proportion.
- Mould of dimension 150mm*150mm*150mm.

Result :

Sr. No	Percentage	Days	Weight	Breaking of Cube
1	25%	7days	7.9 Kg	350 KN
2	30%	7days	7.79 Kg	315 KN
3	35%	7days	7.67 Kg	280 KN

SUMMARY AND CONCLUSION

1 The compressive strength is increased with increment of % of surkhi.
2 It is observed that compressive strength increase with addition of surkhi till certain percentage.
3 Apart from all these properties the usage surkhi (red brick crust) material in the construction that it can enhance the properties of concrete so that we can decrease the cost of construction innovatively.

REFERENCE

[1] Zamir irfan ,syed zeeshan shafi
[2] Sruthi H G, Gowtham Prasad M E ,Harsha Urs K
[3] Bibekkumar Kushwaha, Lijom Padu.
[4] M.Usha Rani, J. Martina Jenifer P.
[5] G. D. Ransinchung R. N.,and brind kumar N.(2010) “Investigation on pastes and mortars on ordinary Portland .
[6] Celik T, Marar K (1996) “Effect of crushed stone dust on some properties of concrete, Concrete Res.,26 (7):1121-1130”.
[7] C.B Wilby (1991) “Concrete Materials and Structure.
[8] B.C.Punmia (2008) “ Building construction”.
[9] IS 456 (2000) : Plain and Reinforced concrete.
[10] IS 10262 (2009) : Guidelines for Concrete Mix Design Proportioning.
[11] IS: 516-1959. Indian Standard Methods of Test for Strength of concrete. Bureau of Indian