A Review Study of Concrete With Partial Replacement of Aggregate With Crushed Ceramic Tiles, Cement With Red Mud And Fine Aggregate With Glass Powder

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Abstract- *With the advent of modernization and industrialization, there has been immense impact of man on the natural environment. Today globally, India is facing with many pollution related problems. One of the problem is the land pollution. Land pollution problem occurs when dumping/disposal of waste as landfills. The major contribution is from construction industries waste from demolition of buildings and industrial wastes. Thus, to control this pollution, the need of the hours is to find sustainable ways to manage these waste materials. The best way is to use various materials as half substitution of concrete materiala. Concrete is most often utilised building materials on the planet. However, the manufacture of P.C., a necessary component of concrete, results in the release of a considerable amount of CO2, a greenhouse gas; one ton of P.C. clinker is estimated to produce one tonne of CO2 and other greenhouse gases (GHGs). Environmental challenges have a significant influence in the cement and concrete industry's long-term viability. To reduce cement aggregate and sand consumption, some material must be used to replace a portion of these resources, and environmental pollution can be reduced to some extent. Some industrial wastes, such as fly ash, silica fume, and blast furnace slag, have been proven to be useful in concrete. This method has numerous advantages. Waste management is improved, and emissions are reduced. Reduce natural resource use and saves money. The aim of this to determine the utilisation of unwanted waste materials at high grade of concrete, namely M30, and to determine the best replacement % for improved workability, strength, and durability. The concrete produced is long-lasting and chemically resistant, with optimum strength achieved when 25% of natural coarse aggregates are replaced with ceramic coarse aggregates, 10% when cement is replaced, 10% glass powder is used as a fine aggregate replacement.*

I. INTRODUCTION

Concrete may be defined as the composite mixture of various substances used in definite proportion. Cement, coarse aggregates, fine aggregates, water, and admixture are some of the elements. After China, India is the world's second-largest manufacturer of concrete. It has a large self-weight, which is one of its key disadvantages. From PCC to RCC, the unit weight ranges from 2400 kg/m to 2500 kg/m3. Reduced sections of structural elements must be designed to carry reduced loads if the loads are reduced. Green concrete is a breakthrough new process in the history of the concrete industry, and it has been utilised since Roman times. . It is defined as the technique of incorporation of those materials in the manufacturing of concrete which are otherwise regarded as a waste material. It's a topic of environment consideration into concrete manufacturing. These materials on one hand are cheap, easily available and retarding pollution from waste materials. In this thesis work, M30 grade of concrete is designed and all experiments are carried out on M-30 grade of concrete. An experimental investigation of concrete with half substitution with other materials . The concrete produced is chemically resistant, with optimum strength reached at replacement levels of 25% and higher, and a reduction of 10% with partial replacement with red mud and glass powder.

II. OBJECTIVE OF STUDY

Comparison of different property like compressive strength, density of modified concrete, with partial replacement of standard concrete with red mud, ceramic tiles & waste glass powder.

- To analyze the effect on the strengthening of red mud, ceramic tiles & glass powder waste materials in concrete.

- Analysis the property of fresh concrete prepared by red mud, ceramic tiles & waste glass powder particle material replacement
- Using knowledge of the various parameters to work out the best result and secure concrete output.
- To safeguard the optimization natural resource, prices.
- Greater resource consumption and optimum concrete serviceability.

III. LITERATURE REVIEW

G.Sai Chand et al, 2017 – A study on the use of crushed ceramic tile waste as a partial substitute for coarse aggregate. Increased tile aggregate replenishment and use of granite powder as additive improve workability. A concrete grade of M25 has been developed. Max strengthening is achieving by using an M30 mix with 30% coarse aggregate replacement.

P. Rajalakshmi et al, 2016 - The replacement of C.A. in concrete, according to this study article, has significant environmental and cost benefits. The workability, durability, mechanical characteristics, and heat resistance of ceramic tile aggregate concrete are all improved. Ceramic tile fine aggregates were also used to substitute fine aggregates in a constant range of 10% by weight, and coarse aggregate in varied amounts of 30%, 60%, and 100% by weight. M30 is the concrete grade that was employed.

Mannava Anusha et al, 2016 – Glass powder is used as half substitute for fine particles in high-performance concrete is the subject of this research report. Glass powder replaced up to 30% of the fine aggregates. The strength finding parameters reveal that replacing 10% of the glass powder with glass powder improves the characteristics. When compared to conventional mix, there is an increment of 9% in compressive strength, a 23% increase in durability, and a 74% increase in flexural strength after 28 days.

Er. Vedpal Nain, Er. Mohd. Usman, Er. Ayay kumar, Er.Sanjay Sangwan et al, 2015 Red mud mixed in concrete was given, with comparisons made to plain cement concrete and fly ash-replaced concrete. The concrete grade M20 is being tested. The durability, corrosion, permeability, environmental effect, crack resistance, and strength of mixed red mud concrete are all excellent. When compared to clay bricks, red mud bricks have superior features such as minimal water absorption and stronger compressive strength.

Daniyal and Ahmad et al, 2015: They looked into the feasibility of ceramic waste as a crushed stone aggregate substitute and discovered that these wastes might be utilised in coarse aggregates place. The strength of the 30 percent replacement concrete was comparing with conventional concrete, and the results demonstrate that it is stronger by 5.43 percent and 32.2 percent, respectively, than conventional concrete.

Sunitha M.Pujar et al, 2014 - A research article on half substitution of cement with red mud, in which its replacing up to 20% by cleaned and unwashed red mud, respectively. At a cement substitution of 2% by unclean red mud, all of the characteristics of concrete improve. Strength metrics abruptly decline over this replacement level. The water absorption and sorptivity of concrete reduces by up to 8% and 2%, respectively, and increases above this.

Naveen Prasad et al, 2014 - Crushed waste tiles from industries and building demolition were used to substitute coarse materials in this study, whereas granite powder was replacing with fine aggregate. Up to 40% of the coarse and fine aggregates were replaced. A concrete grade of M25 has been developed. The test findings reveal that as the amount of granite powder and ceramic particles increases, so does the workability. The compressive strength is higher, and the ideal replacement rate is 30%.

Malik et al, 2013 - This research report demonstrates how discarded glass used as F.A. up to 40% of the time. After 28 days, F.A. replacing with 30% glass powder, which resulted in a 9.8% improvement in compressive strength. Water absorption decreases as glass content rises, whereas workability rises.

S.Suganya, Banu Priya et al, 2011 - The idea of employing GP as F.A. replacement in concrete is investigated in this study. Glass powder used as partial replaced natural sand (0 percent -30 percent) and M50 grade concrete was employed. When compared to normal concrete, there is a 74% increase in flexural strength, and C.S. increases up to 9%, and a 23% increase in tensile strength after 28 days.

Juan et al, 2010- They looked at the repurposing of ceramic waste in the building industry and discovered that adding recycled ceramic aggregates to cement has no detrimental effects on hydration. Because the characteristic compressive strengthening of this mix surpasses the minimum strength necessary for structural concrete by 25 N/mm2, it can also be utilised for that purpose.

Chen et al, 2006 - The utilisation of discarded E-glass as F.A. replacement in concrete is given this article. Glass powder has

good mechanical qualities, including compressive strength, split tensile strength, and long-term durability.

Shehata et al, 2005 - This study comparing uses of waste glass as partial volume replacement for fine aggregates in this research article. In comparison to the conventional mix, the glass powder-replaced concrete has a high modulus of rupture. Excellent crack resistance and a strong interfacial connection between the cement paste and the glass powder.

Jangid Jitendra B. and Saoji A.C. [2012] Conclusion: Cement replacement of up to 40% increases compressive strength by up to 20%, and cement replacement of more than 40% decreases compressive strength.

Patel Dhirendra et al [2012] The qualities of mortar paste incorporating glass powder as half substitution with cement were investigated, and 15% replacement dosage gives best result.

Patil Dhanraj Mohan and Sangle Kehav K. [2012] waste glass powder particles with sizes ranging from 150m to 90m and less than 90m were examined. He demonstrated that when GLP is added on the 7th day, the first strength improvement is minimal, at 28th day. It has been discovered that adding 20% GLP to the mix increases the strength. Also, GLP with a size of less than 90 micron is particularly beneficial in increasing strength.

Gopalakrishnan Ramasamy and Govindaraja Dharshnamoorthy [2011] The results of experiments on waste glass additive cement shows confirms the retarding effect of WG on Portland cement hydration.

IV. MATERIALS

The materials used in the concrete mixture projects are cement, fine aggregate, coarse aggregate, copper slag, as described in detail below:

1.7.1. Cement: It's one of the main component of concrete, since the binding medium for the distinct ingredients is created. Produced from naturally occurring raw materials and then mixing with toxic waste or underground. OPC 53 grades of Ordinary Portland cement (OPC) conforming to IS12269-1987 was used for the analysis.

1.7.2. Fine Aggregate: Aggregates that cover almost 70 to 75 % concrete volume are often used in more than one way as inert ingredients. This is well known now a day, however, that the (i) physical (ii) chemical (iii) thermal properties of aggregates drastically affect the property of 23 mm and concrete results. To extract all pebbles, fine aggregates (sand) use as fresh dry sand sewn in a 4.75 mm sieve.

1.7.3. Coarse Aggregate: For making concrete, coarse aggregate is used. They are generally in form of irregular broken stone, or gravel that naturally occurs. Coarse aggregates are called material that is wide to be held at 4.75 mm sieve size. Up to 40 mm may be its maximum span.

1.7.4. Water: For the preparation of concrete, water plays an important role as it engages in a chemical reaction with cement. In the presence of water gel is formed which helps increase the concrete's strength. For mixing, portable water is usually considered satisfactory. The pH value of water should not be lower than the maximum allowable values expressed in the following concentrations.

a) **Limits of acidity:** Not more than 5 ml of 0.02 NaOH should be needed to neutralize a 100 ml solution of water using phenolphthalein as an indicator. The test details are as stated in IS 3025.
b) **Limits of alkalinity:** Using a mixed indicator, neutralizing a 100 ml solution of water does not need more than 25 ml of 0.02 natural H_2SO_4. The specifics of the tests are as stated in IS 3025.
c) **Percentage of solids:** When measured in compliance with IS 3025, the maximum allowable limits of solids are as set out in IS 3025.

The chemical and physical properties of groundwater shall be tested in conjunction with the soil investigation and if there is no water found to comply with the necessities of IS 456-2000, it shall be clearly specified in the tender documents that contractor has to organize for the construction of good quality water indicating the source.

a) Water is to be found satisfactory for mixing as well as curing. For curing water shall not, however, create on the surface any undesirable stain or unsightly deposit.
b) For mixing or curing, sea water must not be used.
c) Water available for every source is to be tested before start any construction work and every three months thereafter until the end of work. In the case of groundwater, different test can also be performed for a separate drawdown point.

1.7.5. RED MUD: Red mud may be defined as by product during manufacturing of aluminium by Bayer's process. it has been land filled into the useful agricultural lands making it unfit for crop production. This is the major grave menace problem in recent times till date.

1.7.5.1. PROPERTIES OF RED MUD:

1. It has good binding material as it contains mix of solids and metal oxides having excellent binding properties.
2. The mechanical properties of concrete increases tremendously by the incorporation of red mud in concrete.
3. Available free of cost so economical and conserve environment.
4. It reduces capillary pores and hence reduces permeability.
5. Its PH value varies from 10-12, as a result it does not cause corrosion of reinforcement.
6. Good binder, prevents early fading of colour, serves as decorative material, it is economical costs less.

1.7.6. CERAMIC TILE COARSE AGGREGATES: Ceramic tile coarse aggregates are the crushed pieces of waste ceramic tiles having sizes which are passing from 12.5mm sieve but retained on 10mm sieve. These aggregates are added in place of coarse aggregates for different replacement percentages upto 40%. These tile aggregates are much hard, tough, strong and durable than normal stone aggregates and resistant to be attacked by chemicals.

1.7.7. Glass Powder: Locally available glass is collected and converted into powder form. This material replace the cement in different % . Before adding glass powder in the concrete, it has to be powdered to required size. In this experiment glass powder particle sizes not more than 90 μ is used. Glass is a transparent substance made by melting a mixture of silica, soda ash, and CaCO3 at a temperature that is simulated by cooling and hardens without the use of heat crystallization. Glass products are normally used in our daily fabricated items. Since the increase of waste glass leads over the recent years and these waste glass pieces have been dumped and occasionally not in use. The waste glass fill areas which are not in use since glass is less eco-friendly and is not biodegradable. The glass powder which is used in this analysis was purchased from a market in Kolkata. In the mix, this substance takes the place of cement. Glass is a completely recyclable material in theory; it can be recycled without losing its consistency. There are numerous examples of waste glass being successfully recycled: as cullet in glass making, as pavement, parking lots, as a raw material for creating glass pellets or beads for highway reflective paint, to make fibre glass.

- Glass can be manufactured in a range of shapes and sizes, from small fibres to meter-sized parts, with excellent homogeneity.
- Glass is primarily composed of sand, soda ash, limestone, and other addituves.
- Glass has been used as an aggregate in road, house, and masonry construction.

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