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EFFECT OF ASBESTOS CEMENT SHEET WASTE ON FLEXURAL STRENGTH OF CONCRETE: A REVIEW

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Abstract - *Concrete is the leading construction material in the region of the world and used in structural works, including infrastructure, low and high-rise buildings. It is a man-made artifact, essentially consisting of a combination of cement, aggregates, admixture(s) and water. Inert granular materials such as natural sand compacted stone or gravel form the main part of the aggregates. Conservatively aggregates have been available at economic prices as well as of qualities to suit the whole purposes. But, the continued wide removal of aggregates has been questioned as of the depletion of quality main aggregates and greater understanding of environmental safety. The present paper reviews the literature related to the effect of asbestos cement sheet waste on flexural strength of concrete.*

Key Words: OPC 43 Grade, Coarse Aggregate, Fine Aggregate, CICO super plasticizer, Water, W/C ratio, Concrete, Asbestos Cement Sheet Waste, Flexural Strength

1. INTRODUCTION

In North America, as well as in Europe, asbestos was used extensively as a building material because of its effort to heat and corrosive chemicals. It was used in roofing materials (flat and corrugated sheets, tiles, building board), cement pipes, roads and tools (such as brakes), in high temperature equipment (such as industrial boilers) and in ship building (Virta, 2003). In India, chrysotile asbestos (ch) as high durability, tensile strength, resistance to chemicals and fire (National Cancer Institute, 2009). Currently, manufacturing of chrysotile-based products is passed out in more than 100 countries and the annual production is about 27 to 30 million tons.

1.1 AGGREGATES FROM INDUSTRIAL BY-PRODUCTS

The rising anxiety of resource depletion and worldwide pollution has challenged many researchers to find and develop new materials depend on renewable resources. These contain the use of by-products as well as waste materials for building construction. Aggregates classified under this category are that in which no need for processing. These include cork granules, waste glass and broken bricks. Broken bricks are broadly available as waste material from construction sites and are mainly generated from the demolition of old building structures .Concrete made from broken bricks aggregates have densities ranging from 1560 to 1670 kg/m^3 with compressive strength in the range of 13–21N/mm^2.

In waste glass, the main component in glass is silica (silicon oxide SiO_2). Therefore, the main problem when it is used in concrete is that the alkali–silica reaction caused by sure reactive silica present in the waste glass which results expansion, thereby causing extreme damage in concrete. However, recent studies said that when waste glass is ground fine sufficient no harmful effects were apparent.

2. LITERATURE REVIEW

Mohammad Abdur Rashid (2012), studied the properties of concrete by replacing stone aggregate either partly or fully by crushed clay-brick. Concretes were made by replacing partially or fully the stone aggregate by equal volume of brick aggregate whereas everything else was kept same. The only variable in the study was the volumetric replacement of stone aggregate by brick aggregate at 0%, 25%, 50%, 75%, and 100%. It concluded that, reductions of unit weight and compressive strength of concrete by about 14.5% and 33% respectively.

R. Kamala, B. Krishna Rao (2012), in their study, used recycle aggregates and solid wastes from demolition waste and construction is showing a probable application in construction and as an alternative to primary and natural aggregate. Cubes, Cylinders and Prism were cast and tested for compressive, split tensile and flexural strength at 7, 28 and 56 days by partially replaced the crushed tile aggregate to conventional coarse aggregate. The compressive strength of the ceramic concrete varied from 32.88 MPa to 46.88 MPa and the split tensile strength is varied from 2.47 MPa to 3.72 MPa and flexural strength is varied from 5.33 MPa to 7.82 MPa at 28 days. So ceramic waste can be effectively used place of conventional aggregate. He also observed that the strength decreases from 50% replacement of coarse aggregate. Hence upto 40% we can use ceramic tiles as replacement of coarse aggregate.

G. Murali (**2012)** in his experimental study, effects of chemical admixture (supaflo) and the shabath stone on concrete were find. Natural aggregate are replaced by waste shabath stone at four different percentages namely 10%, 20%, 30% & 40 % by wt. of coarse aggregate. His test results show that the replacement of coarse aggregate by 30% gives a good strength. The Maximum Compressive strength of concrete can be found at 30% replacement of shabath stone was achieved to be 26% and 56% higher than the conventional concrete and flexural strength was gradually increased upto 11.76% and 15.29% and the tensile strength of concrete at 30% replacement was increased upto 21.70% and 28.30% with and without chemical admixture respectively.

Rui Liu (2013) in his paper gives an experimental examination on the properties of concrete by replacing coarse aggregate component of the mixture of 10%, 20%, 30%, 50%, and 100% by volume of tire chips. The fresh concrete property compressive strength, flexural strength, splitting tensile strength, permeability and freeze/thaw durability was tested in the lab is determine. Two mixtures of 10% coarse aggregate replacement by tire chips and normal cement content gives the best performance. At 28 days, the average compressive strength of the two mixtures was 4735 psi. Even though this strength was significantly less than 7058 psi of the control mix but it exceeds CDOT field strength of 4200 psi. The average flexural strength was 957 psi which is slightly higher than the control concrete strength of 907 psi and exceeded CDOT's required 650 psi. The averaged splitting tensile strength obtained was higher than 590 psi. In addition, it gives high freeze/ thaw durability exhibited moderate resistance to chloride-ion penetration.

Mohd Monish (2013), in his study an experimental examination have been carried out to measure the effect of partial replacement of coarse aggregate by demolished waste on compressive strength of recycled concrete for the study at 7 and 28 days. Test results showed that the compressive strength of recycled concrete up to 30% replacement of coarse aggregate by demolished waste at 28 days has been found to be comparable to the nominal concrete. Three specimens each having 0%, 10%, 20%, and 30% demolished waste as replacement of coarse aggregate for mix of 1:1.67:3.33 were cast and tested at 28 days in order to have a comparative study. Result shows that up to 30% of coarse aggregate replacement by demolished waste gives strength closer to conventional concrete cubes and strength obtained was in the range of 86.84-94.74% for recycled concrete mix.

Praveen Mathew (2013), in his experimental study, conducted a test for determining the properties of plastic aggregate such as specific gravity, density, and aggregate crushing value. Coarse aggregate is partially replaced by plastic aggregate. The percentage at which maximum compressive strength was obtained are used for determining the other properties such as modulus of elasticity, split tensile strength and flexural strength. Maximum compressive strength was found as replacement of 20% NCA.

N. Manoj (2014), in this research work polyester fibers at proportions of 0.5%, 1%, 1.5% and 2% replacement is used and conducted the compressive, split tensile and flexural strength. Steel slag produced as a waste material in the steel industry gives a harmful effect on environment when disposed. In the future project work replacement of coarse aggregate by steel slag at proportions of 25%, 50%, 75% & 100% with the addition of polyester fibers to achieve the effective strength of concrete.

P.Krishna Prasanna (2014) recycling waste materials are posing serious pollution problems to the human and the environment. So there is need to development of new effective waste management options. An experimental is made by replacing coarse aggregate at proportions of 0%, 5%, 10%, 15% and 20% by E- waste particles and Conventional specimens are also prepared for M30 grade Concrete. After the investigation it was found that use of E-waste aggregates results in the formation of concrete which has lesser weight than that of conventional concrete. This study ensures that reusing of E- waste as coarse aggregate substitutes gives a good approach to reduce cost of materials and solve solid waste problems posed by E waste.

3. CONCLUSIONS

1. In case of replacement of coarse aggregate, 10% asbestos cement sheet waste content can be taken as the optimum dosage for flexural strength and it's giving high strength.
2. Asbestos cement sheet waste aggregate concrete may be an alternative to the conventional concrete.
3. Waste material is utilized in effective manner so by using asbestos cement sheet waste, one can reduce the effective cost of the concrete and it is also helpful for the environmental point of view.

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BIOGRAPHIES

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