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STUDY ON STRENGTH AND DURABILITY OF CONCRETE BY USING GLASS POWDER (GP) AND MUNICIPAL SOLID WASTE (MSW)

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ABSTRACT: Concrete is the most undisputable and essential material being utilized in framework improvement all through the world. Glass is ordinarily utilized in building/development ventures and substantial measure of glass is powdered every day. The transfer of waste glass is a natural issue as waste glass causes transfer issue. Today the development business need discovering savvy materials for expanding the quality of solid structures. The suitable use of Municipal Solid Waste Incineration (MSWI) buildups is an overall contemplated subject in the course of the most recent decades. One of the conceivable outcomes is to utilize MSWI slag in solid creation, as it is finished with coal ignition items Glass powder and metropolitan strong waste better than 600 µ is accounted for to have pozzolanic conduct. An endeavor is made to research the likelihood of utilizing the waste glass powder, city strong waste are the incomplete substitution of normal Portland bond in concrete.

The investigation has been made to assess the impact on mechanical and strength properties of M40 review concrete made with supplanting of bond with Glass powder, (0%, 5%, 10%, 15%, 20% and 25%) and Municipal strong waste, (0%, 5%, 10%, 15%, 20% and 25%) by weight. For each set mechanical properties were examined by performing Compression test for Cubes, Flexural test for bars and Split Tensile test for chambers and toughness properties were considered by performing corrosive assault, soluble assault and Sulfate assault test for solid shapes.

Key words: waste glass, Municipal Solid Waste, mechanical, durability, acid attack, alkaline attack, Sulphate attack

1. INTRODUCTION

Concrete is a mix of bond, sand, coarse total and water. The key factor that enhances concrete is that it tends to be intended to withstand harshest situations noteworthy job. Today a dangerous atmospheric devation and ecological destruction have turned out to be show hurts as of late, worry about natural issues, and a changeover from the mass waste, mass utilization, and large scale manufacturing society of the past to a zero spread society is presently seen as critical. Regularly glass does not hurt the earth at all since it doesn't radiate contaminations, yet it can hurt people and in addition creatures, if not managed deliberately and it is less cordial to condition since it is non biodegradable. Subsequently, the improvement of new advancements has been required.

The term glass contains a few compound assorted varieties including pop lime silicate glass, soluble base silicate glass and borosilicate glass. To date, these sorts of glasses glass powder have been generally utilized in bond and total blend as pozzolana for common works. The presentation of waste glass in concrete will build the antacid substance in the bond. It likewise help in blocks and earthenware make and it jam crude materials, diminishes vitality utilization and volume of waste sent to landfill. As helpful reused materials, glasses and glass powder are primarily utilized in fields identified with structural building, for instance, in concrete, as pozzolana (beneficial cementitious materials), and coarse total. Their reusing proportion is near 100%, and it is additionally utilized in concrete without unfriendly impacts in solid sturdiness. In this manner, it is viewed as perfect for reusing.

OBJECTIVES OF THE STUDY:

The following are the main objectives of the study

1. To determine the workability, the overall strength, as well as the rate of strength gain for varying water cement ratios of concrete containing glass powder and municipal solid waste.
1 Compare the results of the glass powder and municipal solid waste concrete to a conventional mix.
2 To study the compressive strength, split tensile strength, flexural strength of concrete by using glass powder and municipal solid waste (MSW).
3 To study the durability of concrete by using glass powder and municipal solid waste (MSW).

2. LITERATURE REVIEW

Veena V. Bhat , N. Bhavanishankar Rao, et al (2014)

Glass is commonly used in building / construction industries and large amount of glass is powdered daily. The disposal of waste glass is an environmental issue as waste glass causes disposal problem. Today the construction industry is in need of finding cost effective materials for increasing the strength of concrete structures. Glass powder has finer than 600µ is reported to have pozzolanic behaviour. An attempt is made to investigate the possibility of using the waste glass powder as the partial replacement of ordinary Portland cement in concrete. Concrete with replacement of cement by waste glass powder such as 5%, 10%, 15% and 20% were produced and properties of this concrete has been compared with concrete of control mix with no replacement. Cube specimens of 24 numbers were cast, cured and tested for 7 day and 28 days strength. Compression test was conducted and the results were compared. The findings revealed an increase in compressive strength with the increase in the replacement of cement by glass powder. To reduce the demand for cement, glass powder replacements can be adopted. The replacement of glass powder decreases the unit weight as well as the porosity as indicated by the decrease in water absorption. It reduces the quantity of cement to be used in concrete.

Gunalaan Vasudevan, Seri Ganis Kanapathy pillay, et al (2013)

This study was conducted to investigate the effect of using waste glass powder in concrete. Laboratory work was conducted to determine the performance of control sample and concrete with used waste glass powder. The performance of these types of concrete was determined by the workability test, density test and compressive strength test. The workability of concrete is determined using slump test and compacting factor test. Meanwhile, compressive strength test is done to determine the strength of concrete. For each type of concrete, a total of six 150mm x 150mm x 150mm cubes were cast. The cubes were tested at the ages of 7, 14 and 28 days to study the development of compressive strength. The results indicate that the concrete with using waste glass powder were able to increase the workability of concrete and also the compressive strength. However, the density is reduced compare to standard mixture of concrete

3. MATERIALS AND MIX DESIGN

CEMENT:

In this study Ordinary Portland cement of 53 grade (ACC cement) has been procured and has been used.

OPC 53 grade cement

COARSE AGGREGATE

In this study coarse aggregate of nominal sizes of 20mm, 12mm are used

20mm coarse aggregates

12mm coarse aggregates

FINE AGGREGATE:

The fine aggregate used in this study is river sand which is obtained from local company and shown in figure with normal size of 2.36mm

Fine aggregates

Glass powder:

Glass occurs naturally when rock high in silicates melt at high temperature and cool before they can form a crystalline structure. Obsidian or volcanic glass is a well known example of naturally occurring glass. When manufactured by humans the glass is a mixture of silica, sand, lime and other materials.

Glass powder

Municipal Solid waste:

For this study municipal solid waste collected from dumping yard at GWMC office Warangal.

Municipal solid waste

SUPERPLASTICIZERS: (HIGH RANGE WATER REDUCERS)

The use of superplasticizer is practiced for production of flowing, self levelling, self compacting and for the production of high strength concrete.

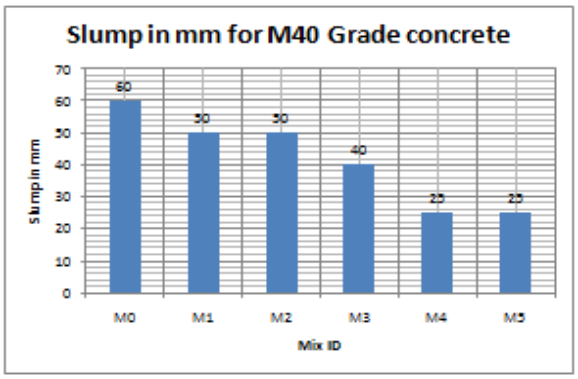
In this study, CONPLAST SP430 has been used in concrete mix to have high workability.

MIX DESIGN OF M40 GRADE CONCRETE

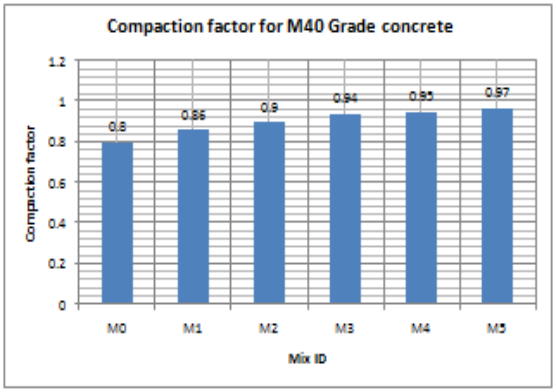
Final trial mix for M40 grade concrete is 1:1.63:2.54 at w/c of 0.45

4. RESULTS AND ANALYSIS

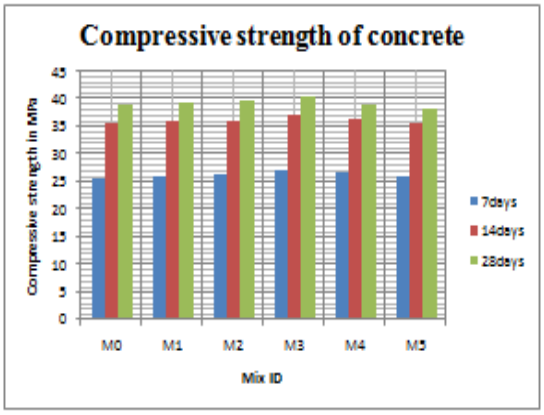
Workability:
Slump cone test:



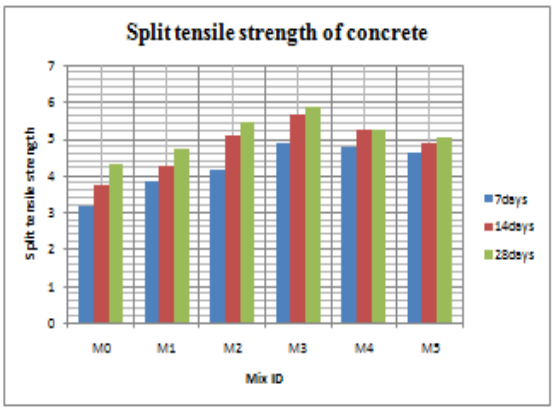
Compaction factor test



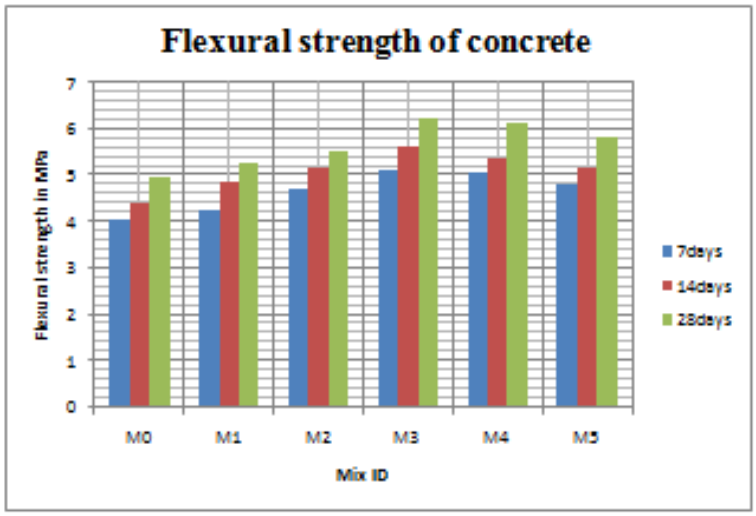
STRENGTH OF CONCRETE:
Compressive strength



Split tensile strength

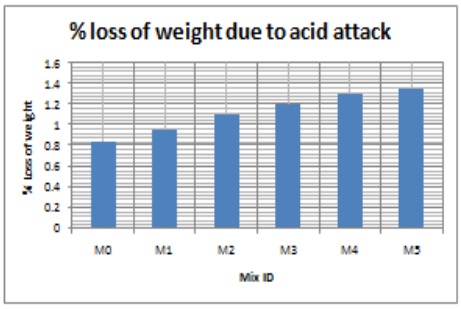


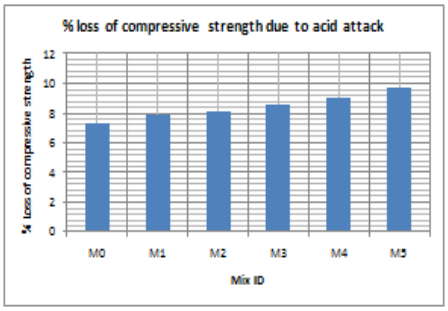
Flexural strength



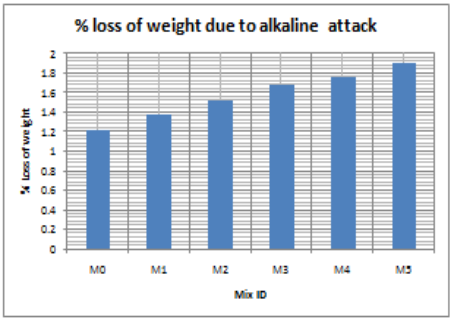
DURABILITY OF CONCRETE:

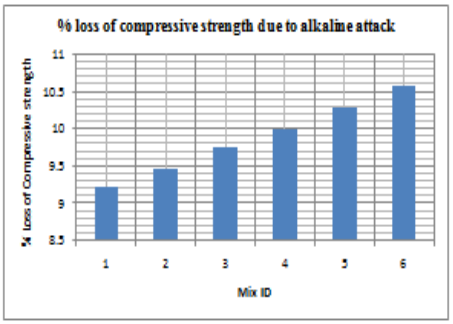
Acid attack



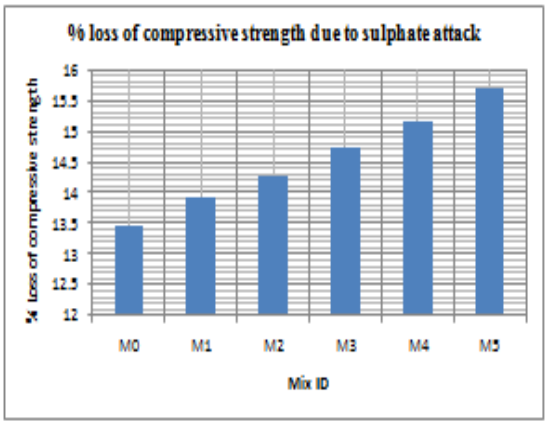


Alkaline attack:





Sulphate attack:



5. CONCLUSIONS

From this study the following conclusions were made

1. The value of slump for the concrete decreases with increasing the percentage of Glass powder and municipal solid waste for M40 Grade concrete. The value of compaction factor for the concrete decreases with increasing the percentage of Glass powder and municipal solid waste for M40 Grade concrete.
2. Compressive strength for 7days, 14days, 28days for the concrete increases initially up to 15% Glass powder+15% Municipal solid waste than decreases with increasing the percentage of Glass powder and municipal solid waste for M40 Grade concrete. The optimum value for the compressive strength was obtained at 15% Glass powder+15% Municipal solid waste.
3. Split tensile strength and flexural strength for 7days,14 days and 28days for the concrete increases initially up to 15% Glass powder+15% Municipal solid waste than decreases with increasing the percentage of Glass powder and municipal solid waste for M40 Grade concrete.
4. The addition of Glass powder and municipal solid waste significantly increased the compressive, tensile and flexural strengths of concrete with maximum strengths in each case being achieved at 15% Glass powder+15% Municipal solid waste.
5. The percentage loss of weight and percentage loss of compressive strength is increases with in increasing the percentages in all cases in durability studies in Glass powder and municipal solid waste concrete. So, the concrete is durable up to 15% Glass powder+15% Municipal solid waste.

So the replacement of 15% Glass powder+15% Municipal solid waste is generally useful for better strength values in M40 grade of concrete.

REFERENCES:

1. Martin Keppert , Zbysek Pavlik , Robert Cerny, Pavel Reiterman, “Properties of Concrete with Municipal Solid Waste Incinerator Bottom Ash”, IPCSIT vol. 28 (2012) © (2012) IACSIT Press, Singapore.
2. Bhupendra Singh Shekhawat, Dr. Vanita Aggarwal, “Utilisation of Waste Glass Powder in Concrete – A Literature Review”, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 7, July 2014
3. Amit Kumar Gupta, Dr. Rajeev Chandak, “Effect on compressive strength of concrete with partial replacement of cement by municipal solid waste incinerator ash”, International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 02 | Feb -2017.
4. Gautam Singh , Ashish Kumar singh, Akhil Bhaskar, Ajit Singh Attree, “A Critical Study of Effectiveness Of Waste Glass Powder In Concrete”, International Archive of Applied Sciences and Technology.
5. Md. Safiuddin , Mohd Zamin Jumaat, M. A. Salam, M. S. Islam, R. Hashim, “Utilization of solid wastes in construction materials”, International Journal of the Physical Sciences Vol. 5(13), pp. 1952-1963, 18 October, 2010.
6. Hashim Mohammed Alhassan, Ahmed Musa Tanko, “Characterization of Solid Waste Incinerator Bottom Ash and the Potential for its Use”, International Journal of Engineering Research and Applications (IJERA), Vol. 2, Issue 4, July-August 2012, pp.516-522.
7. Gunalaan Vasudevan, Seri Ganis Kanapathy pillay, “Performance of Using Waste Glass Powder In Concrete As Replacement Of Cement”, American Journal of Engineering Research (AJER), Volume-02, Issue-12, pp-175-181.
8. Veena V. Bhat, N. Bhavanishankar Rao, **“**Influence of Glass Powder on the Properties Of Concrete”, International Journal of Engineering Trends and Technology (IJETT) – Volume 16 Number 5 – Oct 2014