To Study of Strength and Durability Parameters of Concrete with Partial Replacement of Cement with Ground Granulated Blast Furnace Slag and Sugar Cane Baggage Ash.

[1]Mr.VaibhavSatav,[2]Mr. Sudhanshu Pathak S.

[1](PG Scholars, Civil Department (C&M), D. Y. Patil College of Engineering, Pune, India)

[2](Assistant Professor, Civil Department, D. Y. Patil College of Engineering, Pune, India)

Abstract: The concept of partial replacement of cement which is capable for sustainable development is characterized by application of industrial wastes to reduce consumption of natural resources and energy and pollution of the environment. A presently large amount of ground granulated blast furnace slag is a by-product of manufacturing of pig iron with an important impact on environment and humans, And India being the second most sugarcane producing country in the world, also produces a substantial amount of Sugar Cane Bagasse Ash which is a fibrous waste product of sugar industry and can be used as an alternate binding material in concrete. This would not only help in waste management but also result in saving in cement production the cement has been replaced by combination of GGBS and SCBA accordingly in the range of 0%, 5%, 10%, 15%, 20% &25%by weight of cement for M-25mix. After iterative trial mixes the water/cement ratio 0.5.

Keywords —*GGBS, Sugar cane Bagasse Ash, Compressive strength, Split tensile Strength, Flexural Strength.*

1. INTRODUCTION

For each ten tonnes of sugarcane crushed, a sugar factory produces nearly three tones wet bagasse ash. Bagasse ash is residue obtained from burning of bagasse in sugar producing factory. When bagasse waste is burned under the controlled manner. It also gives ash having amorphous silica, which has pozzolanic properties. The combustion yields ashes containing high amounts of unburned matter like silica and alumina oxides. Sugarcane bagasse ash use as cement replacement material to improve quality and reduce the cost of concrete pavers, soil cement interlocking block. India alone generates approximately 90 million of bagasse as a solid waste from the sugarcane industry. Disposal of solid waste generated from industrial production activity is the other serious problem. . The accumulation of wastes is not only a burden to the industry, but also affects the environment adversely.And one of the known alternative materials to OPC in the concrete mix is Ground Granulated Blast Furnace Slag (GGBS). GGBS is a byproduct extracted from blast furnaces used to produce iron. It is usually produced by heating the combination of iron-ore, coke, and limestone in the blast furnace to 1500 8C. The products of these materials are molten iron and molten slag. The molten slag which contains silicates and alumina has lower density, thus floats above the molten iron and make it is easy to separate the molten slag from the molten iron. After separation, the molten slag is cooled down by using high pressure water jet which quenches the slag into crushed particles which are often less than 5 mm. Such particles are then left to dry and grinded in a rotating ball-mill to produce a very fine powder of GGBS,This paper presents experimental work carried out to determine the effect of partial replacement of OPC with GGBS & Sugar cane Bagasseash.

2. AIM AND OBJECTIVES

1. To Develop Sustainable Concrete Using Sugar Cane Bagasse Ash And Ground Granulated Blast Furnace Slag.

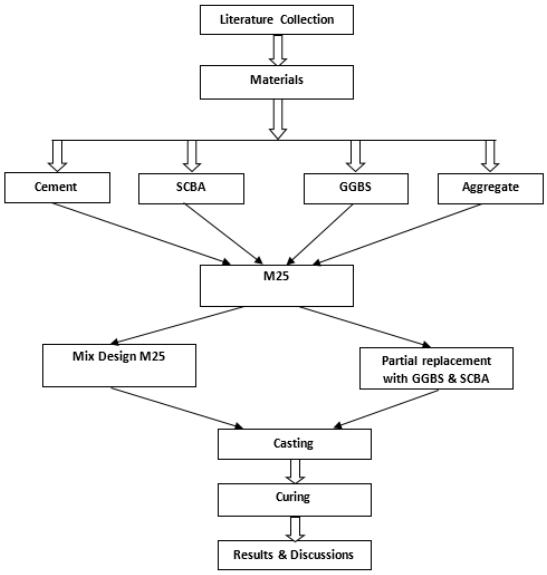
2 .Check Compressive Strength, Flexural Strength and Split tensile Strength.

3. Strength Comparison of Sustainable Concrete with Control Concrete.

4.to Carry out Economical Analysis of Sustainable Concrete.

5.to Study Durability Aspects of Sustainable Concrete.

3. METHODOLOGY



4. EXPERIMENTAL INVESTIGATION

A.Cement

Ordinary cement of 53 grade form single batch was used of the entire work.in this experimental work ordinary Portland cement 53 grade conforming to IS 12269-1987 in all trial mixes is used.

Table no .1 Physical properties of cement

Sr.no	Name of test	Unit	Test Result	Specified limits (IS 269-2015) 53 Grade
1	Standard Consistency	(%)	30.0	-----
2	Density of cement	(g/cc)	3.2	3.15
3	Initial Setting Time	(Min)	65	30 min
4	Final setting Time	(Min)	300	600 max
5	3 Days Compressive Strength	(N/mm2)	28	23 min
	7 Days Compressive Strength		36	33 min
	28 Days Compressive Strength		52	43 min

B.GGBS

Ground-granulated blast-furnace slag (GGBS or GGBFS) is obtained from Guru Corporation, Ahmedabad. The physical properties of GGBS as mentioned below Table

Table no.2 Physical Properties of GGBS

Sr.no	Name of test	Unit	Test Result
1	Specific Gravity	Kg/m3	2700
2	Bulk Density	Kg/m3	1700
3	Maximum Dry density	gm /cc	2.2
4	Optimum Moisture Content	%	20

C. SCBA

Sugar cane bagasse ash was obtained from Shree industries Pune, Physical properties of SCBA as mentioned below table

Table no.3 Physical Properties of SCBA

Sr. no	Name of test	Unit	Test result
1	Density	g/cm3	2.3
2	Particle Size	um	28.9
3	Color		Radish grey

D . COARSE AGGREGATE

Crushed angular /cubical coarse aggregates Aggregate are obtained from S.R industries, bhavdi Road Wagholi Pune ,

Table no.4 Physical Properties of coarse aggregate

Sr.no	Name of test	Result	Unit	Requirement as per IS : 383:2016
1	Specific Gravity	2.9		
2	Water absorption	1.08	%	
3	Dry loose bulk density	1.53	Kg/kilo	Max 45% non – Wearing surface Max 30 % Wearing surface
4	Aggregate Impact value	5.03	%	Max 45% non – Wearing surface Max 30 % Wearing surface
5	Aggregate Crushing value	1531	%	Max 45% non – Wearing surface Max 30 % Wearing surface
6	Flakiness index	2.72	%	Max 40% (Combine Flakiness & Elongation)
7	Elongation index	8.95	%	

E. FINE AGGREGATE

In this study stone dust passing through 4.75 mm sieve conforming to zone -2 as per Is code 383 – 1970 is used as fine aggregates . The fine aggregates is free from clay, silt and organic impurities. The fine aggregate are obtained from S.R industries, bhavdi Road Wagholi Pune,

Table no.5 Physical Properties if fine aggregate

Sr.no	Name of Test	Unit	Results	Test Method
1	Specific Gravity	-	2.75	IS :2386 P3-1963
2	Water Absorption	%	3.14	IS :2386 P3-1963
3	Dry loose bulk density	Kg/lit	1.84	IS :2386 P3-1963
4	Fineness modulus	-	3.70	IS :2386 P1-1963
5	Material Finer than 75u	%	9.60	IS :2386 P1-1963

REFERANCES

1. SayedLairizeZareeia, FarshadAmerib, FarzanDorostkarc, MojtabaAhmadi, "Rice husk ash as a partial replacement of cement in high strength concrete containing micro silica: Evaluating durability and mechanical properties":Case studies in construction Materials (2017).

2. Josephin Alex, J. Dhanalakshmi, B. Ambedkar" Experimental investigation on rice husk ash as cement replacement on concrete production": journal of Elsevier Production(2016)

3. N.VenkataSairam Kumar, K.S.Sai Ram." Experimental study on properties of concrete containing crushed rock dust as a partial replacement of cement", journal of Elsevier Production(2017).

4.G. M. Sadiqul Islam a , M. H. Rahman b , NayemKazi a," Waste glass powder as partial replacement of cement for sustainable concrete practice,: International Journal of Sustainable Built Environment (2016).

5.ParthibanKathirvel⇑ , George AmalAnik, Saravana Raja Mohan Kaliyaperuma," Effect of partial replacement of cement with Prosopisjuliflora ash on the strength and microstructural characteristics of cement concrete" :Journal of Construction and Building Materials (2019) .

6. Dima M. Kannan a , Sherif H. Aboubakr b , Amr S. EL-Dieb a , Mahmoud M. RedaTaha b, "High performance concrete incorporating ceramic waste powder as large partial replacement of Portland cement":Journal of Construction and Building Materials (2017).

7. S. Chowdhury *, A. Maniar, O.M. Suganya," Strength development in concrete with wood ash blended cement and use of soft computing models to predict strength parameters": Journal of Advanced Research(2014).

8. SwaptikChowdhury *, Mihir Mishra, Om Suganya," The incorporation of wood waste ash as a partial cement replacement material for making structural grade concrete: An overview": Ain Shams Engineering Journal (2014)

9. KirtiVardhan⇑ ,ShwetaGoyal, RafatSiddique, Malkit Singh," Mechanical properties and microstructural analysis of cement mortar incorporating marble powder as partial replacement of cement": Journal of Construction and Building Materials (2015).

10. V.R. Prasath Kumar⁎ , K. Gunasekaran, T. Shyamala," V.R. Prasath Kumar⁎ , K. Gunasekaran, T. Shyamala": Journal of Building Engineering(2019)

11. Alaa M. Rashad⇑ , Dina M. Sadek," An investigation on Portland cement replaced by high-volume GGBS pastes modified with micro-sized metakaolin subjected to elevated temperatures": International Journal of Sustainable Built Environment(2016).

12. A. Oner a,*, S. Akyuz b," An experimental study on optimum usage of GGBS for the compressive strength of concrete": Journal of Cement & Concrete Composites

13. Rami A. Hawileh *, Jamal A. Abdalla, FakherdineFardmanesh, PoyaShahsana, AbdolrezaKhalili, "Performance of reinforced concretebeams cast with different percentages of GGBS replacement to cement": Journal of Cleaner Production

14.Prajakta N. Haramkar1,Aaditya Bhardwaj2 ,Rupesh K. Bhendarkar3 ,Praful S. Chandewar4 ,sohelhasmi S. Maladhari5 ,Shweta R. Patel," Partial Replacement of Cement with Sugarcane Bagasse Ash": International Conference on Emanations in Modern Engineering Science and management.

15.Er. ShubhamSrivastava, Er. Puneet Kumar Shukla," Studies on Partial Replacement of Cement by Bagasse Ash in Concrete": International Journal for Innovative Research in Science &Technologys.

16. P. Ganesh , A. Ramachandra Murthy - Tensile behaviour and durability aspects of sustainable ultra-high performance concrete incorporated with GGBS as cementitious material