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GREEN CONCRETE USING GGBS

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Abstract : They have made it clear at the World Earth Summits that uncontrolled rising emissions of greenhouse gases into the atmosphere are no longer acceptable for sustainable development on environmental and social grounds. Increased cement manufacturing will have an impact on environmental preservation, natural conservation, and CO2 emissions, which are one of the main contributors to global warming. By substituting ground granulated blast furnace slag (GGBS) for a portion of Portland cement in concrete, CO2 emissions can be reduced. The percentages of (GGBS) used to substitute Portland cement were 15, 20, and 30%, with curing temperature of 35 and 38 degrees. The concrete cubes were examined at seven different ages: seven, fourteen, and twenty-eight days. The mix design was carried out to obtain concrete.

***Index Terms* - GGBS, CO2 Emission, Global warming, Natural conservation**

I. INTRODUCTION

"Green concrete" refers to concrete manufactured from environmentally friendly concrete debris. Green concrete is made by using as many recycled elements as feasible while leaving the minimum carbon footprint possible. Cement is made from basic materials such as limestone and clay, which are burned at high temperatures to make calcium silicates, which provide the cement's binding qualities. CO2 gas is emitted into the environment through the burning of raw materials. For every tonne of cement produced, about 1 tonne of CO2 is emitted. Cement manufacture accounts for around 7% of total CO2 emissions into the environment. Annual global concrete production is currently at 12 billion tonnes. The use of significant volumes of supplemental cement materials such as (GGBS) in the building sector to replace a portion of cement can help to minimize CO2 emissions and ensure the long-term sustainability of cement raw materials.

II. MATERIALS

- *Cement*

  The cement used in this project is ordinary Portland cement of grade 53, which has a specific gravity of 3.15, a fineness of less than 5% (IS: 4031-PART 1-1996), and a suitable unique floor area of more than 600 m2/ kg, according to IS 11269, and has a specified gravity of 3.15. The cement is stored in a hermetic environment with no moisture access to prevent lump formation.

- *Fine Aggregate*

  The fine combination employed in this examination is obtained from a nearby supplier, and its smooth river sand conforms to the IS:383 requirements, and it confirms to Zone-II with a specific gravity of 2.68 and is free of any foreign particles. Sand is received in large packing containers with no access to moisture and is managed as smooth and dry to control the water content material within the blend design.

- *Course aggregate*

  The coarse combination used in this mix comes from a nearby crusher facility and is made of basalt rock. It is not flaky and has clean edges. The aggregates are sieved on crusher discharge with a nominal length of 20 mm by IS 383 standards. The coarse mixture has a selected gravity of 2.65, an abrasion cost of less than 6%, and an appropriate effect crushing electricity of less than 3%, indicating that it could be utilized for dual carriageway spur- position. The obtained cloth is stored in a concrete tank with a shelter to keep it safe from water, and a clean, dry combination is used throughout the research.

- *Ground Granulated Blast Furnace Slag (GGBS)*

  It is obtained by hot molten iron slag from blast furnace which is dried and grounded to form a powder called as Ground Granulated Blast Furnace Slag.

- *Water*

  Pure potable water which is free from heavy metals is used for the mix.

III. SPECIFICATION

SPECIFICATION OF CONVENTIONAL CONCRETE MIX

MIX DESIGN-

TABLE 1. SPECIFICATION

	Conventional mix	Batch 1	Batch 2	Batch 3
Cement (kg/m^3)	**420**	**357**	**336**	**315**
Fine aggregate (kg/m^3)	**649**	**649**	**649**	**649**
Course aggregate (kg/m^3)	**1168**	**1168**	**1168**	**1168**
Water ($liter/m^3$)	**160**	**160**	**160**	**160**
GGBS %	**0**	**15**	**20**	**25**

IV. METHODOLOGY

4.1. *Apparatus*

- Moulds of cube (150 x 150 x 150 mm)
- Trowel
- Universal testing machine
- Curing tank
- Weighing machine
- Containers
- Sieves
- Hammer

4.2. *Procedure of Casting Members*

1. Cleaning and fixing moulds
2. Mixing
3. Placing, compacting & finishing concrete
4. Curing

4.2.1. *Cleaning and fixing moulds*

- Clean the moulds properly and apply oil on inner surface of moulds. But care should be taken that no oil should be visible on surface.
- Fix the moulds with base plate tightly so that no gaps should be left in joints to prevent the penetration of cement slurry.

4.2.2. *Mixing*

- Cement, Fine aggregate, Course aggregate and GGBS is brought into a mixing pan
- The material is mixed with hand using trowel
- Precautions should be taken while mixing.

4.2.3. *Placing, Compacting and Finishing concrete*

- Concrete is to be placed in three layers using trowel. Each layer is compacted by giving 25 blows of tamping rod
- Excess concrete is removed from the top of mould and the concrete surface is evenly finished with the help of trowel.
- The moulds should be completely left undisturbed for 24 hours after casting.

- After 24 hours the moulds are demoulded and specimens are labeled using marker.

4.2.3. *Curing*

- The specimens are immersed in curing tank to achieve strength.

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V. Testing and Results

5.1. *Testing*

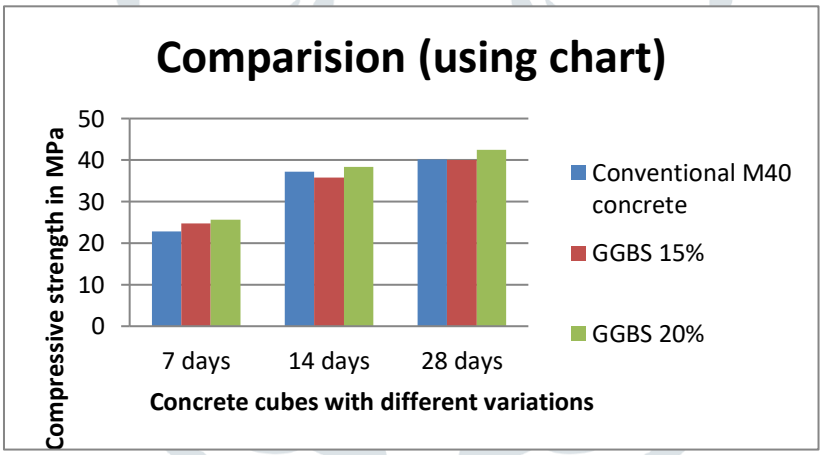
- The specimens kept for curing are to be taken out of the tank and allowed to dry for 2 hours
- The dried specimens are to be tested in universal testing machine.
- The readings should be noted.

5.2. *Results*

Table 2. Results

Results	Conventional M40 concrete	GGBS 15% replaced	GGBS 20% replaced	GGBS 25% replaced
7 days	22.8 MPa	24.8 MPa	25.7 MPa	20 MPa
14 days	37.0 MPa	35.8 MPa	38.3 MPa	28 MPa
28 days	40.2 MPa	40 MPa	42.5 MPa	37 MPa

Figure 1. Results of testing



Conclusions

- The Cement was replaced by GGBS by 15%, 20%, & 25% respectively giving better results as compared to conventional concrete mix.
- The replaced quantity of cement will reduce the demand up to a certain levels and will reduce the impact on environment.
- The emissions from cement manufacturing will reduce by 15-25%

References

[1] Basil Johny, Prof. M V George, Dr. Elson John, Study of properties of Sustainable concrete using slag and recycled concrete aggregates, International Journal of Engineering Research and Technology, Vol-3-Issue -9, September 2014.

[2] M L Berndt, Properties of Sustainable Concrete containing fly ash, Slag and recycled concrete aggregate, Construction and Building Material,2009.

[3] Tushar R Sonawane, Use of recycled aggregate in concrete, International Journal of Engineering Research & Technology, Vol. 2 Issue 1, January- 2013.

[4] S. Gangaram, V. Bhikshma, M. Janardhana, Strength and durability Aspects of recycled aggregate concrete, International Journal of Research in Engineering and Technology, Vol. 3 Special Issue 13, December-2015.

[5] MdShakir Ahmed , H S Vidyadhara, Experimental study on strength behavior of recycled aggregate concrete, International Journal of Engineering Research & Technology (IJERT),Vol. 2 Issue 10, October – 2013.