

# Behaviour of GGBS and ROBO Sand Replaced High Performance Concrete



L. Sai Indrasena Reddy, M.M. Vijayalakshmi, Praveenkumar T R

**Abstract:** The utilization of superior strength concrete offers points of interest in durability, simplicity of position, and decreased shrinkage and creep, just as expanded compressive, shear and rigidity. Balancing these favorable circumstances are possibly diminished flexibility and imperviousness to fire, and expanded unit cost. The present paper centers around the researching attributes of M50 evaluation concrete with replacement of cement with Ground Granulated Blast Furnace Slag (GGBS) and sand with the ROBO sand (crusher dust). The solid concrete cubes and cylinders are tried for compressive and split tensile strength. It is discovered that by replacement of cement with GGBS and the sand with ROBO sand helped in improving the quality of the solid considerably contrasted with ostensible blend concrete. The compressive quality is learned at 7days, 28 days. Water decreasing admixtures are utilized to expand functionality qualities. For all degrees of bond substitution cement accomplished predominant execution in the crisp and mechanical tests ought to be contrasted and the reference blend.

**Key words:** HPC, GGBS, Robo sand,

## I. INTRODUCTION

Cement is the commonly utilized development material in India with yearly utilization surpassing 100 million cubic metres[1-7]. It is notable that customary cement planned based on compressive quality doesn't meet numerous utilitarian necessities, for example, impermeability, protection from ice, cracks due to thermal stresses satisfactorily. Traditional Portland bond cement is discovered insufficient in regard of:

- Durability in extreme environs (Shorter administration life and require upkeep)
- Time of development (longer discharge time of structures and more slow addition of solidarity)
- Energy ingestion limit (for quake safe structures)
- Repair and retrofitting employments

In the building industry, the improvement of existing materials take into account mechanical progression and the development of increasingly dependable structures without over plan. A High strength cement is something which requests a lot higher execution from concrete when contrasted with execution anticipated from steering concrete.

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Utilization of synthetic admixtures decreases the water content, in this way diminishing the porosity inside the hydrated cement paaste. Mineral admixtures additionally called as bond substitution material (CRM, for example, fly fiery debris, rice husk powder, ground granulated impact heater slag ,

Metakaolin, silica fume are all the more usually utilized in the advancement of High execution blends, go about as pozzolanic materials just as fine fillers, consequently the microstructure of solidified concrete lattice ends up denser and solid.

## II. LITERATURE REVIEW

Wang Ling et al. (2004) studied the behaviour of GGBS and the impact of GGBS on new concrete and solidified cement. GGBS cement is described by high quality, lower heat of hydration and protection from compound erosion.

Aveline Darquennes et al. (2011) decided the slag impact on splitting. Their investigation centers around the autogenous distortion advancement of cements portrayed by various rates of slag (0 and 42% of the folio mass) under free and limitation conditions by methods for the TSTM gadget (Temperature Stress Testing Machine).

Elsayed (2011) examined tentatively in his investigation the impacts of mineral admixtures on water porousness and compressive quality of cements containing silica rage (SF) and fly powder (FA). The outcomes were contrasted with the control solid, conventional Portland bond concrete without admixtures. The ideal bond substitution by FA and SF in this analysis was 10%. The quality and porousness of cement containing silica seethe, fly cinder and high slag bond could be gainful in the use of these waste materials in solid work, particularly as far as solidness.

Amit Rana (2012) discovered the ideal amount of steel filaments required to accomplish the greatest flexural quality for M25 evaluation cement was discovered. From the comprehensive and broad exploratory work it was discovered that with increment in steel fiber content in cement there was a huge increment in Flexural quality. Indeed, even at 1 % steel fiber content flexural quality of 6.46 N/mm<sup>2</sup> was seen against flexural quality 5.36 N/mm<sup>2</sup> at 0% henceforth increment of 1.1% flexural quality.

Eva Vejmelkova, et al., (2013). Studied the performance of metakaolin on concrete and results of this study showed that inclusion of metakaolin upto 20% improves the properties of concrete in later stages.

Mojtaba Valinejad Shoubi et al. (2013) checked on in their examination the details, creation technique and level of adequacy of some modern results, for example, GGBS,

Silica Fume and PFA as bond substitution to accomplish superior and supportable solid which can lead not exclusively to improving the presentation of the solid yet in addition to the decrease of ECO2 by diminishing the measure of PC demonstrating how they influence prudent, natural and social perspectives decidedly.

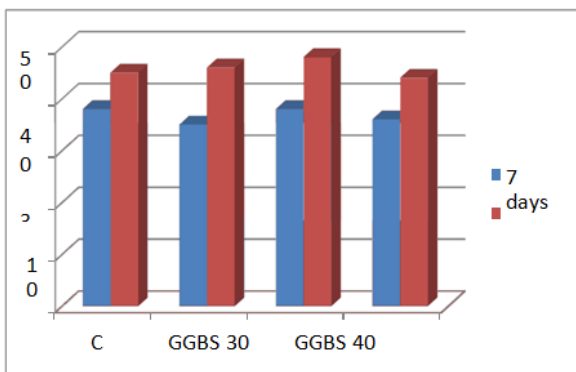
Marta Kasior - Kazberuk and Malgorzata Lelusz (2014) "Strength of cement with various kinds of bond have been investigated to assess the impact of expansion content, the hour of restoring and the sort of concrete on the compressive quality changes. The pozzolanic and water driven action of fly fiery debris has essentially been called attention to just as the likelihood to utilize this expansion as a solid part.

Shreeti S. Mavinkurve, et al., (2015) "Present paper examines the methodology received to create HPC blend by methods for lab preliminaries utilizing HRM. The different properties of concrete, both in the crisp and solidified states are likewise featured .It can be finished up the high quality cement up to compressive quality of 82.75 MPa, having very low penetrability and with sensibly high workability can be created utilizing Indian HRM and bond".

## III. MATERIALS AND TESTING METHODS

The concrete samples were tested for split tensile and compressive strength after 28 days of curing.

### Compressive Strength of Compressive



Strength of GGBS and QS GGBS

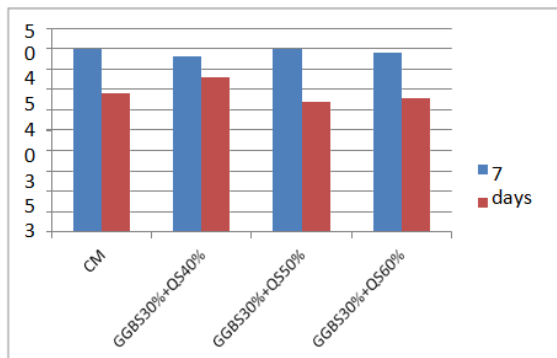
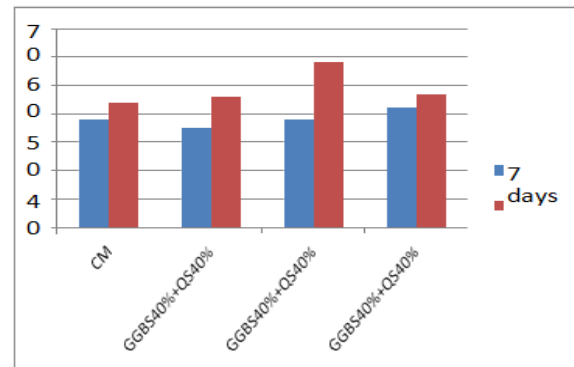


Fig 4.2 7 and 28 Days Compressive Strength of GGBS with the variation of QS.

### Compressive Strength of GGBS and QS



Compressive Strength of GGBS and QS

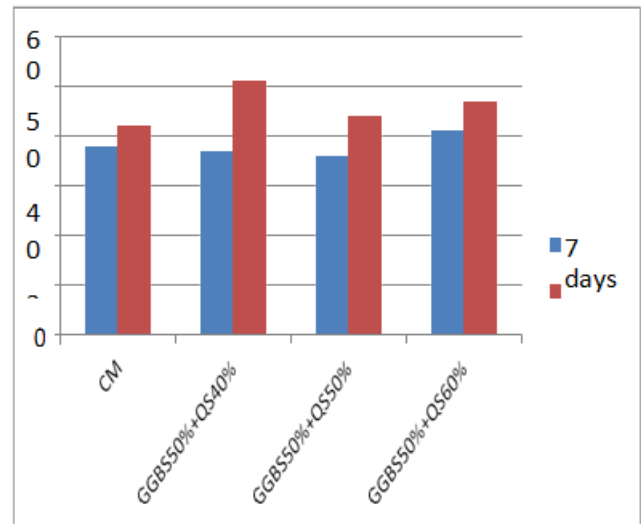


Fig 4.3 a and 4.3 B 7 and 28 Days Compressive Strength of GGBS with the variation of QS.

### 28 Days Split Tensile Strength (Mpa)

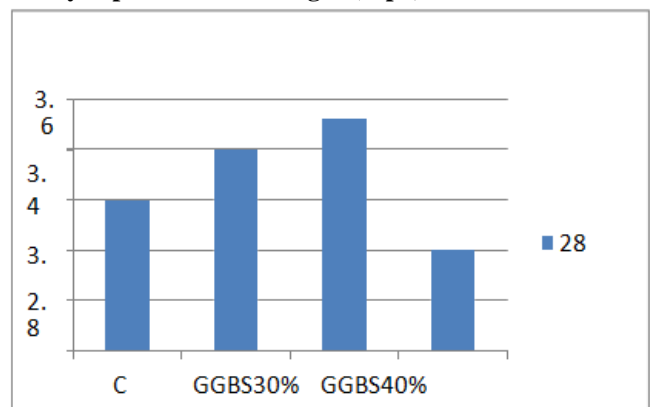


Fig 4.4 28 Days Flexural Strength of GGBS variations

### 28 Days Split Tensile Strength of CGBS with the variation of QS

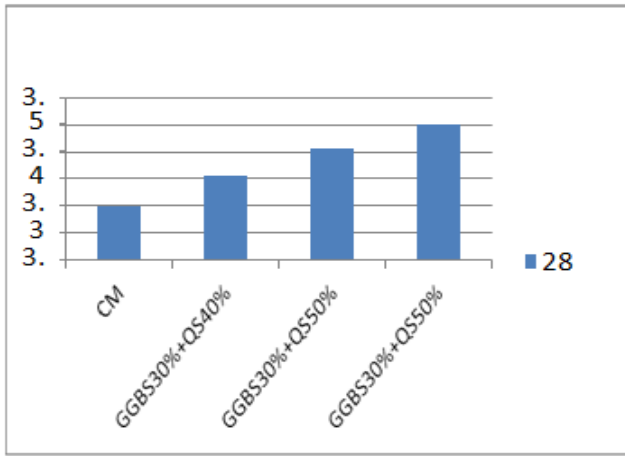


Fig 4.5 28 Days Tensile Strength of GGBS and QS variation,

#### Mix Proportion Per Cubic Meter

Mixes Name	GGBS (Kg)	Cement (Kg)	FA (Kg)	CA(Kg)	QS (Kg)	Water	SUPERPLAS TICIZER
M	-	425	685	1121.25	-	170	3.187
M1	127.5	297.5	685	1121.25	-	170	3.187
M2	170	255	685	1121.25	-	170	3.187
M3	212.5	213	685	1121.25	-	170	3.187
M4	127.5	298	685	1121.25	473.7	170	3.187
M5	127.5	254	410.25	1121.25	342.12	170	3.187
M6	127.5	212.5	342.12	1121.25	410.55	170	3.187
M7	170	297.5	410.55	1121.25	273.7	170	3.187
M8	170	255	342.12	1121.25	342.12	170	3.187
M9	170	212.5	237.7	1121.25	410.55	170	3.187
M10	212.5	297.5	410.55	1121.25	273.7	170	3.187
M11	212.5	255	342.12	1121.25	342.12	170	3.187
M12	212.5	212.5	273.7	1121.21	410.55	170	3.187

#### 28 Days Split Tensile Strength of GGBS with the Variation of QS

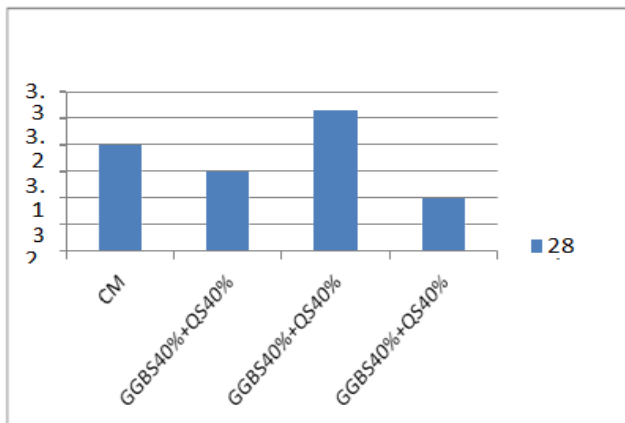


Fig 4.6 28 Days Tensile Strength of GGBS and QS Variation.

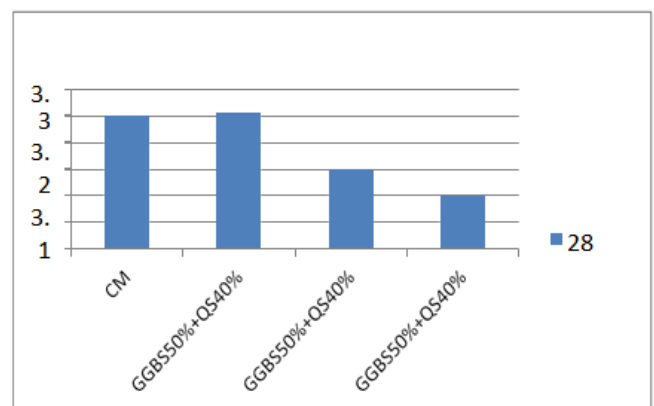
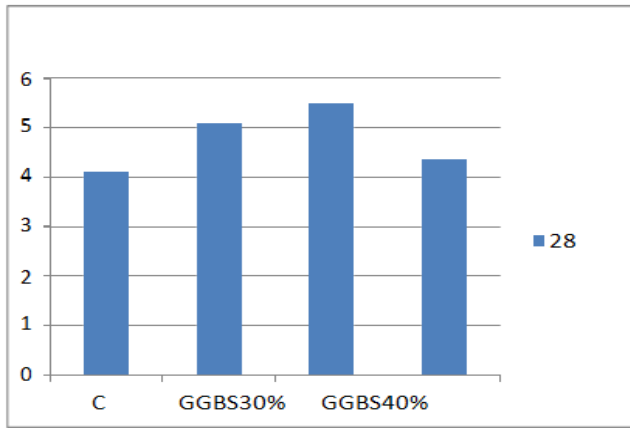


Fig 4.7 28 Days Tensile Strength of GGBS with and QS Variation

#### 28 Days Flexural Strength of GGBS

#### 28 Days Split Tensile Strength of GGBS with the Variation of QS



**Fig 4.8 Days Flexural Strength of GGBS.**

## IV. CONCLUSIONS

As level of Robo sand substitution in place of River Sand is expanded, the workability of the blend diminishes independent of level of GGBS replacing concrete. At steady rate substitution of River Sand with Robo sand, the functionality of the solid doesn't get affected as rate GGBS substitution the concrete is differed. Robosand can supplant River Sand 100% without affecting Compressive Strength. The ideal level of GGBS substituting concrete is half for getting greatest compressive quality and the most extreme Compressive Strength got is 52.76 N/mm<sup>2</sup>. The Split Tensile Strength increments with the expansion in level of GGBS just as with the increment in level of Robo sand and the most extreme Tensile Strength acquired is 4.56 N/mm<sup>2</sup>. The Flexural Strength additionally increments with the expansion in level of GGBS just as with the increment in level of Robo sand and the most extreme Flexural Strength acquired is 6.85 N/mm<sup>2</sup>. The greatest increment in Compressive Strength is about 17.22% when contrasted with that of the customary blend at 28 years old days. The normal increment in Split Tensile Strength is about 26.6 % when contrasted with that of the customary blend at 28 years old days. The normal increment in Flexural Strength is about 12% when contrasted with that of the customary blend at 28 years old days.

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