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A Study on Characteristics of Self Compacting Concrete with the Presence of Glass Powder and Steel Slag

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ABSTRACT

Concrete cement has the most huge activity in the field of regular structure. Concrete is the most huge part in Concrete which integrates the Totals, anyway its creation is very essentialness using and adds to about 7% of Greenhouse gases, all around, and it is assessed that the age of one ton of Cement produces about 0.9 tremendous measures of CO2, which is released in nature. The fine aggregate or sand used are ordinarily procured from regular sources outstandingly stream beds or conduit banks. By and by a day as a result of consistent sand mining the trademark sand is debilitating at an upsetting rate. Thusly, there is a need to find alternative rather than basic sand and cement. The undertakings have been made to fragmentary overriding of sand with Granular Steel Slag (G.S.S) and bond with Waste Glass Powder (W.G.P) in view to reduce natural issues like pollution, utilization of basic resources and issues in waste the administrators.

Granular Steel Slag (G.S.S) which is an aftereffect of steel making is conveyed during the parcel of the fluid steel from corruptions in steel-creation radiators. The Slag occurs as a fluid liquid mollify and is an eccentric course of action of silicates and oxides that concretes in the wake of cooling. Development of steel slag improves the mechanical properties of concrete. Waste Glass Powder (W.G.P) is a significant mechanical waste. It shows pozzolanic direct when the particle size is under 75µ. The pozzolanic properties may be credited to the high proportion of silica. The particles of Glass Powder are fine, filling voids between bond grains which realizes extra strong Concrete. Fine total was not entirely superseded with 25%, half and 75% Granular Steel Slag (G.S.S) and bond replaced with 20% (consistent) Waste Glass Powder (W.G.P) for M20 grade concrete. Tests were performed for fresh and mechanical properties of cement at 7, 28 and 56 days and the results showed up there is a consistent increment in characteristics from 25% to half of replacement.

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KEYWORDS: *Glass powder, Steel slag*

INTRODUCTION

Self compacting or unnecessarily functional concrete is in like manner one kind of High Performance Concrete (HPC) has been made for use in situation where vibration is inconvenient and bracing steel is astoundingly blocked. The headway of self compacting non-seclusions solid utilizing High Range Water Reducing Admixtures (HRWR) is an import accomplishment towards achieving world class concrete through automation. From the beginning it was made in Japan in 1980 to balance a going inadequacy of gifted work, SCC development was made possible by the a great deal earlier improvement of super plasticizers for strong, this advancement relies upon growing the proportion of fine material like fly flotsam and jetsam, limestone, etc., without changing the water content stood out from the standard concrete. There are various thoughts for the making of SCC mixes which change for the most part in the whole and kind of used included substances and admixture

Replacement Materials

Glass Powder

Glass Powder is a helpful modern waste. It displays pozzolanic conduct when the molecule size is under 75 µ. The pozzolanic properties might be ascribed to the high measure of silica. The particles of Glass Powder are exceptionally fine, filling voids between concrete grains which brings about progressively solid Concrete. The strong waste glass is viewed as one of the most major ecological issues everywhere throughout the world since it possesses colossal pieces of the landfill spaces, and it has a non biodegradable nature. Notwithstanding it causes genuine ecological contaminations (air, water and soil contaminations) which spread everywhere throughout the world, both as far as amount and related wellbeing dangers. In this specific situation, early endeavors were completed for quite a while to removal or reusing of the squashed waste glass as a swap for fine sand, coarse aggregate, and even concrete in the solid. In the most recent decade, the reusing of squashed waste glass in building materials has pulled in numerous analysts because of its physical attributes and substance arrangements. Strong mechanical results, for example, siliceous and aluminous materials, just as some normal pozzolanic materials are progressively being utilized in the concrete and solid industry. The fuse of these materials in concrete has been giving empowering results

with respect to the mechanical and strength properties of cement.

Notwithstanding the presence of a lot of modern waste, for example, impact heater slag, fly debris, silica smoke, slag and rural buildups, for example, rice husk debris, which have been utilized for a long time in enormous sum as crude materials and segments in the concrete business, there are as yet numerous other mechanical squanders not utilized at this point, for example, squander glass. Indeed a couple of studies have effectively examined the possible utilization of finely ground squander glass as a pozzolanic material concentrating on quality turn of events and soluble base silica reactivity.

Glass is the aftereffect of the merger of a few inorganic mineral crude materials, which subsequent to experiencing a procedure of controlled cooling turns into a hard, homogeneous, steady, dormant, undefined and isotropic material. In light of the significant sythesis, glass can be grouped into a few classes yet soft drink lime glass is the most generally used to make compartments, buoy and sheet glass and in this way making over 80% by weight of waste glass.

Fig-1. Disposal of industrial glass waste

Fig-2. Glass powder

Table 1.1: Physical Properties of Glass Powder

Properties	Values
Specific gravity	2.71
Surface area	2120 cm^2/g
Fineness	6

Table 1.2: Chemical Properties of Glass Powder

Constituent	Percentage
SiO2	68
Al2O3	0.9
Fe2O3	0.6
CaO	14.5
Na2O	12.2
SO3	0.4
MgO	1.8
K2O	0.8

Steel Slag

Steel slag, the result of steel and iron creation is created in huge amounts every day, and these items are viewed as risky and dangerous for both the manufacturing plants and the earth. In 2016, over 100million huge amounts of steel slag were delivered in China, and the sum is expanding each year, while the absolute usage proportion of steel slag is just 10%. The collection of steel slag not just takes up a huge zone of land, yet additionally contaminates the general condition. To investigate the use of steel slag, reusing advancements to utilize steel slag as development material have gotten expanding consideration.

Likewise, steel slag has been generally utilized as total in solid, that is steel slag total cement. A few investigations exhibited that the utilization of steel slag as fine total in concrete improves the mechanical properties of solidified cement. The utilization of steel slag as fine total in concrete blends positively affects both the compressive and malleable.

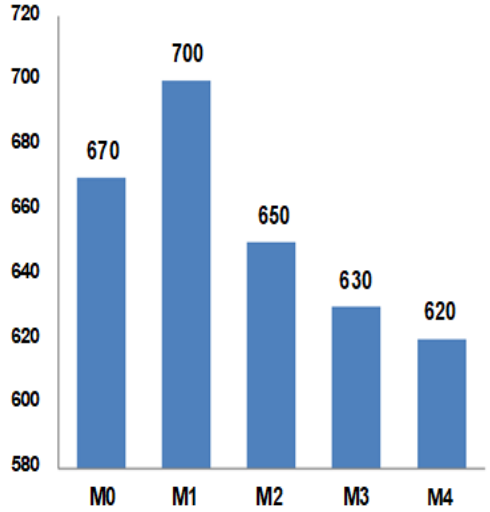
Fig-3Granular Steel Slag

.3: Physical Properties of Steel slag

Properties	Values
Specific gravity	3.2-3.6
Unit weight	1600-1920
Absorption	Up to 3%

Chemical Properties of Steel Slag

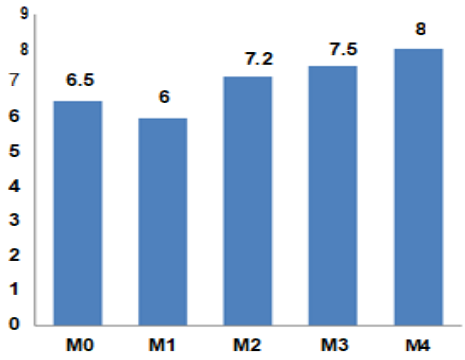
Constituent	Percentage (%)
CaO	40-52
SiO2	10-19
FeO	10-40 (70 - 80% FeO,20 - 30% Fe2O3)
MnO	5-8
MgO	5–10
Al2O3	1-3
P2O5	0.5–1
S	< 0.1
Metallic Fe	0.5-10



% Replacement Vs Slump Flow Values in mm

V-Funnel Test Results

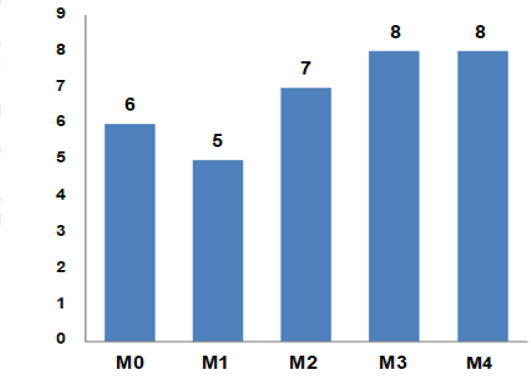
S.No	% of G.P+ % of S.S	Time (sec)
1	M0	6.5
2	M1	6
3	M2	7.2
4	M3	7.5
5	M4	8



% Replacement vs. V-Funnel Time in secs

J-Ring Test Results

S.No	% of GP+ % of S.S	J- Ring test(mm)
1	M0	6
2	M1	5
3	M2	7
4	M3	8
5	M4	8



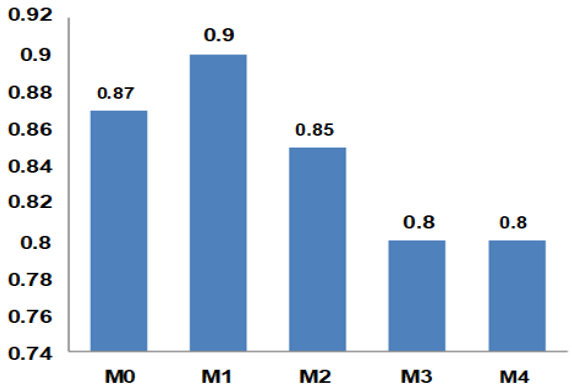
% Replacement Vs J-Ring Test Values in mm

Slump Flow Test Results

S.No	% of GP+ % of S.S	Slump flow(mm)
1	M0	670
2	M1	700
3	M2	650
4	M3	630
5	M4	620

L-Box Test Results

S.No	% of GP+ % of S.S	Blocking ratio(mm)
1	M0	0.87
2	M1	0.9
3	M2	0.85
4	M3	0.8
5	M4	0.8



% Replacement Vs Blocking Ratio in mm

CONCLUSIONS:

This examination was done to research the joined impact of G.P and S.S supplanting concrete and F.A, on Fresh and Hardened Properties of SCC. Following ends were surmised from the test outcomes:

- The usefulness of cement is more with expansion of Glass Powder content which might be because of improved pressing thickness with fuse of G.P.
- Workability diminishes continuously with the expansion in Granular Steel Slag content i.e.; (25%, half, and 75%) which might be credited to the permeable and unpleasant surface of Steel Slag.
- Compressive Strength, Split Tensile Strength, Flexural Strength increments with the expansion in Granular Steel Slag content at steady degree of Glass Powder up to half of Steel Slag which might be expected to the pozzolanic activity of Steel Slag Aggregates or distinction in hardness of Steel Slag and supplanted totals.
- The rate variety of compressive quality is 2.35% at M1, 7.35% at M2, 20.58% at M3, 13.53% at M4 for 7 days and 2.16% at M1, 7.23% at M2, 12.7% at M3, 10.45% at M4 for 28 days and 2.26% at M1, 11.4% at M2, 17.96% at M3, 14.73% at M4 for 56days regarding M0 Mix.
- The most extreme increment in Compressive quality is 20.58% at 7days, 12.7% at 28days and 17.96% at 56days for M3 Mix individually.
- The rate variety of Split Tensile Strength Test is 2.36% at M1, 6.3% at M2, 28.34% at M3, 11.02% at M4 for 7 days and 2.86% at M1, 6.2% at M2 20.95% at M3, 12.38% at M4 for 28 days and 3.3% at M1, 5.8% at M2, 24% at M3, 12.4% at M4 for 56 days regarding M0 Mix.
- For Split Tensile Test the most extreme increment is 28.34% at 7 days, 20.95% at 28 days and 24% at 56 days for M3 Mix individually.
- The rate variety of Flexural Strength Test is 1.26% at M1, 9.7% at M2, 35.02% at M3, 22.36% at M4 for 7 days and 2.22% at M1, 6.66% at M2, 24.5% at M3, 15.55% at M4 for 28 days and 2.5% at M1, 6.77% at M2, 24.8% at M3, 16.05% at M4 for 56days regarding M0 Mix.
- For Flexural Strength the most extreme increment is 35.02% at 7 days, 24.5% at 28 days and 24.8% at 56 days for M3 Mix individually.
- The squander materials for example Glass Powder and Granular Steel Slag may successfully be used in development industry for the creation of cement, balancing enormous amounts of concrete and regular totals. This may lessen ecological issues and land fill issues notwithstanding bringing down the solid creation cost.
- The created cement might be utilized for private development, where moderate compressive quality of cement is wanted. Be that as it may, sturdiness of solid should be examined to check its presentation against corrosive assault, sulfate assault, freezing and defrosting and so forth before application.

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