# Replacement of Usual Sand by Altered Substitutions in Current Leanings

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***ABSTRACT*:-Elementary requirements for any building diligence are Cement, fine and coarse aggregate. Fine aggregate plays a major role for preparation of plaster and concrete and similarly in mix design. Now a day's corrosion of watercourses and bearing in mind as ecological disputes, there is a shortage of river sand. The scarcity of river sand will disturb the building industry, henceforth there is an essential to invent the different alternative substantial to exchange the river sand, such that leftover stream corrosion and damage to environment is banned. Numerous scholars are finding dissimilar resources to replace sand. Using different proportion of these slag, ash, glass powder and quarry dust beside with sand the essential material combination can be achieved. This paper helps to analysis of the dissimilar substitutions to usual sand in preparation of plaster and concrete. The paper highlight on the physical and motorized belongings and power feature on plaster and concrete.**

***Keywords:*** **Sand, Quarry Stone Dust, Slag, Ash, Alternate Material, Physical Properties, MotorizedProperties.**

## *I. INTRODUCTION*

Elementary requirements for any building industry are Cement, fine and coarse aggregate. Fine aggregate plays a major role for preparation of plaster and concrete and similarly in mix design. In common consumption of ordinary sand is high, due to the enormous usage of concrete and plaster. Later the demand of ordinary sand is very high in emerging nations to gratify the speedy structure development. The emerging country like India fronting scarcity of worthy value ordinary sand and mainly in India, ordinary sand deposits are presence castoff and affecting environment as fine as the humanity. Speedy removal of sand from waterway couch initiating various complications for examples dropping liquid holding topsoil bands, excavating of the stream couches and affecting store slithers, damage to foliage on the series of streams, disrupts the aquatic lifecycle as well as distracts farming due to dropping the water desk in the well etc. The heavy-exploitation of stream grit for building purposes in Sri Lanka has directed to several dangerous harms [1]. Possibilities for several river sand replacements, such as offshore grit, quarry powder and sieved grit have also been primed [2]. Even still offshore grit is really castoff in numerous nations such for example the Sri Lanka, Singapore, UK, India and Continental Europe maximum of the accounts concerning usage of this alternate originate mostly as a smaller range of repetition in the building field [3]. Owing to scarcity of stream grit as well as its great the Madras High Court constraints on sand removal in streams Tamirabharani and Cauvery. Thus consequently the necessity to bargain another concrete and plaster aggregate solid to stream sand in construction mechanism has supposed superior significance nowadays. Scholar and Engineers partake through their individual concepts to decline or entirely change the usage of stream sand and custom current revolutions such as filtered sand, M-Sand (manufactured sand), stone crusher dust, robot sand, cured and filtered silt detached from basins as well as barriers also sand from former water builds [4]. Lately ordinary sand is flattering a very expensive solid because of its entreaty in the building industry owed to this illness investigation started for inexpensive and simply nearby substitute solid to ordinary sand. Practically substitutions resources consume previously stayed castoff by way of a replacement of ordinary sand such as quarry dust or limestone, filtered sand, fly-ash and siliceous stone powder, copper slag are recycled in concrete and plaster mixtures as a part or full replacement of ordinary [9].Physical as well as natural possessions of sand distress the toughness, strength and also workability of concrete, so sand is a most vital elementary of cement plaster and concrete. Usually river sand is castoff as fine aggregate in concrete and plaster. Composed coarse and fine aggregate make about 70- 85 % of entire volume of concrete and later it is identical significant to well appropriate type and good quality aggregate. On the further pointer, deficiency in essential value is the main restraint in some of the beyond resources. Nowadays maintainable infrastructural development necessitates the substitute solid that must gratify nominal provisions of sand as fine as it would be existing nearby through huge quantity.

Industrialized waste and by-products which have remained rising dangerous trepidations mutually for the atmosphere and social fitness be able to have main usage in structure. This can be beneficial for both the atmosphere and budget. This current effort is meant to decide whether such remunerations might be gained by the usage of these four materials composed to yield strength of Concrete and to enumerate such benefits and allow them to be castoff as limited replacement for grit in concrete.

Multipurpose auditoriums are one of the most important areas in the institutions around the world. This type of auditoriums is extensively used for lectures, concerts and cultural events. The structural and acoustical aspects of thistype of auditoriums have a great variation with other types of auditoriums, since it needs to accommodate a variety of events with acoustics suitable for all types. In the economical aspect of an institution, it is of great advantage to have a multipurpose auditorium instead of having various auditoriums of different types. For greater span truss with the bottom chord are inclined towards the mid span for withstanding the tensile and bending moment. A composite structure of steel truss supported over a concrete column is considered to be highly sustainable to withstand the structural load. As a replacement of conventional type of trusses modified lenticular shaped girders [10] are introduced to withstand the heavy bending moment occurring in long span structures [1]. The composite structure of a steel truss or girder over a concrete wall has developed recently. These are adapted as an alternative to conventional structures owing to its less structural weight, speedy construction and ability to bear high bending moment without any column interruption for long spans [2]. The connections can also be established on concrete beam to cut down the cost and increase the structural efficiency. Studies reveal that for biaxial loading conditions reinforced concrete columns are more efficient to withstand heavy compression loads [4]. The columns can be supported over any type of footing depending upon the behavior of soil [5].

## *II. DIFFERENT ALTERED SUBSTITUTIONS TO STREAM GRIT*

### *A. Granulated Blast Furnace Slag*

From iron and steel industry around 10 million tonnes Granulated Blast Furnace Slag (GBFS) is presently being produced in the nation. It is reflective particle and grainy materials and has a related particle size as like sand. The specific gravity of the GBFS is 2.6. As like sand the bulk density of GBFS differs from 1425 kg/m3. The water immersion of GBFS was found to be less than 2.5 %. The presence of silica in GBFS is about 25% as it is one of the elements of the natural sand. The fineness of GBFS was 2.35.

TABLE 1 CHEMICAL PROPERTIES OF GBFS

| | |
|---|---|
| $SiO_2$ | 40.98 |
| $Al_2O_3$ | 10.82 |
| $Fe_2O_3$ | 1.85 |
| CaO | 34.85 |
| MgO | 8.24 |
| $SO_3$ | 0.80 |

### *B. Fly-ash*

Currently India is producing in over 100 million tons of coal ash and also the by-product that is made in the thermal power plants. The fly-ash is categorized on the source of the chemical configuration, Class F fly ash is castoff for the replacement of sand. The specific gravity of class F flyash is 2.6.

TABLE 2 CHEMICAL PROPERTIES OF FLY ASH

| | |
|---|---|
| $SiO_2$ | 55.5 |
| $Al_2O_3$ | 31.3 |
| $Fe_2O_3$ | 6.4 |
| CaO | 1.02 |
| MgO | 0.21 |
| Alkalis equivalent | Nil |
| $TiO_2$ | 2.7 |
| $SO_3$ | 0.44 |
| Loss on Ignition | 0.74 |

### *C. Sheet Glass Powder (SGP)*

Crushing of glass pieces is done by crusher. Glass material is sieved in 2.36 mm sieve. Then it is used by replacing sand in different percentages. The specific gravity of the SGP is 2.5. The bulk density of SGP 2.53

TABLE 3 CHEMICAL PROPERTIES OF SGP

| | |
|---|---|
| $SiO_2$ | 72.5 |
| $Al_2O_3$ | 1.06 |
| $Fe_2O_3$ | 0.36 |
| CaO | 8 |
| MgO | 4.18 |
| $SO_3$ | 0.18 |

*D. Quarry Dust*

Around 20 to 25 %of the total production in each crusher unit is left out as the unused material quarry dust.

TABLE 4PHYSICAL PROPERTIES OF QUARRY DUST

| | |
|---|---|
| Specific gravity | 2.54 |
| Bulk density(kg/m3) | 1720 |
| Absorption (%) | 1.20 |
| Moisture Content (%) | Nil |
| MgO | 4.18 |
| $SO_3$ | 0.18 |

TABLE 5 CHEMICAL PROPERTIES OFQUARRY DUST

| | |
|---|---|
| $SiO_2$ | 62.48 |
| $Al_2O_3$ | 18.72 |
| $Fe_2O_3$ | 6.54 |
| CaO | 4.83 |
| MgO | 2.56 |

## *III.MATERIALS USED*

*A. Cement*:

The cement castoff is of OPC 43 grade as per the Standard Specifications. The cement according to the Indian specification must satisfy the IS code IS 12269- 1987 .

*B. Fine Aggregates:*

The river sand which is the maximum commonly used ordinary material for the fine aggregates that is used, but the current collective issue that produced a scarcity of the material formed a great problem in the building sector. For the studies the river sand of Zone-II is used in all the locations.

*C. Coarse Aggregate:*

Normal stonework wrecked stone combinations of size larger than 12mm are castoff for the study.

*D. Mixing of the Materials*:

The ordinary grade of the concrete that is castoff is M20 for ordinary construction purposes in India.The mix deign is done separately for the Granulated Blast Furnace slag, Class F fly ash, Sheet glass powder and quarry dust using the minimum void ratio methods and maximum density method

## *IV TEST SPECIMENS AND TEST PROCEDURE*

The 150mm x 150mm x 150mm size concrete cubes, concrete beams of size 100 mm x 100 mm x 500 mm were castoff as trial samples and then the cubes and beams are kept for curing .Thecompressive strength test was done according to IS 516: 1959 for 7days, 14days, 21 days and 27days for ordinary mix and for the partial replaced samples. Theflexural strength test was done in 27 days for ordinary mix and for the partial replaced samples. The samples were cast for M20 grade and for coarse aggregates of size 20 mm was used. By partial replacement of sand by Granulated Blast Furnace slag, Class F fly ash, Sheet glass powder and quarry dust as 2.5% each, 5% each and 10% each.

*Figure 1. Compressive strength test*

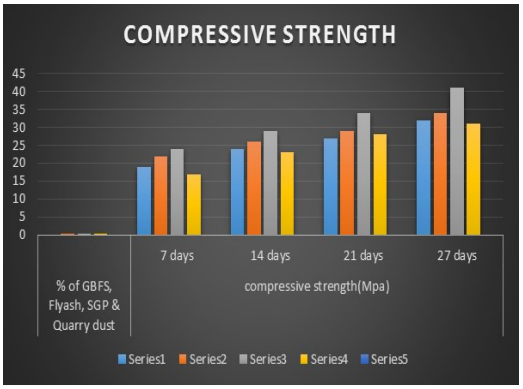
*Figure 2. Flexural strength test*

## *V. RESULTS*

The compressive strength and flexural strength results of standard cubes and beams are assembled in below Table 5. The Indian standard method ensued in highly conventional results of compressive and Flexural strengths.

TABLE 4 RESULTS OF COMPRESSIVE AND FLEXURAL STRENGTH TEST

| % of GBFS, Flyash, SGP& Quarry dust | compressive strength(Mpa) | | | | flexural strength (Mpa) |
|---|---|---|---|---|---|
| | 7 days | 14 days | 21 days | 27 days | 27 days |
| Control mix | 19 | 24 | 27 | 32 | 5.1 |
| 2.5% | 22 | 26 | 29 | 34 | 5.5 |
| 5% | 24 | 29 | 34 | 41 | 5.7 |
| 10% | 17 | 23 | 28 | 31 | 4.7 |



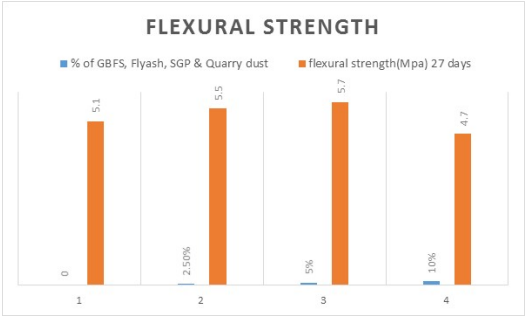




*Figure 3. Comparision of Compressive Strength*

*Figure 4. Comparision of Flexural Strength*

## *VI CONCLUSION*

There is development in the compressive and flexural strength of the concrete by limited replacement of Granulated Blast Furnace slag, Class F fly ash, Sheet glass powder and quarry dust in concrete. The maximum strength is attained by 5% replacement of Granulated Blast Furnace slag, Class F fly ash, Sheet glass powder and quarry dust in concrete. There is no increase in strength observed with 10% of each replacement in concrete. Test results shown that the compressive and flexural strength of 2.5% replacement of each material in concrete is slight minute greater than that of the 10% replacement of each material in concrete at age of 7, 14 , 21 an d 27 days, respectively shown in fig 3 and 4.

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