

Conglasscrete and Green Concrete using Chemical Curing

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Abstract: Waste glass is a main component of the solid waste material in making conglasscrete concrete. It can be found in many forms like flat glass of windows, bulb. At present time a small proportion of the waste glasses are recycled and reused in significant proportion making conglasscrete cubes which is about 84% of the waste glass is used in making conglasscrete. Glass is a recyclable material and imparts high strength or show good aesthetical properties It suitable for long time uses. Glass is most useful thing in a human life in manufacturing products such as vehicles, sheet glass, bottles, glassware, and vacuum tube. Glass is a good material for recycling and it is used in construction processes. The use of recycled glass save the energy and it is economical compared to other materials. Increasing in rate of glass recycling speeds up in the use of waste glass with different process in various fields. One of the significant importances of glass in construction field where the waste glass is recycled and reused for making concrete. The application of glass also in architectural field to good aesthetical view. Laboratory experiments work are conducted in the SHIATS to identify the use of waste glass as coarse and fine aggregates replace or add in making concrete. The study gives the Waste glass can effective to be used as coarse or fine aggregate replaced or add (up to 50%) without change in strength.

Glass is a good material because it is easily replaced by a coarse aggregate and it is economical.

Keywords: Coarse aggregate; Compressive strength; Concrete; Waste glass.

I. INTRODUCTION

Glass is a good transparent material and it is produced by a mixture of raw materials like SiO_2 , soda ash, and calcium carbonate (CaCO_3) at a temperature up to cooling during a time when it gain form of solid without crystallization process. For a main purpose to developed a technique to use the waste glasses in making concrete crushed glass pieces are replaced as coarse aggregates in conglasscrete concrete. In the above study it is shown that waste glass that is first crushed and then screened should be strong safe environment friendly and economical in concrete. In the few decades it is shown that the Sheet Glass from shops, factories, and construction areas has a big quantity. From Using waste glass in making concrete construction field is beneficial because the production cost of concrete will be going down. The amount of mixed waste glass in concrete is gradually increased over the last few years due to an ever-growing use of glass products. Most waste glasses are not useful in the construction so it is dumped into landfill sites. The process of land filling of waste glasses is not beneficial because these glass materials are not biodegradable and less

environmentally friendly. There is huge potential for using waste glass in the concrete construction field. When the waste glasses are mixed in making concrete cubes, the total production cost of concrete will go down. If the Crushed glass is in proper size then it is also used as a fine aggregate in making conglasscrete cubes. When it is used in construction process, waste glass should be crushed and screened to produce a proper design gradation. Rock crushing equipments are used to crush the waste glasses. The glass crushing equipments are primarily used to reduce the size or density of the glass for easily transportation purpose. the glass crushing equipments is typically smaller and uses less energy than rock crushing equipments.

The application of alkali silica ratio is limited because it is responsible for damaging and expansion of concrete cubes.

The chemical reaction between the alkali and silica in aggregates of Portland cement forms silica gel. This silica gel is not only responsible for the cracks in concrete, but it also creates a weakness the concrete and harmful for its life.

Ground waste glass is also used as aggregate form in the mortars and no reaction are detected with fine aggregates; it indicates the feasibility of the waste glass reuse as aggregate in mortars and concrete. Estimated cost for housing projects of glass is more and some construction materials like natural aggregates are also becoming rare. In the present study an extensive experimental works and carried out to find the suitability of use of waste glass in making concrete and it was proposed-

- i. To study the workability of concrete mode using glass waste as partial replacement of coarse aggregate.
- ii. To study the compressive strength of concrete mode using glass waste as partial replacement of coarse aggregate.

II. MATERIALS & METHODOLOGY

Materials

- cement
- fine aggregates
- coarse aggregates
- water
- glass pieces

In order to study the effect of waste glass on strength of cubes as partial replacement of coarse aggregate with waste glass materials above materials are taken in proper proportion. To study a comparative analysis of conglasscrete and green concrete making the cubes by use of above materials.

Cement

Ordinary Portland cement (OPC) OF 43 grade are used to making concrete cubes.

It should provide strength to masonry and good moisture resistant.

It should possess good plasticity.

Fine Aggregate

Fine aggregates or sand is finding to disintegration of rocks. It is popular from gravel only by the size of grain particle, but it is apparent from clays which contain organic minerals. Sands that is used in concrete it sort out and separated from the organic material like action of currents of water or by winds across arid lands are generally quite uniform in size of grains. The commercial sand that is used in big construction is obtained from river beds or from sand dunes it is formed by the action of winds. Mostly earth's surface is sandy it contains sand on its surface, and the sand is quartz. Sand is used to making mortar and concrete and for making concrete cubes.

Coarse Aggregate

Coarse aggregate are the material which find from crushed stones and used for making concrete. The commercial stones are quarried, crushed and graded. Much of the crushed stones used are granite, limestone. Crushed angular size of granite material of 10 mm size from a local source was used as coarse aggregate. The specific gravity of 2.6 and fineness modulus 6.05 should be used. Also The coarse aggregate are granular materials obtained from rocks and crushed stones. They may be also obtained from various materials like slag, shale, fly ash and clay for use in light-weight concrete.

Water

Potable water is used for mixing and curing of ordinary concrete cubes. If mixing of higher percentage of demolished waste glass then requirement of water increases for the same workability. Slump test has been the criteria for water requirement but the specimens having 0% demolished waste, water cement ratio of 0.60 has been used.

Concrete

The concrete mix design is done according to IS: 10262:1982. The cement content in the M-25 grade of mix design is taken as 340 kg/m³ which fulfill the minimum requirement of 300 kg/m³ in order to avoid the balling effect. The aggregates like Good stone aggregate and natural river sand of zone-4(Jaipur) are used as coarse aggregate and fine aggregate respectively. Maximum size of coarse aggregate was 19.5 mm of angular size[1]. The sieve analysis is done according to IS: 383-1970 was carried out for both the fine and coarse aggregate.

Concrete may be produced as a dense mass which is practically artificial rock and various chemicals are added to make it waterproof or it can be made porous and highly permeable for such use as filter beds[2]. An air-entraining agent may be added to produce bubbles for porosity. Normally, the hardening period of concrete is at least 7 days and first time compressive strength are checked out after

7days. The gradual increase in strength is due to the heat of hydration of the C₃A and silicates[3]

C₃A are responsible of all undesirable properties of concrete.

Sand used in concrete are originally specified as roughly angular, but rounded grains are now preferred. The weight of concrete varies with the type and the amount of rock and sand that is aggregates.

III. RESULT AND DISCUSSION

Apparatus

- Cube Mould of size (150x150x150 mm).
- Tamping rod of 16 mm diameter.
- Trowel.

Procedures of Making Concrete Cube

Making concrete-cube specimen done in three simple steps-

- Cleaning & fixing mould.
- Placing, Compacting & Finishing concrete, and
- Curing.

1. Cleaning & fixing mould

Clean the cube-mould and provide oil on inner surface of mould.

Fix the cube mould with base plate. No gap should be left in joints of mould so that cement-paste doesn't penetrate.

- Place the mould on plane surface.

2. Placing, Compacting & Finishing concrete

- Take concrete from ready mix.
- Place concrete into mould in three or four layers. Compact each layer by giving 35 blows of tamping rod.
- Use table vibrator to remove voids in concrete mix.
- Remove excess concrete from the top of mould and finish concrete surface with trowel.
- Left the mould on plane surface for first five hours after casting.

3. Curing

- After casting cube placed for curing in water or chemical curing.
- After 28 days of curing take out specimens from water tank and send to laboratory for testing.

TABLE 1. COMPRESSIVE STRENGTH RESULTS

S.No	Cube Designation	Curing (In Days)	Comp. Strength(N/mm ²)		% of glass
			Ordinary con. cube	Conglascr-ete cube	
1.	A	7	16.56	20.75	10
2.	B	14	21.33	27.67	15
3.	C	28	24.52	32.33	20
4.	D	56	-	-	-

IV. CONCLUSIONS

- While using waste glass as coarse aggregate replacement, 28 days strength is found to marginally increase up to 20% replacement level.
- Waste glass can effectively be used as coarse aggregate replacement.
- The optimum replacement level of waste glass as coarse aggregate is 10%.

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