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INVESTIGATION OF GLASS FIBRE ON CELLULAR LIGHTWEIGHT CONCRETE PROPERTIES

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Abstract - To achive high strength, reduced dead load, decrease the foundation, energy saving, waste consuming temperature concervation and noise pollution. By preparing to investigate the strength of glass fibre on mechanical properties of structural lightweight foamed concrete. Foam agent was used to produce lightweight concrete to obtain high workability and compressive strength with slight test fresh density. The volume fraction of the glass fibre used are 0,0.5,0.75,1.0,1.25,1.5 of total volume. The result of SLFC mixtures show that increase in glass fibre content can produce foam concrete with enhanced mechanical properties of all percentage of glass fibre in the mixes.

Introduction - Concrete is considered as one of the most widely used material in construction. Concrete is initally poured in the liquid matter into places which eventually becomes hard after a certain period of time like natural rock and so it is characterized as a quintessential construction material. The global obtainable major cement replacement materials are silica fume and fly ash which is generated in thermal industries and has an adverse effect on the environment. These are predominantly used as the cement replacement in order to reduce the usage of cement. Moreover, they enhance the properties of concrete like durability, sulphate resistance and impermeability fly ash conceives all these properties. Fly ash initally improves the workability in the fresh state which is due to the particles fly ash being spherical shape and smooth. Fibre reinforced concrete is a concrete with a mixture of indiscriminately oriented and un-uniformly distributed short discrete fibre which increases the integrity of the structure. These fibres may include mostly glass, steel, carbon, nylon and polyester. The total quantity of fibre added to the concrete mix is calculated as a percentage by mass of cementitious material I.e, concrete and fibre, which ranges from 0.1 to 3%.

Material Investigation:

Glass fibre - A glass fibre or fibre glass can be defined as "a material consisting of extremely fine filament of glass that are combined in yarn and woven into fabrics, used in masses as a thermal and acoustical insulator, or embedded in various resins to make boat hulls, fishing rod. Glass Fibre Reinforced Concrete (GFRC) is a cementations composite product reinforced with discrete glass fibre of varying length and size. The glass fibre used is alkaline resistant as glass fibre is susceptible to alkali which decreases the durability of GFRC. Cement type is also found to have a considerable effect on the GFRC.

Here, we taken E-GLASS. It does not actually melt, but softens instead, the softening point being "the temperature at which a 0.55-0.77mm diameter fibers 235mm long, elongates under its own weight at 1mm/min when suspended vertically and heated at the rate of 5°C per minute".

- Does not corrodeand excellent workability.
- Invisible on the finished surface.
- Effective at very low dosage.

Sodium Louryl Ether Sulfate Foam(SLES) - SLES is an inexpensive and very effective foaming agent. SLES, SLS, ALS are surfactants that are used in many cosmetic products for their cleaning and emulsifying properties. It is derived from plam kernel oil or coconut oil.

SLES-$CH_3(CH_2)_{11}(OCH_2CH_2)nOSO_3Na$

Important properties of foam concrete:

- Resisting capacity fire
- Energy absorbing qualities
- Drying shrinkage
- Permeability.

Fly ash - Fly ash is an inorganic, non-combustible by-product of coal-burning power plants. As coal is burnt at high temperature, carbon is burnt off and most of the mineral impurities are carried away by the flue gas in the form of ash. Fly ash is used as cement replacement.

Cement - A cement is a binder, a substance used for construction that sets, hardens and adheres to other materials to bind them together. Cement used in

construction are usually inorganic, often lime or calcium silicate based, which can be characterized as non-hydraulic or hydraulic respectively, depending on the ability of the cement to set in the presence of water.

Properties of ordinary portland cement:

Properties	Values
Specific Gravity	3.12
Normal Consistency	29%
Initial Setting Time	65 min
Final Setting Time	275 min
Fitness	330 kg/m^2
Soundness	2.5mm
Bulk Density	830-1650 kg/m^3

Mix proportion –

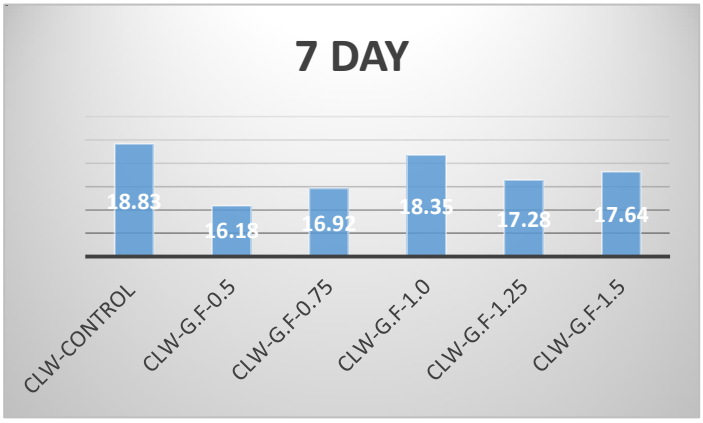
MIX ID	CLC-CONTROL	CLC-G.F-0.5	CLC-G.F-0.75	CLC-G.F-1.0	CLC-G.F-1.25	CLC-G.F-1.5
No. Of cubes	2	2	2	2	2	2
Fly ash (kg)	3.2319	3.2319	3.2319	3.2319	3.2319	3.2319
Cement (kg)	3.2319	3.2319	3.2319	3.2319	3.2319	3.2319
Glass fibre	0	0.5	0.75	1.0	1.25	1.5
Foam (ml)	3.5	3.5	3.5	3.5	3.5	3.5
Water (ml)	135	135	135	135	135	135

Procedure - Remove the specimen from water 7 and 28 days after specified curing time and wipe out excess water from the surface. Clean the bearing surface of the testing machine. Plan the specimen in the machine in such a manner that the load shall be applied to the opposite sides of the cube cast. Align the specimen centrally on the base plate of the machine. Rotate the movable portion gently by hand so that it touches the top surface of the specimen. Apply the load gradually without shockl and continously at the rate of 140kg/cm^2/minute till the specimen fails. Record the maximum load and note any usual features in the type of failure.

Resullt and Discussion - The compressive strength test is carried out on the specimens cubical or cyclindrical in shape. Compressive strength is one of the important properties of concrete. Cube moulds of size 150mm x 150mm x 150mm were used. If the largest nominal size of the aggregate does not exceed 20mm, 10mm size aggregate may also be used as an alternative. The 7 days and 28 days compressive strength was studied and are shown in the tabular form, Table shows the date of 7 days and 28 days, 28 days compressive strength is obtained.

SI. NO	CUBE SPECIFICATION	PERCENTAGE OF GLASS FIBRE(%)	COMPRESSIVE STRENGTH IN (N/mm^2)
1	CLW-CONTROL	0	18.83
2	CLW-G.F-0.5	0.5	16.18
3	CLW-G.F-0.75	0.75	16.92
4	CLW-G.F-1.0	1.0	18.35
5	CLW-G.F-1.25	1.25	17.28
6	CLW-G.F-1.5	1.5	17.64

Compressive strength of 7 days

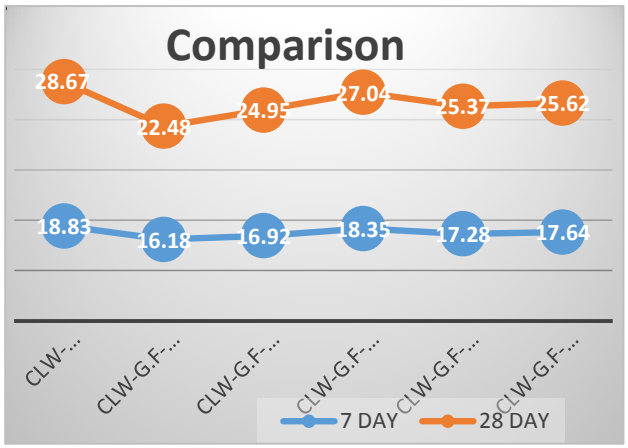


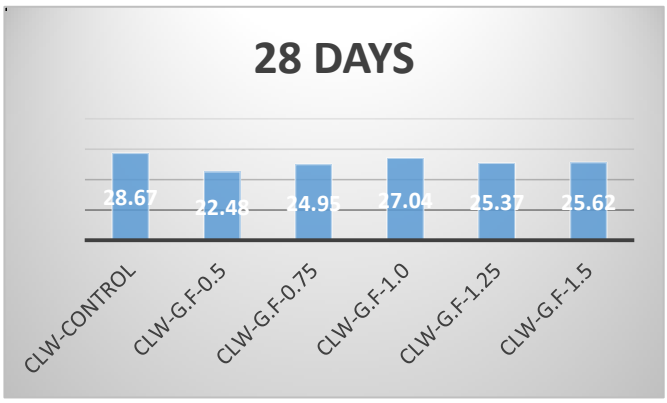
Graphical representation of 7 day test

SI.NO	CUBE SPECIFICATION	PERCENTAGE OF GLASS FIBRE(%)	COMPRESSIVE STRENGTH IN (N/mm²)
1	CLW-CONTROL	0	28.67
2	CLW-G.F-0.5	0.5	22.48
3	CLW-G.F-0.75	0.75	24.95
4	CLW-G.F-1.0	1.0	27.04
5	CLW-G.F-1.25	1.25	25.37
6	CLW-G.F-1.5	1.5	25.62

Compressive strength of 28 days

Graphical representation of 28 days test





Graphical comparision of 7 day and 28 day compressive strength test

CONCLUTION - The compressive strength of 28 days test of cellular lightweight concrete cube is approximately increased double the time of 7 day test strength. When no glass fibre and 1.0% of glass fibre is added it increase strength double the time. When 0.5% and 0.75% of glass fibre is added, it increased by 5 to 6 percentage of strength. Then, 1.25% and 1.5% increase the strength by 8 to 9%. The use of fly ash in foamed concrete either can grately improve its property ans studies the effect of glass fibre on properties of foamed concrete. The reduction in self weight of CLC block and increase in compressive strength. The test result on CLC are quite satisfactory and it can be used for non bearing exterior and interior wall also. It is advantageous in terms of general construction properties as well eco friendliness. Thus this CLC block in glass fibre has very good future scope for its development as a commercial product.

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