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Investigation on Self Curing Concrete with Polyethylene Glycol

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Abstract - *The aim of this research is to investigate the strength and hardness of concrete that has been handled with water-soluble polyethylene glycol as a self-curing agent. The objective of a self-curing agent is to avoid the evaporation of water from cement. It is necessary to use self-curing admixture ,particularly as water resources grow more valuable by the day. Concrete was treated with polyethylene glycol in amounts of 1%, 7 1.5%, and 2%. (i.e., each 1m3 of concrete needed approximately 3m3 of water to construct). The most of it is for the sake of recovery. At 7, 14, and 28 days of age, concrete made from The compressive resistance, the split tensile and flexure strength were measured for the M20-grade mix and the results were comparable with normal concrete.*

Key Words: **Polyethylene Glycol, Self-Curing Agent, M20-Grade, Admixture, Strength, etc**

1.INTRODUCTION

Concrete is the most commonly used building tool on the planet. Many aspects of our daily lives depend on real, whether expressly or indirectly. Concrete is manufactured by mixing widely available materials such as cement, concrete, and water. Concrete is unique to large building materials because it is particularly engineered for complex structural project engineering. Concrete is a building material that consists of granular materials such as coarse concrete, linked by a morter or binder filling and holding them together within the spaces between the particles. Concrete is widely utilised in the construction and renovation of facilities around the world. Finding suitable alternatives for concrete planning is becoming more challenging. As a consequence, natural aggregate sources other than sand and gravel are becoming more relevant.

1.1 CONCRETE

Concrete is a composite medium in which an inert particle of well-graded fine and coarse concrete is bonded together by a binding material mixed in water and solidified.

1.2 CLASSIFICATION OF CONCRETE

Concrete are classified into different types: ¬ According to binding materials used in concrete ¬ According to design of concrete.

2. Methodology

Collection of Raw Materials: The materials used in this project are Ordinary Portland cement (OPC), Coarse aggregate, Fine aggregate, PEG-400(polyethylene glycol), Flyash (coal burning product) are easily available in market

Table -1: Material Required

Sr. No	Material Used
1	Cement
2	Course Aggregate
3	Fine Aggregate
4	Polyethylene glycol

Compressive Strength: This metric determines the compressive strength of reinforced concrete. The compressive strength of concrete is shown by the compressive test in optimal circumstances. The compressive strength of concrete is an indicator of its strength once it has hardened. Testing should be carried out with care. The test was carried out at a standardised stress of 140 kg/cm2/minute after the specimen was centred in the measurement unit. Loading continued until the dial gauge needle simply reversed its movement. The needle's path has been redirected, meaning that the specimen failed. The dial gauge reading at the time, which was maximum load, was registered. The ultimate cube compressive power is proportional to the ultimate load separated by the specimen's cross sectional area. The compressive strength of concrete reveals information about the material's general quality. The test specimen is cubical in shape and measures 150mmx150mmx150mm. If the highest normal dimension of the aggregate is less than 20mm, 10mm cubes would be used instead. Compressive strength checks are conducted on specimens of proven age, ideally from different batches made for each age of processing. All of the cubes were tested in a saturated condition after the surface moisture was removed. At 7 days and 28 days of self-curing, each trail mix mixture three cube was tested using a compression measuring machine with a capacity of 2000KN according to IS 516-1959.

Cement used : OPC53 grade confirming IS 8112

Specific gravity of cement : 3.15 Specific gravity of

Fine aggregate : 2.65

Coarse aggregate : 2.67

Fine aggregate : NIL

Coarse aggregate : NIL

TEST ON FINE AGGREGATE

- **Fineness modulus test**

The fineness modulus was used to calculate the fineness of the aggregates. Sieve analysis is used in this test. One kilogramme of fine aggregate was obtained. The sieve sets were positioned with the pan at the bottom and ranging in size from 4.36mm to 75 micron. The aggregate sample was placed in a 4.36mm sieve, capped, and run for 10 minutes. The weight of each sieve's preserved sample was recorded after 10 minutes Specific gravity test Moisture content test.

- **SPECIFIC GRAVITY TEST**

A precise gravity test was carried out using a pycnometer. First, w1 is the pycnometer's empty weight with cover. The pycnometer's weight, which had been filled with 400g of sand, was then recorded as w2. The weight was recorded as w3 after filling the pycnometer up to the lid with water. The pycnometer was then properly washed and filled with water as w4.

TEST ON COARSE AGGREGATE

- **Specific gravity test**

A pyrometer is sometimes used to calculate the precise gravity of coarse aggregate. A third of the pycnometer was filled with coarse aggregate sieved through a 20mm sieve.

S.NO	TRAIL	w1(g)	w2(g)	w3(g)	w4(g)	
1	1	620	825	1640	1510	2.73
2	2	620	815	1630	1510	2.65

- **Fineness modulus test**

Fine aggregate is graded into four grading zones according to IS 383- 1970, ranging from coarser and (zone1) to fines sand (zone 4)

Sr.NO	Sieve size mm	Wt of particles	% of wt retained	Cumulative % of wt retained	% fineness
1	20	0.385	19.25	19.25	80.75
2	16	0.780	39	58.25	41.75
3	12.5	0.630	31.50	89.75	50.25
4	10	0.155	7.75	97.50	2.50
5	6.3	0.050	2.50	100	0
6	4.75	-	-	-	-
7	pan	-	-	-	-

TEST ON CEMENT

- **Consistency Test**

The volume of water used to make the cement paste is referred to as the cement's regular consistency. This paste is used to assess the initial and final setting times of cement, as well as its soundness. The Vicat apparatus is used to determine the consistency of the cement paste.

- **Initial Setting Time**

The vicat apparatus was often used to determine the initial setting time of cement. 500g of cement and usual quality water content is used to make cement paste. After that, the paste was put in a vicat mould and left in place. The Vicat needle was put on the surface of the cement paste and then released. It was recorded how long it took to hit a depth of 33-35mm.

TEST ON FRESH CONCRETE

- **SLUMP CONE TEST**

The slump cone scale, which employs a 30cm slump cone, is used to assess the intensity of fresh concrete. The slump cone was refilled with new concrete and

tamped 15 times. When the concrete has been cored, the slump cone is removed vertically and the concrete is able to remain alone. The concrete would then settle and the height of the subsided concrete will be measured. This experiment was repeated many times with various water cement ratio.

- **COMPACTION FACTOR TEST**

The compaction element is often used to evaluate the workability of fresh concrete. A compaction factor unit is used in this study. To begin, new concrete with a lower water cement ratio was mixed. The compaction factor machine is made up of anupper hopper, a lower hopper, and a cylinder. At the lower part of the hoppers, trap doors are provided. The empty weight of the cylinder was determined.

After that, the upper hopper is packed with concrete and compacted. The trap door in the upper hopper was then opened, allowing concrete to spill into the lower hopper. After that, the lower trap door was opened, allowing the concrete to fall on the cylinder. The surface of the cylinder was rubbed clean, and the weight was taken. Following that, concrete as poured and compacted into the upper ho per, and the process was repeated.

Result:

Sr.no	% of PEG	Compressive strength After 7 days	Compressive strength After 14 days	Compressive strength After 28 days
1	0%	13.65 Mpa	16.20 Mpa	21 Mpa
2	0.5%	18.20 Mpa	22.50 Mpa	27.56 Mpa
3	1%	19.30 Mpa	24.80 Mpa	29 Mpa
4	1.5%	21.40 Mpa	27 Mpa	32.30 Mpa

3. CONCLUSIONS

The compressive strength rises as percent polyethylene glycol is increases, and When 0.5 – 1.5% PEG is added, the split tensile strength increases; when PEG is added, the intensity increases. Flexural pressure rises as percent PEG is applied. The PEG optimum ideal dose with the highest compressive strength and split tensile strength was discovered to be 0.5 – 1.5% of the PEG optimum ideal dosage. A workability analysis shows that the percentage of PEG-4in concrete improves as the percentage of PEG rises. Self-curing concrete is the alternative where there is a larger scarcity of water. For curing in the study, cast cubes, rods, and prisms were kept at room temperature.

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