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Physical Properties of Self Curing Concrete by using Polyethyline Glycol

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Abstract*: The existence of a world without concrete is impossible. Concrete is a soul of infrastructure & constitutions. Concrete is necessary to gain strength in structures. Conventional concrete, which is the mixture of cement, fine aggregate, coarse aggregate, water, needs curing to achieve strength. So it is required to cure for a minimum period of 28 days for good hydration and to achieve target strength. Lack of proper curing can badly affect the strength and durability Criteria's. Self curing concrete is the one modern type concrete, type concrete, which cure itself by retaining water (moisture content) in it. The use of admixture POLYETHYLENE GLYCOL in conventional concrete as an admixture helps better hydration process and hence to achieve better strength of the concrete. In this present research work individual effect of admixture PEG400 & PEG1500 on compressive strength by varying the percentage of PEG400 and PEG1500 by weight of cement 0.5%, 1.0%, 1.5% and 2% were studied. The study shows that PEG400 and PEG1500 could help in gaining the strength of conventional concrete by reducing the conventional curing period. It was founded that 1.5%of both PEG400 and PEG1500 by weight of cement was optimum for M30 and M40 grade concrete for achieving maximum strength without compromising workability. The test results indicate that use of water soluble polymer like PEG400 and PEG1500 in conventional concrete has improved performance.*

Keywords:-Self-curing concrete, water retention, admixture and workability

I. INTRODUCTION

Concrete is the fundamental engineering material is used in civil engineering structures. Curing of concrete structures is key to meet the act, workability and durability requirements. In conventional curing this is achieved by external curing applied after placing, mixing and finishing. In conventional curing this is achieved by external curing applied after mixing, placing and finishing. Self-curing or internal curing is a technique that can be used to provide additional moisture in concrete for more effective hydration of cement and reduced self-desiccation. Self-curing concrete is good durability and good strength and self-curing ease with which it can be manufactured at site. Concrete like a engineering properties is a workability, strength and durability.

The concept of self-curing concrete is to be reducing the water is restricted from concrete, and hence increase the water maintenance capacity by means of some chemical compounds of the concrete compared to conventional curing concrete. It was found that water soluble polymers (polyethylene glycol*)* can be used as self-curing agents in concrete.

II. REVIEW OF LITERATURE

Patel Manish Kumar Dahyabhai: The experimental study the strength of self-curing concrete by adding poly ethylene glycol PEG600 and PEG1500 @ 0.5%, 1%, 1.5% and 2% by weight of cement to the concrete of each. The experimental program was aimed to study compressive strength. To study the above properties, mix of M25 were considered.

Shikha Tyagi: The experimental investigation the strength of self-curing concrete by adding poly ethylene glycol PEG400 @ 0.5%, 1%, 1.5% and 2% by weight of cement to the concrete of each. The experimental program was aimed to study compressive strength. To study the above properties, mix of M25 and M40 were considered.

M.V.Jagannadha Kumar, Srikanth and K.Jagannadha Rao: The experimental search the strength of self-curing concrete by adding poly ethylene glycol PEG400 @ 0.5%, 1%, 1.5% and 2% by weight of cement to the concrete of each. The experimental program was aimed to study compressive strength and split tensile strength. To study the above properties, mix of M20 and M40 were considered.

III. MATERIAL PROPERTIES

CEMENT: Ordinary Portland cement confirming IS: 12269: 1987.

TABLE No 1: Properties of Cement

PROPERTY	OBTAINED TEST RESULTS	CODAL VALUE (IS 12269:1987)
Soundness	4mm	Less than 10mm
Specific gravity	3.125	Not >3.15
Fineness	4%	Not >10%
Standard Consistency	30%	-
Initial setting time	53min	>30 min
Final setting time	276 min	Not > 600 min

FINE AGGREGATE: The fine aggregate conforming to zone II according to IS: 383-1970 was used.

TABLE No 2: Properties of Fine Aggregate

PROPERTY	VALUE	IS 383-1970
Fineness modulus	2.67	2.2-3.2
Specific gravity	2.61	2.6-2.7
Zone	II	

COARSE AGGREGATE: The coarse aggregate according to IS: 383-1970, the size of aggregate is used to below 20 mm.

TABLE No 3: Properties of Coarse Aggregate

PROPERTY	OBTAINED VALUE	IS 383-1970
Fineness modulus	6.43	5.5-8
Specific gravity	2.74	2.6-2.8
Impact value	12.07%	<35%

Admixture: The PEG is used to two types 1. PEG-400 (Liquid)
2. PEG-1500 (Solid).

WATER: Clean water was used in the investigational work for both mixing and curing purposes.

IV. EXPERIMENTAL PROGAMME

The experimental program was designed to investigate the strength of self-curing concrete by adding poly ethylene glycol PEG400 and PEG1500 @ 0.5%, 1%, 1.5% and 2% by weight of cement to the concrete of each. The experimental program was aimed to study compressive strength. To study the above properties, mix of M30 & M40 were considered. The scheme of experimental program as following. Cubes (150 x 150 x 150), Beam (100 x 100 x 500) mm of standard size were casted and tested for 28 days curing period and results for compressive strength and flexural strength for M30 & M40 grade concrete tabulated from TABLE No's 5, 6, 7 & 8 respectively.

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V. RESULTS AND DISCUSSIONS

TABLE No 4: M30 & M40 Grade of concrete slump test values

	MIX PROPORTIONS	SLUMP value(mm)	
		M30	M40
A	Without curing and without admixture (A)	65	**60**
B	With general curing and without admixture (B)	69	66
C1	With admixture PEG400 0.50% weight of cement(C1)	70	71
C2	With admixture PEG400 1% weight of cement(C2)	83	80
C3	With admixture PEG400 1.5% weight of cement (C3)	95	92
C4	With admixture PEG400 2% weight of cement (C4)	109	101
D1	With admixture PEG1500 0.50% weight of cement (D1)	75	70
D2	With admixture PEG1500 1% weight of cement (D2)	86	78
D3	With admixture PEG15001.5% weight of cement(D3)	91	87
D4	With admixture PEG1500 2% weight of cement(D4)	103	103

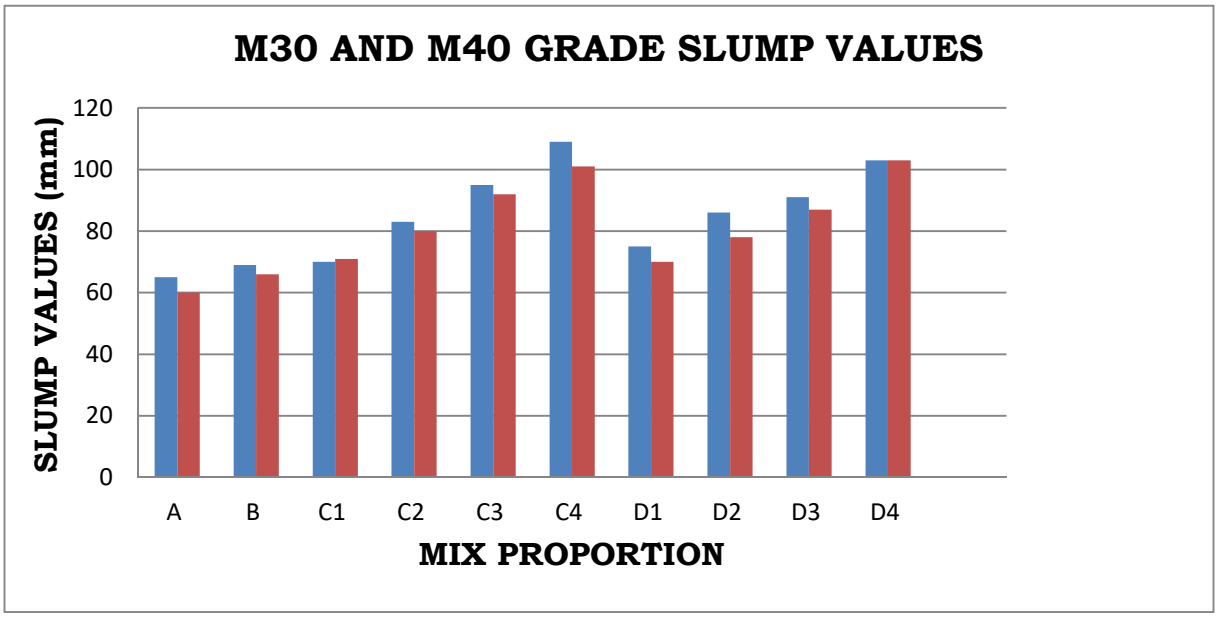

Fig:1: M30 And M40 Grade Slump Values

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TABLE No 5: M30 Grade of Concrete Compressive Strength

Mix proportion	M30 Compressive Strength (MPa)		Non-Destructive Testing Rebound Hammer Test Values	
	7 Days	28 Days	7 Days	28 Days
A	20.26	32.97	22	34
B	20.96	33.67	24	36
C1	20.36	33.40	22	36
C2	22.04	35.20	28	38
C3	22.35	36.97	30	40
C4	20.44	33.70	24	36
D1	21.02	34.00	24	38
D2	22.04	35.46	28	40
D3	22.66	37.02	32	42
D4	21.46	34.88	24	38

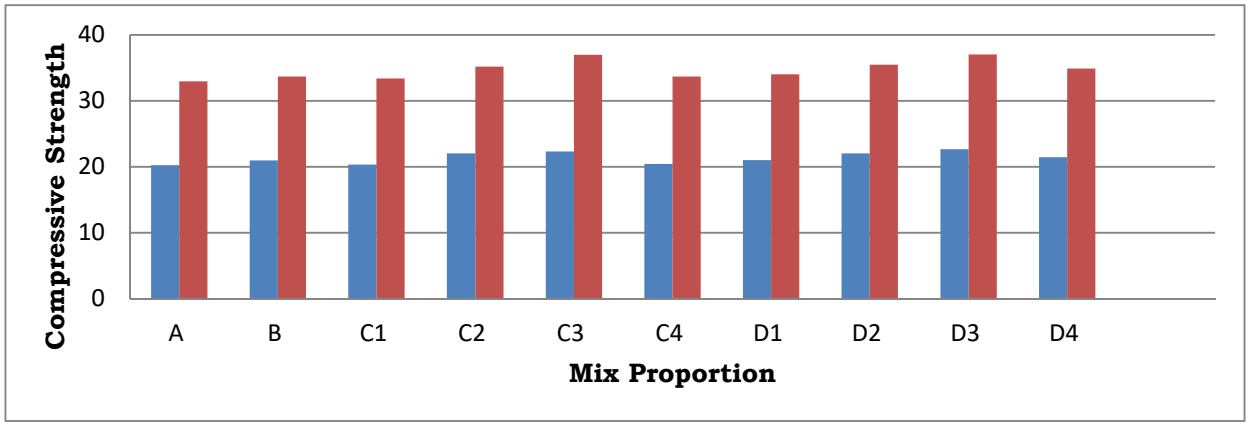

Fig No 2: M30 Grade of Compressive Strength

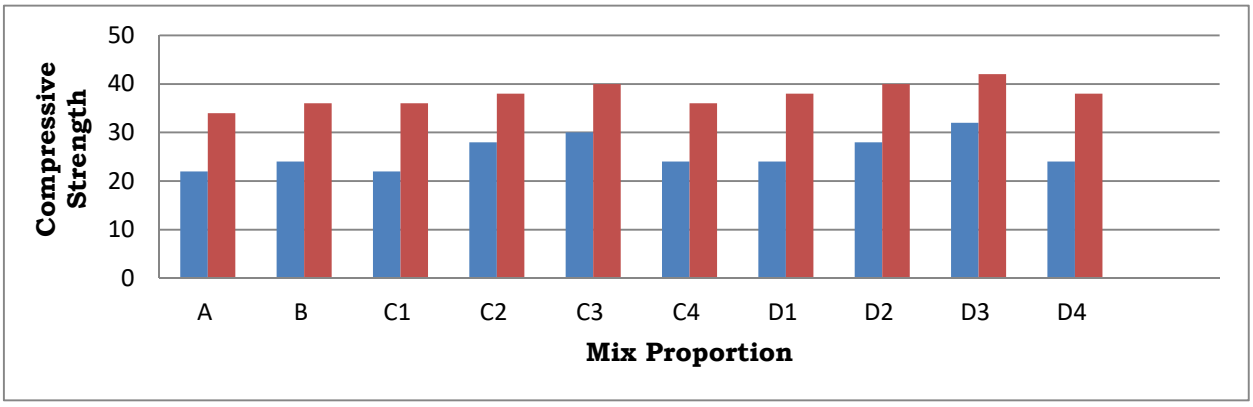

Fig No 3: Rebound Hammer Test Values

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TABLE No 6: M30 Grade of Concrete Flexural Strength

Mix Proportion	M30 Grade of Concrete Flexural Strength	
	7 Days	28 Days
A	1.96	3.5
B	2.09	3.66
C1	2.016	3.632
C2	2.13	3.87
C3	2.37	4.12
C4	2.05	3.75
D1	1.99	3.66
D2	2.162	3.89
D3	2.40	4.06
D4	2.22	3.70

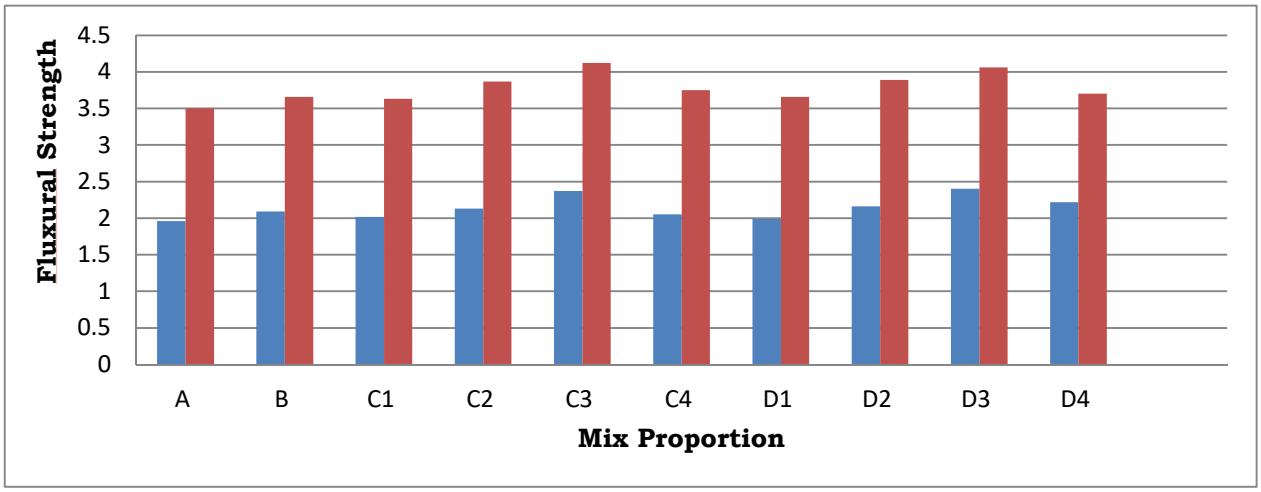

Fig No 4: M30 Flexural strength

TABLE No 7: M40 Grade of Concrete Compressive Strength

Mix proportion	M40 Compressive Strength (MPa)		Non Destructive Testing Rebound Hammer Test Values	
	7 Days	28 Days	7 Days	28 Days
A	28.59	41.53	30	44
B	28.90	42.91	32	44
C1	29.33	42.34	36	46
C2	30.91	43.72	40	46
C3	29.97	43.14	36	44
C4	27.03	39.03	30	42
D1	28.24	41.43	32	44
D2	31.01	43.79	40	46
D3	29.01	42.01	36	44
D4	27.03	40.66	30	42

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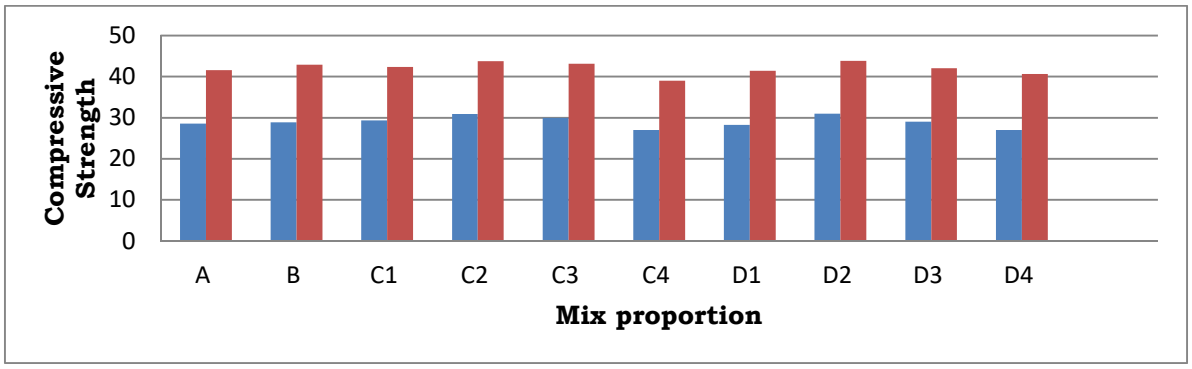

Fig No 5: M40 Grade of Compressive Strength

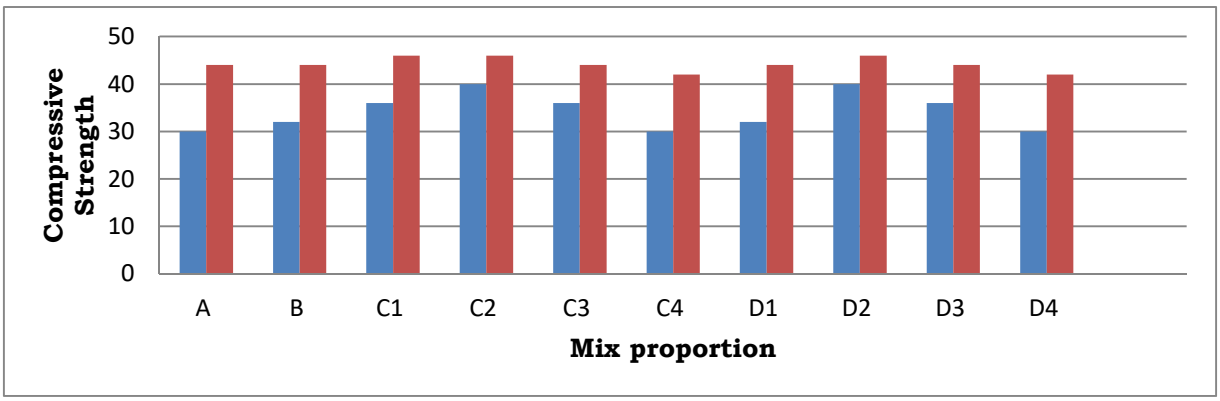

Fig No 6: Rebound Hammer Test results

TABLE No 8: M40 Grade of Concrete Flexural Strength

Mix proportion	M40 Grade of Concrete Flexural Strength	
	7 Days	28 Days
A	1.97	3.90
B	2.18	4.009
C1	2.17	3.98
C2	2.76	4.50
C3	2.36	4.22
C4	2.15	3.82
D1	2.10	3.94
D2	2.75	4.54
D3	2.18	4.2
D4	2.26	4.16

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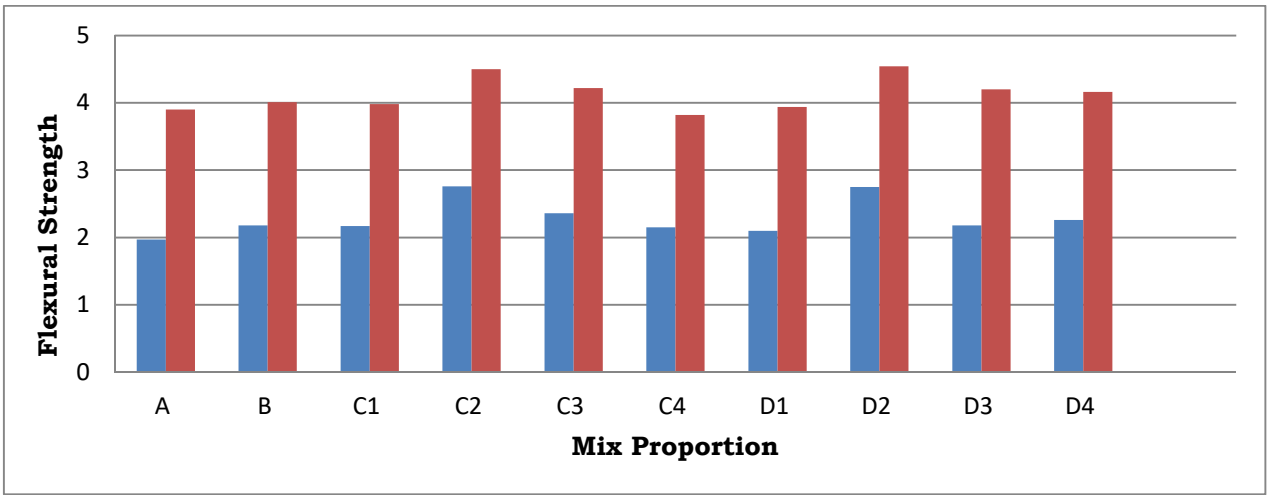

Fig No 7: M40 Flexural strength of concrete

VI. CONCLUSION

- As per the results compiled in the tables, compressive strength of a range of mixes for M30 and M40 Grade concrete we conclude that the compressive strength mixes using self curing compounds (PEG-400 and PEG1500) are equal with that of the concrete with conventional curing.
- The best dosage of PEG400 for maximum strength was found to be 1.5% for M30 and 1% for M40 grade.
- The best dosage of PEG1500 for maximum strength was found to be 1.5% for M30 and 1%for M40 grade
- From the slump test results the workability is increased and compressive strength for self -curing concrete gets decreased
- From these research work, we conclude that M30 (1.5%) grade shows better results than M40(1%)

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