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Comparison Between High Grade Retempered Concrete [M40] and Medium Grade Retempered Concrete [M20]

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Abstract - **As the grade of concrete is increases the quantity of cement is increases which effects on theproperties of retempered concrete. For M20 concrete we can retemper the concrete upto 120 min. but forM40 concrete retempering time is only 30 min. Adding water to a plastic mix to increase slump is an extremely common practice, even though it is not recommended because it increases the porosity of concrete. Concrete often arrives on site more than half an hour after initial mixing. Placement operations can take anywhere from 10 to 60 minutes, depending on the field conditions and the size of the load. When the slump decreases to an unacceptable level during the operations, water is added to the mix. Objective of this paper to study the strength characteristics of retempered concrete M20 & M40 concrete. Usually the retempering process is used with normal concrete or with ready mixed concrete; an attempt is made to check the compressive and flexural strength of normal retempered concrete with an addition of retarder in three different percentages as 0.2%, 0.4% and 0.6% at retempering time of 15 minutes to 90 minutes.**

Keywords: **Retempering of Concrete, Flexural Strength of Concrete, Compressive Strength of Concrete Slump of Concrete**

I. Introduction

Retempering is defined as "Addition of water and remixing of concrete or mortar which has lost enough workability to become unplaceable". Retempering inevitably results in some loss of strength compared with the original concrete [1]. Concrete is like material obtained by mixing cement, fine aggregate, coarse aggregate and water in specific proportions. Water is added for chemical reaction and gives workability to fill in the Manuscript (excluding authors' names and affiliations) form of shape and dimension for structure. The chemical interaction between cement and water bonds the aggregate into solid mass [2].

II. Effects of Prolonged Mixing on Slump Loss

The most important result of prolonged mixing is on slump value of concrete. Fresh concrete mixes tiffen with time, particularly if continuously mixed. This stiffening effect is reflected in a reduced slump and accordingly, this phenomenon is reflected as slump loss. This loss of slump value at prolonged mixed concrete is caused by a number of reasons. The main reasons are simply that some water from themix is absorbed by the aggregate if mix is not saturated, some water is lost by evaporation and some water is removed by initial chemical reactions The higher water absorption rate of aggregates as a result of longer mixing time is a reason for slump loss of prolonged mixed concrete .The grinding effect caused by extra mixing of fresh concrete causes greater amount of fine aggregate than the one determined duringdesign process. This situation results in a decrease in slump value, since increase in finer aggregateincreases the water demand for same consistency of concrete [3]. As the grade of concrete is increases the quantity of cement is increases which effects on theproperties of retempered concrete. For M20 concrete we can retemper the concrete upto 120 min. but for M40 concrete retempering time is only 30 min.

III. Research Significance

Ready-mixed (RMC) concrete which is mixed at the plant, using a normal, well-designed concrete mix, should arrive at its destination with sufficient workability to enable it to be properly placed and fully compacted. In such circumstances, where there is a significant period of time between mixing and placing the concrete, there will be a noticeable reduction in the workability of the fresh concrete. If for any reason,the placement of the concrete is unduly delayed, then it may stiffen to an unacceptable degree and site staff would normally insist on the rejection of a batch or otherwise good concrete, on the grounds of insufficient workability. If not rejected, excessive vibration would be needed to attempt to fully compact the concrete,with the risk of incomplete compaction, expensive repair, or, at worst, removal of the hardenedconcrete [4 & 5].

IV. Experimental Programme

The main aim of this experimentation work is to find the effect of addition of retardering admixtures on the properties

of retempered concrete. Portland Pozzolona Cement and locally available aggregates and crushed sand were used in the experimentation. The specific gravity of fine and coarse aggregate was 2.76 and 2.87 respectively. The experiments were conducted on a mix proportion of 1: 1.26:2.1 with water cement ratio (w/c) equal to 0.54 which corresponds to M 20 grade of concrete.

Table I Slump of Retempered Concrete

Retempering Time	Target Slump = 50 mm							
	O% retarder		O.2 % retarder		O.4 % retarder		O.6% retarder	
	M 20	M 40	M 20	M 40	M 20	M 40	M 20	M 40
0 minutes	76	50	80	70	100	100	100	100
15 minutes	73	30	77	50	80	65	85	70
30 minutes	62	10	73	20	77	30	80	35
45 minutes	30	0	68	10	70	15	77	17
60 minutes	20	0	33	0	65	0	70	0
75 minutes	10	0	25	0	50	0	65	0
90 minutes	0	0	20	0	33	0	50	0

Table II Compressive Strength of Retempered Concrete

Retempering Time	Compressive Strength at 28 days in N/mm^2							
	O% retarder		O.2 % retarder		O.4 % retarder		O.6% retarder	
	M 20	M 40	M 20	M 40	M 20	M 40	M 20	M 40
0 minutes	35.48	53.45	38.32	56.20	36.71	56.41	36.04	55.96
15 minutes	34.64	51.00	36.25	54.12	35.52	55.17	34.03	54.12
30 minutes	33.32	42.51	35.12	52.43	35.51	53.18	33.94	53.92
45 minutes	30.22	31.62	31.86	41.11	33.63	44.09	33.54	42.60
60 minutes	26.67	-	30.01	32.94	33.51	34.54	33.32	37.32
75 minutes	23.29	-	26.73	-	33.36	--	33.15	--
90 minutes	21.29	-	22.84	-	32.02	--	31.95	--

Table III Compaction Factor of Retempered Concrete

Retempering Time	Compaction Factor							
	O% retarder		O.2 % retarder		O.4 % retarder		O.6% retarder	
	M 20	M 40	M 20	M 40	M 20	M 40	M 20	M 40
0 minutes	0.93	0.87	0.87	0.92	0.94	0.94	0.94	0.94
15 minutes	0.91	0.85	0.92	0.87	0.93	0.88	0.93	0.93
30 minutes	0.87	0.78	0.87	0.80	0.93	0.85	0.93	0.92
45 minutes	0.85	0.70	0.86	0.78	0.92	0.80	0.93	0.85
60 minutes	0.80	0	0.85	0.78	0.91	0.79	0.92	0.80
75 minutes	0.79	0	0.84	0	0.89	0	0.91	0
90 minutes	0.78	0	0.81	0	0.87	0	0.89	0

After thoroughly mixing all the ingredients in dry state, the required quantity of water was added in the mix and thoroughly mixed. At this stage the homogeneous concrete mix was obtained. This concretemix was covered with gunny bags for 15 minutes. The time was reckoned,Another set of retempered concrete specimens were cast by adding 0.2% retarder and the required extra amount of water to balance a w/c ratio of 0.54 & 0.40 for M20 & M40 respectively. All the specimenswere demoulded and were transferred to curing tank to cure them for 28 days. After 28 days of curing the specimens were tested for their compressive strength and flexural strength as per IS specifications. For compressive strength test, the cubes of dimensions 150 mm X 150 mm X 150 mm were cast and weretested under compression testing machine as per I S 516-1959.

V. Conclusions

1) The concrete M 20 & M 40 without any retarder shows target compressive strength, flexural strength, up to retempering time 45 minutes & 15 minutes respectively.
2) The concrete M 20 & M 40 with 0.2% retarder shows target compressive strength, flexural strength, up to retempering time 60 minutes & 30 minutes respectively.
3) The concrete M 20 & M 40 with 0.4% retarder shows target compressive strength, flexural strength, up to retempering time 90 minutes & 30 minutes respectively.
4) Concrete M 20 & M 40 with 0.6% retarder shows target compressive strength, flexural strength, up to retempering time 90 minutes & 30 minutes respectively.
5) The concrete M 20 & M 40 without any retarder shows target slump, up to retempering time 30 minutes & 0 minutes respectively.
6) The concrete M 20 & M 40 with 0.2% retarder shows target slump, up to retempering time 45 minutes & 15 minutes respectively.
7) The concrete M 20 & M 40 with 0.4% retarder shows target slump, up to retempering time 75 minutes & 15 minutes respectively.
8) Concrete M 20 & M 40 with 0.6% retarder shows target slump up to retempering time 90 minutes & 15 minutes respectively.
9) With the addition of 0.2% retarder the demoulding period is increase up to 24 hours.
10) With the addition of 0.4 % retarder the demoulding period is increase up to 36 hours.
11) With the addition of 0.6% retarder the demoulding period is increase up to 48 hours.

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