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Effect of Retempering On Strength and Durability of Concrete (M 25 & M35)

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Abstract: *Retempering is defined as, ''Addition of water and remixing of concrete or mortar which has lost enough workability to become unplaceable ''. Retempering in results in some loss of strength compared with the original concrete. 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 min, 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. In this work, an attempt is made to study the strength characteristics of retempered concrete after 8 to 10 year old concrete structure by taking NDT. Durability of retempered concrete is affected after retempering time of 50 min and durability of concrete is depending up on 28 days strength of concrete.*

Keyword: *Compressive Strength, Retempering, Durability, destructive testing and Non destructive testing.*

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I. Introduction

Retempering is defined "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.

One of the adverse effects of hot weather concreting is loss of slump. Delay in the delivery of ready mixed concrete has the same result and leads many people in the concrete industry to regain the original slump by adding water, a process known as 'retempering'.

Concrete is stone like material obtained by mixing cement, sand, and aggregate in specific proportions and water is added for chemical reaction and give workability to fill in the form of shape and dimension for structure. The chemical interaction between cement and water bonds the aggregate into solid mass.

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 hardened concrete.

EFFECT OF PROLONG MIXING ON SLUMP

The most important result of prolonged mixing is on slump value of concrete. Fresh concrete mixes stiffen 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 the mix 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 .

If abnormal slump loss in anticipated or if transport times are significant, then the intelligent use of admixtures can alleviate the potential workability difficulties, although at additional cost, and this practice is common place. However, in cases where unforeseen delay Some other cause has lead unexpectedly to poor workability, retempering of the concrete by water, while normally considered to be bad practice, may, in reality,

be contemplated as a possible course of action. The increase in the water content of the concrete immediately prior to discharge will improve the consistency, but it is widely held that there must be a subsequent increase in the water/ cement (w/c) ratio which will be detrimental to the hardened concrete

METHODS OF ANALYSIS

The proposed objective can be studied through the experiment; therefore entire research work is experimental oriented. The main aim of this experimentation work is to find the effect of Retempering on durability of M25 & M35 grade concrete.

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 a homogeneous concrete mix was obtained. This concrete mix was covered with gunny bags for 15 minutes. The time was reckoned, the moment the water was added to the concrete mix. After 15 minutes the mix was poured into the moulds and the specimens were cast with sufficient compaction through vibration. This forms retempered concrete for 15 minutes. Similarly, the specimens were prepared with retempered concrete with a retempering time of 30 minutes, 45 minutes, 60 minutes, 75 minutes and 90 minutes.

THE MIX PROPORTIONS

Grade of Concrete	W/C	Cement	Fine aggregate	Coarse aggregate
M25	0.44	1	1.68	2.37
M35	0.41	1	1.6	2.907

Table no.1 – Mix Proportion of M25 & M35

DURABILITY OF CONCRETE

In general at construction site the curing cannot be more than 5 days. This is because so many parallel works are being carried out at the same time, such as centering work, brick work and also the pressure of completing work within stipulated time. Consequently the compressive strength of concrete reduces considerably because of this inadequate curing, but the customers are under the impression that the curing is done for almost 28 days. In addition to that retempering is a general practice at almost all sites which further reduces the strength of the concrete.

Durability defines the suitability of concrete to preserve its structural performances fixed by the designers, over specified span of time; hence it plays a fundamental role in determining the service life of the structure. Durability of concrete is defined as its ability to resist weathering action, chemical attack, abrasion or any other process of deterioration. The concrete should be designed without deterioration. As a matter of fact porosity and permeability are the governing parameter which is held responsible for the performance of the concrete.

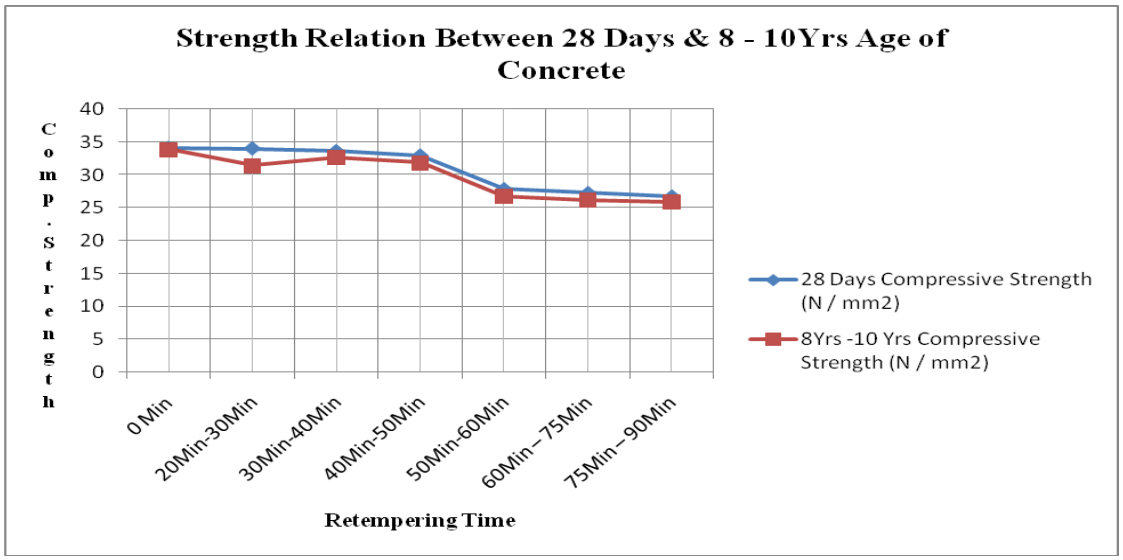
THE RELATIONSHIP BETWEEN STRENGTH AND POROSITY

Porosity is one of the major components of microstructure of the cement system. It influences the strength and permeability of concrete. All aspect of strength is related to the total porosity. The pore structure development in the cement pastes tends to reduce the volume of large pores during the initial stage of hydration. The presence of entrapped air capillary porous and estimated air in concrete could influence the strength properties of concrete.

OBSERVATION TABLE

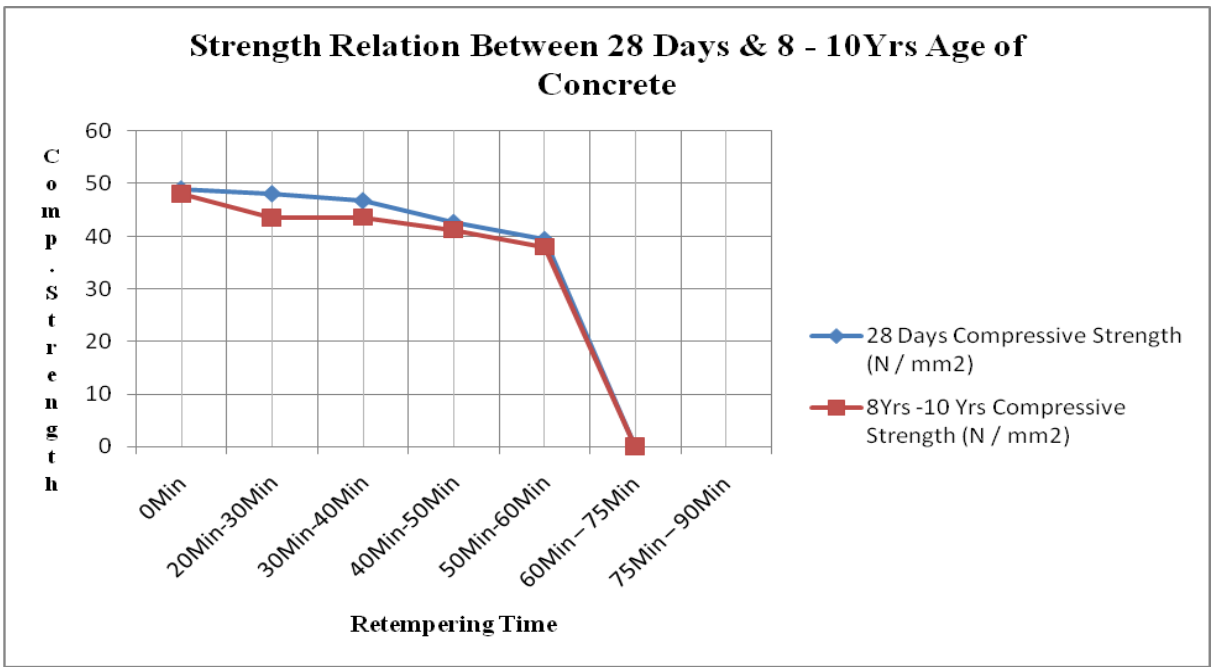
Sr no.	**Test conducted**	**Destructive Testing (By CTM)**	**Non Destructive Testing (By Rebound Hammer)**
	No of Specimens Tested	**21**	**45**
	Retempering Time	**Age of Concrete**	
		28 Days Compressive Strength (N / mm2)	**8Yrs -10 Yrs Compressive Strength (N / mm2)**
1	0Min	34.09	33.89
2	20Min-30Min	34.01	31.4
3	30Min-40Min	33.59	32.67
4	40Min-50Min	32.92	31.84
5	50Min-60Min	27.79	26.8
6	60Min – 75Min	27.21	26.2
7	75Min – 90Min	26.68	25.88

Table no. 2 – Compressive Strength of Concrete for M25

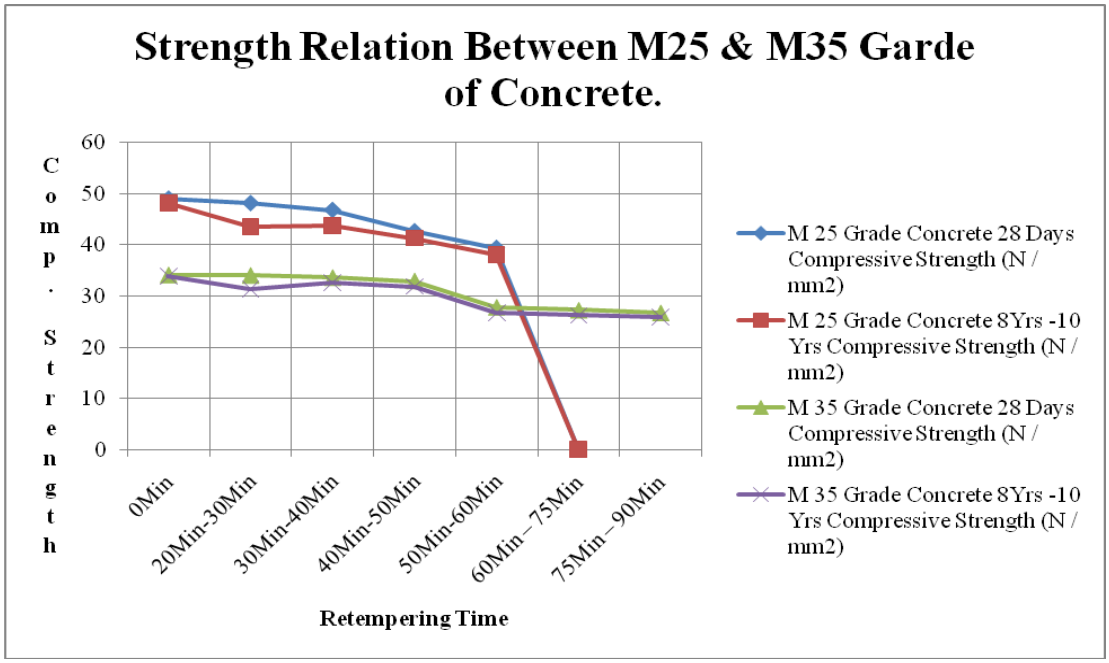


Sr no.	Test conducted	Destructive Testing (By CTM)	Non Destructive Testing (By Rebound Hammer)
	No of Specimens Tested	21	45
	Retempering Time	Age of Concrete	
		28 Days Compressive Strength (N / mm2)	8Yrs -10 Yrs Compressive Strength (N / mm2)
1	0Min	49	48.15
2	20Min-30Min	48.12	43.5
3	30Min-40Min	46.79	43.7
4	40Min-50Min	42.64	41.3
5	50Min-60Min	39.39	38
6	60Min – 75Min	Concrete is Not Workable	
7	75Min – 90Min		

Table no. 3 – Compressive Strength of Concrete for M35



II. Conclusions



- Strength of the concrete up to 50 min of retempering time is unaffected due to retempering process.
- Strength of the 28 days concrete is reduced after 50 min. Retempering time
- It observed that same effect on 8 to 10 years old concrete structure.
- From all above conclusion it says that durability of retempered concrete is affected after retempering time of 50 min.

"From above observation we can say that durability of concrete is correlate with 28 days strength of concrete."

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