

Effect of Moisture on Concrete during Monsoon Reduce Compressive Strength of Concrete Cube

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ABSTRACT

Concrete with various Mix design used for casting concrete cube. It was found that there is variation in compressive strength of concrete in 7days and 28 days concrete cube were casting at site in different season in a year. They were tested at quality control lab for research work. The cube casted in different season like spring, summer, autumn, winter, during the entire season. When the cube was test in different season for the 7days and 28 day test compressive strength. It was found that concrete strength varied during the season in a year. During the spring, summer, winter months 7days and 28 days cubes, there was increasing in compressive strength of concrete cubes. But in the rainy season 7days and 28 days cubes, started failing for the entire period of Monsoon season. It was also found that cubes does not fail immediately with the start of monsoon, it take minimum period of 15 day to 20 day start of monsoon. Once the monsoon period is over, the moisture in air starts reducing thus reducing the moisture in concrete cubes, moisture in air during monsoon plays a crucial role in increasing moisture in concrete cube thus reducing the compressive strength of 7days and 28days. The concrete cubes take one month to regain the compressive strength and then compressive strength of concrete cube starts giving very good result. This failure of concrete cube is only in monsoon period. Thus we can conclude that the transition of failing concrete cube end and concrete cubes starts passing compressive strength test.

INTRODUCTION

Concrete is the mixture of cement, fine aggregate and coarse aggregate plus admixture to increase the setting time of cement. Cement is a fine powder, which when mixed with water and allowed to set and harden can join different components like coarse aggregate, fine aggregate or members together to give a mechanically strong structure. Although the percentage of cement in concrete is around varies from 15% to 20%, the role of cement is very important in the strength and durability of concrete. Concrete mixtures can be designed to provide a wide range of mechanical and durability properties to meet the design requirement of structure. Selection of good quality cement is therefore essential. There are different Types of Cement, Although around eighteen types of cements are recognized by BIS, more commonly used ones are: Ordinary Portland Cement 33, 43, & 53 grade , Blended Cements (PPC and PSC), Sulphate Resisting Cement (SRC), Low Heat Portland Cement (LHPC), Hydrophobic Portland Cement, Coloured Cement(White Cement). Requirements of Good Concrete should meet the strength requirements as measured by compressive strength, fulfill durability requirements to resist the environment in which the structure is expected to serve, be mixed, transported and compacted as efficiently as possible and will be as economical as possible. Durability of concrete is the ability of concrete to withstand the harmful effects of environment to which it will be subjected to, during its service life, without undergoing into deterioration beyond acceptable limits". Durability can be

assured keeping in view the environment exposure of structure, certain minimum cement binder content, max limit on w/c ratio and a certain minimum grade of concrete for that particular exposure. Factors affecting Strength are the strength of hardened concrete depends on many factors are W/C ratio, strength of the cement, type and shape of aggregate, Entrained air content, moisture in cement, moisture in aggregate, moisture in fine aggregate, mix temperature, etc. The concrete mix proportions chosen be such that the concrete is of adequate workability for the placing condition of the concrete and can properly be compacted with the means available. monsoon or rainy season lasting from July to September. The season is dominated by the humid southwest summer monsoon, which slowly sweeps across the country beginning in late may or early June. Monsoon rains begin to recede from north India at the beginning of October. South India typically receives more rainfall. The monsoons winds in winter mainly blow from northeastern region of India subcontinent carrying a little amount of moisture.

METHOD

In the project specimen of fine aggregate, aggregate, cement was test at quality control lab. Combined Sieve analysis of aggregate 20mm (55%) and 10 mm (45%) was tested .While concrete pour, Slump test was taken at site to find the workability of concrete during pour. Once workability is found ok, cubes are casted (150mmx150mmx150mm). Concrete Mix design M-25, 43 grade cement was used .The sampling of the entire test was carried out for 388 set of cube were casted at site. The total number of cube tested 2324nos on site. The cement consumption found to be 366 bag/day, Aggregate (20mm&10mm) consumption found to be 1334 cft/day, fine aggregate consumption found to be 6 73 cft/day and concrete poured found to be 52m³/day. The specimen sample was taken in different season (spring, summer, autumn, winter) .The concrete cube were tested in same seasoning cycle spring, summer,

autumn, and winter. Following test was conducted in site.

Table: 1 Combined sieve analysis of coarse aggregate

Seive No	Wt. Ret	RetWt %	CumWt Ret%	Cumpass %	As per IS
40mm	0	0	0	100	100
20mm	680	13.60	13.60	86	85-100
10mm	4270	85.40	99.0	1	0-20
4.75mm	50	1.0	100	0	0-5

Table:2 Sieve analysis of Fine aggregate

SeiveNo	Weight h. Ret	Retained Wt %	Cumulative Wt Ret%	Cumulative pass%	As per IS
4.75	3	0.30	0.3	99.7	90-100
2.36	19	1.90	2.2	97.8	85-100
1.18	188	18.8	21	79.0	75-100
600micron	138	13.8	34.8	65.2	60-70
300micron	257	25.7	60.5	39.5	12-40
150micron	150	19.7	80.2	19.8	0-20
pan	198	19.8	100	0	0

Table:-3 Test on Cement

Sno	Type of Test	Result	Limits
1	Consistency of cement	21.25 %	43 Grade
2	Quantity of Water	85ml	400 gram (Cement)
3	Initial setting	95 min	> 30min
4	Final setting	140 min	< 600 min
5	Slump Test	100mm	
6	Fineness of cement	7%	

Table:-4 Test on fine Aggregate

Sno	Type of Test	Result	Limits
1	Bulking of Sand	3.33%	< 28%
2	Silt content	3.3%	< 8%
3	Sand water absorbsion	1.93%	

Table:-5 Test on coarse Aggregate

Sno	Type of Test	Result	Limits
1	Aggregate Water absorbsion	0.15 % (20mm)	
2	Impact Value	23 %	< 45 %
3	Crushing Value	11%	< 45%
4	Flakiness Index	11.5%	< 35%
5	Elongation Index	13.8%	< 25%

Table:-6 Test on Concrete cube different season (150mmx150mmx150mm)

Sno	Type of Test	Date of Cube	Result	Limits
1				
2	Compressive Strength 28day	May/06	27.31 N/mm2	During Normal Season (Summer)
3	Compressive Strength 7day	June/06	10.76 N/mm2	During Monsoon Season (Rainy)
4	Compressive Strength 28day	July/06	12.55 N/mm2	During Monsoon Season (Rainy)
6	Compressive Strength 7day	Aug/06	10.44 N/mm2	During Normal Season (Rainy Season)
5	Compressive Strength 7day	Sept/06	20.78 N/mm2	During Normal Season (End of rainy Season)Transition
6	Compressive Strength 28day	Oct/06	27.32 N/mm2	During Normal Season (Winter)
7	Compressive Strength 7day	Nov/06	19.76 N/mm2	During Monsoon Season (Winter)
8	Compressive Strength 28day	Dec/06	26.71 N/mm2	During Monsoon Season (Winter)
9	Compressive Strength 7day	Jan/07	21.76 N/mm2	During Monsoon Season (Spring)
10	Compressive Strength 28day	Feb/07	25.72 N/mm2	During Monsoon Season (Spring)
11	Compressive Strength 7day	Mar/07	17.71 N/mm2	During Normal Season (Spring)
12	Compressive Strength 28day	Apr/07	25.71 N/mm2	During Monsoon Season (Summer)

There is normally a gain of strength beyond 28days. The quantum of increase depends upon the grade and type of cement ,curing and environment conditions ,etc. The design should be based on 28 days characteristic strength of concrete unless there is a evidence to justify a higher strength for a particular structure due to age. The free water –cement ratio is an important factor in governing the durability of concrete and should always be the lowest value. Cement content not including fly ash and ground granulated blast furnace slag in excess of 450Kg/m³ should not be used unless special consideration has been given in design to the

increase risk of cracking due to drying shrinking in thin sections, or to early thermal cracking and to the increase risk of damage due to alkali silica reactions.

Table:-7 Test on cement Mortar (70mmx70mmx70mm)

Sno	Type of Test	Date of Cube	Result	Limits
1	Compressive Strength 3day	Mar/06	32.60 N/mm2	During Normal Season (Summer)
2	Compressive Strength 7day	Mar/06	40.81 N/mm2	During Normal Season (Summer)
3	Compressive Strength 28day	Apr/06	57.10 N/mm2	During Normal Season (summer)

Table:-8 Test on cement mortar (70mmx70mmx70mm)

Sl no	Type of Test	Date of Cube	Result	Limits
1	Compressive Strength 3day	June/06	26.68 N/mm2	During Monsoon season (Rainy)
2	Compressive Strength 7day	June/06	30.74 N/mm2	During Monsoon season (Rainy)
3	Compressive Strength 28day	July/06	36.82 N/mm2	During Monsoon season (Rainy)

Curing

The test specimens shall be stored in place ,free from vibration, in moist air of at least 90% relative humidity and at a temperature of 27°C+-2°C for 24hr+- half hour from the time of addition of water to the dry ingredients. After this period ,the specimens shall be marked and removed from the moulds and unless required to test within 24hr ,immediately submerged in clean ,fresh water or saturated lime solution and kept there until taken out just prior to test. The water or solution in which the specimen are submerged shall be renewed every seven day and shall be maintained at a temperature of 27°C+-2°C. The specimens shall not be allowed to become dry at any time until they have been tested.

Fig1: Concrete poured.

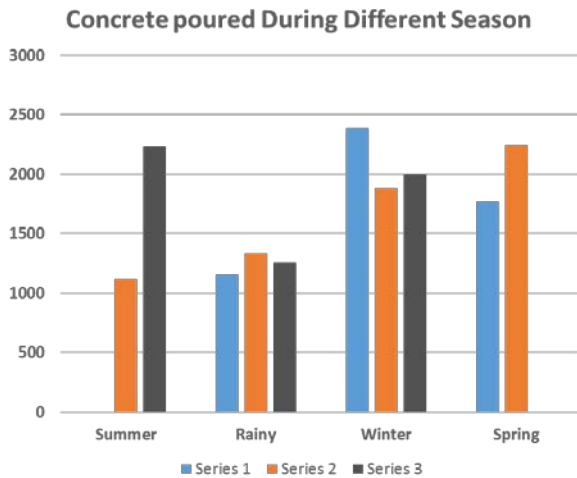
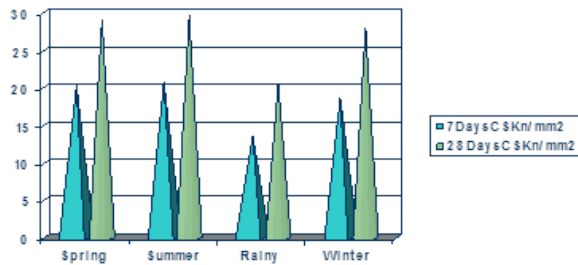


Fig2: Compressive strength of concrete.



CONCLUSION

From above analysis of the test carried out, it was revealed that decrease in compressive strength in Monsoon season is due to the presence of moisture in air which increases the moisture in concrete cube thus reducing compressive strength of 7days and 28days compressive strength of cubes. Moisture in fine aggregate, coarse aggregate and cement were the main cause in reducing in compressive strength of concrete cubes during the rainy season. It is normal Phenomena to change the cement batch during the monsoon season to increase the strength of concrete cubes. Whereas coarse

aggregate, fine aggregate pass the test and cement fail the test in rainy season. Raw material like fine aggregate does not pass the test due to high silt content. Transition from cubes failing at the start of monsoon season to concrete cubes starting passing at end of monsoon season. This Transition period last for one month after the monsoon ends. Once monsoon period is over concrete cubes starts regain the compressive strength both 7days and 28 days.

REFERENCE

- [1]. _____ Indian standard recommended guidelines for concrete mix design, IS 10262: 1982, Bureau of Indian Standards, New Delhi
- [2]. _____ Indian standard Plain and Reinforced concrete-Code and practice IS456:2000, Bureau of Indian Standards, New Delhi
- [3] _____ Indian standard Method of tests for strength of concrete, IS: 516-1959 (Reaffirmed 2004) Bureau of Indian Standards, New Delhi