

Concrete Behavior of Concrete Due to Improper Casting Sequence

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Abstract – The approach of cement has opened time in structural designing giving a limitless reach for structural architects for the plan and development of constructions of changed size and shape. Solid designs, either plain or built up are remarkable among the numerous frameworks of present day development, as they are the lone kinds of constructions, chiefly made from its segment materials on the site of work. Concrete is a composite combination of coarse total, fine total, concrete and water in a determined sum. Coarse total and fine total are the dormant materials which go about as fillers, while concrete and water are receptive materials which partake in response and are liable for solidifying of cement. The strength improvement in concrete relies upon numerous elements, for example, concrete substance, size and state of total, water-concrete proportion, compaction and so on In a perfect world the newly pre-arranged cement ought to be projected into the form absent a lot of deferral to get its greatest strength. Solid industry frequently encounters some unforeseen conditions like deferral on the way because of vehicle breakdown, traffic or force disappointment, and hefty downpour fall, removal of formwork, mishaps, work strike and so forth

Keywords – Concrete, Casting Sequence

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INTRODUCTION

The most famous fake material utilized for development on planet earth is concrete. Concrete, a fake stone cast set up in a plastic condition basically comprises of a limiting medium, inside which are implanted particles or pieces of generally inactive mineral filler. The filler material, which is typically modest, is called total and is by and large reviewed as fine total, sand or squashed stone and coarse total which is normally a blend of appropriately evaluated rock or stone chips of fluctuating size for acquiring thick concrete. The folio is a blend of concrete, water and is called as concrete glue. The significance of value control in solid work at the site is evident. An acceptable cement is the one which has important planned properties, like consistency, usefulness, strength, toughness, water snugness and volume consistency in the solidified item. It is suitable that the newly pre-arranged cement ought to be projected in form immediately to get its greatest strength. Postponements in solid projecting may bring about cool joints. To keep away from cold joints, concrete putting is recommenced broadly before the hour of starting set. For surprising long defers the solid ought to be kept alive by intermittently re-vibrating it. In any case, cement ought not be over-vibrated to the purpose of causing isolation.

On the off chance that under any condition the solid situation is halted for more than the underlying setting

time, the joint ought to be treated as a development joint. Postponement in cementing may bring about cool joints. Issues related with cold joints range from minor to the intense issues. Under minor issue a virus joint may bring about an outwardly unappealing irregularity called a virus joint line. When the solid has solidified these virus joint lines are noticeable on a superficial level. Since it is a stylish deformity, it very well might be basically disguised instead of fixing. Under genuine or serious issue related with a virus joint is the chance of dampness infringement into the solid segment. In the event that water gets comfortable a virus joint, it might prompt disintegration of the solid under certain ecological conditions. Other than cool joint is a plane of traded off strength, concrete is prominent for its high strength under pressure, yet it is a lot more vulnerable under strain. A virus joint makes concrete significantly more vulnerable under strain, and it is defenseless to shearing at the irregularity. The brokenness or non-homogeneity is significantly between the layers because of the failure of the newly poured, wet cement to consolidate or tie appropriately to the solidified cement. Such an irregularity is regularly the consequence of operational issues, for example, a worker for hire's plan for getting work done or a startling material lack.

FRESH CONCRETE

The concrete freshly prepared and cast into the mould without any delay is fresh concrete. To attain homogeneity and uniform characteristics throughout any structural element, it is essential that the entire element is cast in one go without any break. But due to some unforeseen circumstances a portion of the element mould is cast and then the casting operation is disrupted. Though not permitted the casting operation is resumed for the remaining portion of the mould with freshly prepared concrete over the partially set layer to complete the work. This study was attempted with following objectives:

- To study the strength behavior of concrete cast in two layers.
- To study the influence of the plane to continue casting.
- To study the relationship between the time lag and the plane of casting.

LITERATURE REVIEW

R. Sri Ravindrarajah [2011], three arrangement of tests were led on concrete. First and second were to check the impact of impeding specialist (lignin based) and superplasticizer (naphthalene formaldehyde) on functionality misfortune with time. The third was to check the effect on usefulness and strength, if the super plasticizer expansion design is differed. From the investigation it very well may be seen that projecting deferral has no huge impact on compressive strength, yet functionality misfortune is seen with time delay. Super plasticizers and set retarders can improve the reduction the usefulness with time delay. Compressive strength is affected by the example of admixture expansion to concrete.

Sakir Erdogan [2012], in this investigation impact of delayed blending was noticed. Truck blender was utilized to blend concrete. Concrete having drop of 19cm was arranged and later it was blended for a term of 30, 60, 90, 120 and 150minutes. Toward the finish of every length concrete was then cast into the molds. Three sorts of cement were tried, in first kind cement was arranged and projected after the previously mentioned time delay. In the second and third sort, concrete was retempered with water and super plasticizer (melamine based) prior to projecting. From this examination it is seen that drawn out blending has no much unfriendly impact on compressive strength of typical cement yet functionality. Misfortune was noticed. To beat the usefulness misfortune concrete was retempered with water and super plasticizer which was additionally not helpful.

OnderKirca, Lutfullah Turanli, Turhan Y. Erdogan [2013], in this examination four retempering measures were done to explore there impact on properties of

cement exposed to delayed blending i.e upto 4 hours. After every hour concrete was eliminated from the blender and retempered to get the necessary droop and afterward cast. Retempering measure was finished with water, water + 1.5% S.P, water + 3% S.P, water + 4.5% S.P (S. P. Superplasticizer-melamine based polymer scattering). They arrived at the resolution that the temperature expansion in concrete, the level of hydration and the crushing activity is the significant justification droop misfortune. To keep away from droop misfortune at site, if water is utilized to retemper and make concrete useful; the strength of the solid is influenced. So less measure of water can be utilized alongside super plasticizer to retemper the solid with no antagonistic impacts.

J. Sobhani, M. Najimi, A. R. Pourkhorshidi [2014], in this investigation concrete was retempered with water, melamine sulphonate naphthalene-based superplasticizer and retain water to examine the impact on compressive strength and penetrability of deferred concrete. The aftereffects of this examination showed that compressive strength of deferred concrete was expanded if there should be an occurrence of retempering with super plasticizer and with hold water. Slight droop misfortune was seen by the utilization of retain water. In any case, retempering with water was differently affecting the properties of cement. Subsequently retempering was suggested by either retain water or super plasticizer.

Sachin Shrikanth Kavathe, Jayant Govindrao Kulkarni [2015], in this work the unfavorable impact of solid projecting postponement was considered. Concrete was retempered with concrete, retarder and superplasticizer to accomplish the necessary functionality and strength after the deferral. The outcome uncovered that retempered cement can be utilized around an hour delay. From compressive strength perspective retempering with concrete and retarder was more helpful.

Ziad H. Abo Mustafa, Dr. Ali. S. Zregh [2016], the work was completed to consider the properties of solid when retempered with super plasticizer (sulphonated polymer) and water. The outcome uncovered that retempering should be possible between 15 to an hour from blending, after that retempering prompts strength misfortune. Most extreme strength was seen in retempered concrete for 30 minutes delay. Retempering with super plasticizer is suggested over water as retempered concrete with water diminishes compressive strength.

James K. Cable [2017], the study was to notice the impact of delayed blending in solid blenders. Two solid blenders and three sorts of cement at four distinctive time stretches were explored. The outcomes uncovered that drum type pulling blender have no huge antagonistic impact on delayed

blending and 60 seconds of blending was viewed as ideal.

T. Yashwanth Sai, M Sambasivarao [2015], the examination was done to comprehend the impact of postponement in projecting of cement and furthermore for delay in concrete retempered with water and admixture. The outcomes uncovered that delay in projecting has no much antagonistic impact on compressive strength aside from concrete retendered with water. Modest quantity of water can be utilized alongside super plasticizer for retempering.

A. Baskoca, M. H. Ozkul and S. Artirma [2016], in this examination three sorts of admixtures were utilized lignosulfonate-based water reducer; dextrin based water reducer and gluconate based retarder were utilized to research their impact on concrete exposed to draw out blending. The outcomes uncovered no much misfortune in compressive strength except for droop misfortune was least if there should be an occurrence of dextrin based water reducer. Draw out blending of cement with admixture has no much antagonistic impact on flexural strength rather bond strength among cement and bars was improved.

OBJECTIVE

- Displacement of form work, power failure, accidents.
- Running out of materials midway during construction.

RESEARCH METHODOLOGY

Clearly the exhibition of the solid relies upon the different boundaries like the actual properties of the fixings, extent of the blend, water concrete proportion, compaction exertion, quality control, type and time of restoring. The materials utilized in this examination are concrete, fine total, coarse total, water and hindering specialist (sugar). To know the actual properties of the materials, different tests determined by the Indian Standards were directed and their appropriateness for use was checked. The subtleties of the examination are introduced underneath:

CEMENT

Ordinary portland 53 grade cement is used throughout the course of work.



Fig 1.1 - 53 grade ordinary portland cement



Fig 1.2 - Vicat's mould for testing setting time of cement

The properties of the cement used are shown in tables below and are as per IS: 12269-1987 limits.

Table 1.1 - Properties of ordinary portland cement

SLNo.	Test performed	Results	Requirements as per IS:12269-1987
1	Normal consistency	31%	Not specified
2	Initial setting time	75 minutes	30 minutes (min)
3	Final setting time	175 minutes	600 minutes (max)
4	Specific gravity	2.9	3.15 (max)
5	Compressive strength of cement		
	After 3 days of curing	28 MPa	27MPa (min)
	After 7 days of curing	39 MPa	37 MPa (min)
	After 28 days of curing	54MPa	53MPa (min)
6	Fineness of cement	4%	10% (max)

STATISTICAL ANALYSIS

It is the study of gathering, investigating and introducing information to get examples and patterns in a perception. Insights are applied each day in exploration, industry and different fields to turn out to be more logical about the discoveries and its applications from there on. The single direction examination of change (ANOVA) is utilized to decide if there are any genuinely huge contrasts between the methods for at least three autonomous gatherings. The single direction ANOVA analyzes the methods between the gatherings and decides if any of those methods are measurably fundamentally not quite the same as one another. In particular, it tests the invalid speculation. Single direction ANOVA is a trial of measurement that can't explicit the gathering which is genuinely huge unique in relation to one another. To recognize which explicit gatherings are unique in relation to one another post hoc test is performed. All information were communicated as mean and standard deviation to quantify focal inclination and scattering of boundaries. Further examination to analyze between two gatherings, Student's 't' test was played out the p-esteem is the degree of minor importance inside a factual theory test addressing the likelihood of the event of the tried outcomes. A more modest p-esteem implies that there is more grounded proof for the elective speculation. The pre-owned p-esteem in our investigation is 0.05 importance level. A point by point factual investigation computation is appeared in Appendix – B.



Fig 1.3 - Cubes kept for curing

RESULTS

Stained concrete – Compressive strength

Test results for workability and compressive strength of stained concrete are tabulated from table 1.2 – graphically represented from fig 4.15 – 4.18 for full cubes, cubes with diagonal, vertical and horizontal planes.

Table 1. 2 - Test results for compressive strength and workability of stained concrete for full cubes

Sl.No.	Time lag (minutes)	Compressive strength of concrete (N/mm ²)	Workability Slump (mm)	ANOVA	Post-hoc analysis		
					Pairs	t	p
1	0	30.47	72	F = 704			
2	45	34.78	68	p < 0.05	0 vs 45	16	<0.05
3	75	47.49	52	(Statistically significant)	0 vs 75	64	<0.05
4	120	36.84	40		0 vs 120	24	<0.05
5	180	30.30	28		0 vs 180	0.64	>0.05*

*Not Significant

It is seen that there is no determinate sick impact on compressive strength of cement because of postponement in projecting. Compressive strength increments regarding delay in projecting, however at 180min a decrease was seen in the compressive strength. Table 4.2 demonstrates the outcomes for stained cement for full shapes, the rate expansion in compressive strength is 14.14%, 55.85% and 20.00% for 45, 75 and 120minutes delay individually however at 180 minutes the diminishing in compressive strength is 0.55%. As portrayed in table 4.2 that the examination of compressive strength at various time stretches has genuinely critical contrast, dictated by one path investigation of difference (ANOVA). On oppressing the information for post-hoc investigation by Tukey test it was seen that 0 moment compressive strength was altogether not quite the same as any remaining time factors aside from 180 minutes delay, which was not critical. It was additionally noticed that brief time delay had more prominent 't' esteem contrasted with others.

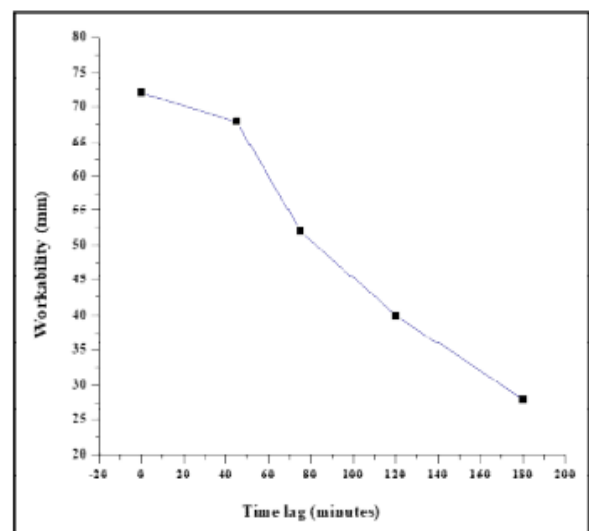


Fig 1.4 - Workability of stained concrete

From fig 1.4 it is observed that there is gradual loss of workability with time delay. After final setting time concrete becomes hard due to loss of water content and results in poor workability.

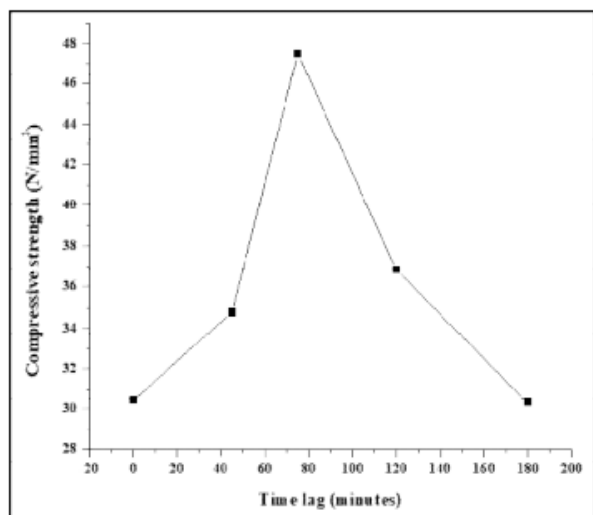


Fig 1.5 - Compressive strength of stained concrete for full cubes

From Figure 4.16 it can be seen that compressive strength of full 3D shapes expands at first and afterward it diminishes as the delay among blending and projecting increments. The increment is reflected upto 75 min i.e., the underlying setting time. Since the majority of the underlying hydration happens inside the underlying setting time, the compressive strength of the solid declines for the delay surpassing the underlying setting time. It is notable that the solid beginnings decaying whenever upset after the last setting season of concrete. The compressive strength for the blocks with delay surpassing the last setting time was not exactly that of the 3D shapes cast at zero minutes or the objective mean strength.

CONCLUSIONS

From the current study the following conclusions are drawn:

- Strength of stained solid shapes increments at first till the underlying setting season of concrete, and later on for delay surpassing introductory setting time, it diminishes.
- Strength of stained cement lessens beneath the objective mean strength for delay surpassing last setting season of concrete.
- When contrasted with compressive strength more misfortune was seen in flexure and split rigidities for examples cast after definite setting time.
- Among the various planes to keep projecting the diminishing in compressive strength is least in the event of slanting plane contrasted with vertical and even planes.
- Even if the delay is over 15 hours the necessary compressive strength can be accomplished with askew plane to keep

projecting by applying a layer of holding specialist.

- Null theory was demonstrated by factual examination that corner to corner is the best plane to keep projecting cycle.
- In instance of ill-advised projecting arrangement it is smarter to keep up the slanting plane for additional projecting.

Deferral in solid projecting will have no determinate sick impact on strength of cement, however usefulness will be severely influenced by delay. This is because of the decrease in water concrete proportion or hydration in new solid when presented to climate. In ordinary cement upto specific degree, water decrease and diminished air content outcomes in expanded strength. Enormous measure of water misfortune in new solid declines the strength, as the solid isn't furnished with the necessary measure of water to finish hydration interaction and gain the objective strength. It is notable that the solid beginnings breaking down whenever upset after the last setting season of concrete. To keep away from the evil impacts of cold joints it is in every case better to keep projecting in askew plane by applying a layer of holding specialist.

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