

BUILDING DIGEST

CENTRAL BUILDING RESEARCH INSTITUTE, INDIA



ACCELERATED TESTING OF 28-DAY STRENGTH OF CONCRETE

The strength of portland cement concrete is presently determined by the conventional procedure requiring 28 days of curing. This period is too long and the compressive strength is not of much value for either construction control or acceptance purposes. More timely information on compressive strength would help in achieving greater uniformity and better quality control.

Different accelerated tests are used in different countries all over the world for predicting the 28-day compressive strength of concrete. Most of these require external application of heat and consist of curing concrete cylinders or cubes in oven or in water at temperatures from 35°C to 100°C for times between 3 and 48 hours. Only in one test reported so far, the rise in temperature due to cement hydration is utilised to accelerate development of strength in concrete. In this test, concrete cylinders are placed inside well-insulated container immediately after casting and cured for 48 hours.

Evaluation of Different Test Procedures

An accelerated testing committee was formed in U.K. in 1959 under the Chairmanship of Prof. J.W.H. King to examine and compare various accelerated test procedure with a view to evolving a reliable standard test which would be simple enough for field use and take not more than a day to complete. The study covered curing of concrete cubes in oven and in water for times between 3 and 48 hours and at temperature from 35°C to 100°C. On the basis of the analysis of data obtained at six different laboratories in U.K. an accelerated test procedure was recommended. The details of the test procedure are given below :

Concrete cubes (10-cm or 15-cm) are moulded in the normal way and covered by a top plate

they are placed within 30 ± 15 minutes after gauging in a water bath maintained at $55^\circ \pm 2^\circ\text{C}$ and left there for $24 \pm \frac{1}{4}$ hour. They are then removed, stripped and tested within 30 ± 15 minutes of their removal.

There should be at least 5 cm of water over the moulds and at least 0.02 cum of water per 10-cm cube and mould or 0.06 cum of water per 15-cm cube and mould in the water bath.

Fig. 1 shows the correlation between accelerated test strength and 28-day water cured strength. It was reported that the 28-day compressive strength could be predicted with a coefficient of variation of about 8.5 percent on individual cubes and with greater accuracy using means of sets of three or more. No significant difference in results obtained on 10-cm and 15-cm cubes was observed.

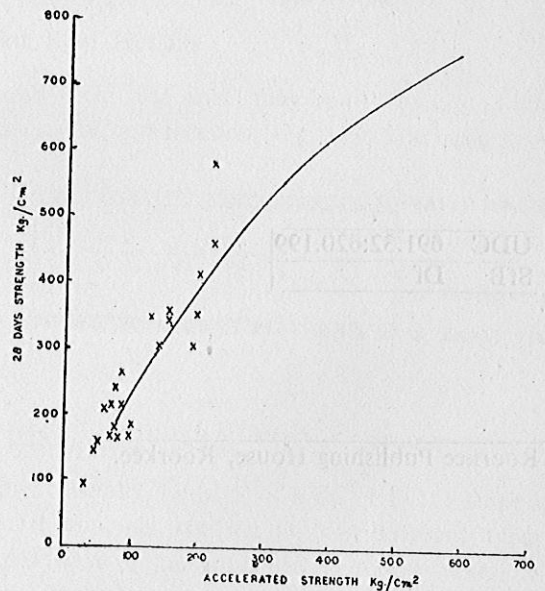


Fig. 1. Relationship Between Accelerated test Strength and 28-day Water cured Strength.

In view of the fact that no accelerated test is being used in India and there is a need for one, the

suitability of the test recommended by the British Accelerated Testing Committee was evaluated at the Central Building Research Institute, Roorkee (U.P.). Eleven cement samples obtained from different cement works in India were used for making concretes of grades varying from M100 to M250. The data obtained (shown by cross marks in fig. 1) compared well with the correlation curve. The variation in the quality of cement obtained from different cement works did not appear to affect

the relationship. The reproducibility of strength values obtained was found to be good.

Concluding Remarks

The accelerated test procedure described above, can be adopted to predict 28-day compressive strength and control the quality of concrete being used at various construction projects.

There is a demand for short notes summarising available information on selected building topics for the use of Engineers and Architects in India. To meet the need, this Institute is bringing out a series of Building Digests from time to time and the present one is the 93rd in the series. Readers are requested to send to the Institute their experience of adopting the suggestion given in this Digest.

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