



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 3, March 2024

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423



9940 572 462



6381 907 438



ijirset@gmail.com



www.ijirset.com

Economical Cure Method Using a Beam Curing Pad

Shravan Pradeep Bobade, Prathamesh Nitin Chondhe, Aniket Avinash Dawatkar,

Pratik Prakash Dawatkar, Prof.G.R. Chila

Diploma Student, Department of Civil Engineering, Zeal Polytechnic Narhe, Pune, India

Project Guide, Department of Civil Engineering, Zeal Polytechnic Narhe, Pune, India

ABSTRACT: The secret to high-quality concrete is effective, continuous curing. Given the cost of curing, proper concrete curing is essential to achieving design strength and maximum longevity. The main purpose of curing is to maintain the moisture content of the concrete by avoiding its loss while it is strengthening. The need to develop a new method for concrete curing arose from the growing issue of water shortage and the high cost of traditional curing processes. This study discusses the experimental work associated with a recently invented beam curing technology that is efficient, cost-effective, and well-designed. This technique uses a technology called "Curing Pad" that lowers evaporation losses while simultaneously absorbing and holding onto water for a long time.

KEYWORDS: strength, scarcity of water.

I. INTRODUCTION

In building, cement serves as a binder—a material that binds other materials together by setting, hardening, and adhering to them. Cement is made by heating raw materials to temperatures as high as 1450 °C and then cooling them down. When water is added to the cement, the heat is retained there and combines with the water to create an exothermic process that releases heat. Because heat is lost from the outer surface of hydration at a faster rate than from the inner core, this causes a thermal gradient. Because of the uneven expansion of the concrete within the body, this thermal gradient leads to cracks in concrete. Controlling the pace and amount of moisture loss from concrete during cement hydration is known as curing. It could come either after it.

A binder is a material that sets, hardens, and sticks to other materials to bind them together. Cement is one such material. Cement is made from raw materials that are heated to temperatures as high as 1450 °C and then cooled. This heat is retained in the cement, where it combines with the water to create an exothermic reaction that releases heat. Due to a greater rate of heat loss from the outer surface than from the inner core, heat of hydration creates a thermal gradient. Because of this heat gradient, the concrete expands unevenly inside the body, which leads to cracks. Curing is the process of regulating how much and how quickly concrete loses moisture as a result of cement hydration. It might come either after it.

Types of curing methods: -

1. Ponding and immersion.
2. Fogging and Sprinkler.
3. Wet Covering.
4. Membrane-Forming Curing Compounds.
5. Steam Curing.

II. AREA OF STUDY

EXISTING INSTITUTIONAL BUILDING (ZEAL POLYTECHNIC, NARHE, PUNE).

<https://www.google.com/maps/place/ZEAL+POLYTECHNIC/@18.448789,73.8229341,17z/data=!3m1!4m6!3m5!1s0x3BC2953B72319C43:0X549FBDCF78511937!8m2!3d18.448789!4d73.825509!16s%2FG%2F1TFP0XP0?ENTRY=TTU>



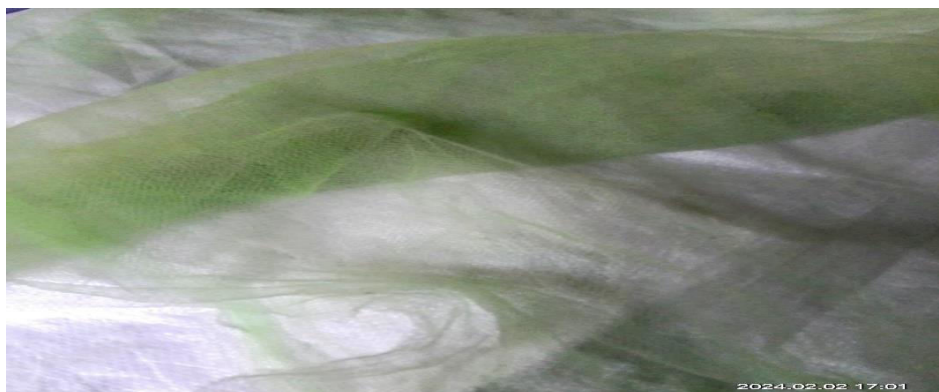
III. METHODOLOGY

Layers in the Curing Pad: A number of building sites were inspected in order to examine the conventional curing method used for slabs and column beams. Gunny bags and the ponding method were discovered to be utilized for slabs, beams, and columns, respectively. This kind of curing technique has been in use for the past few years. Information was gathered about the various approaches and uses of the ponding method for slab curing. The information gathered was utilized to distinguish between the new and conventional curing methods. We have chosen to construct a three-layered curing pad based on the data. An analysis was conducted based on the data gathered to determine the best materials for the Upper Layer: – To stop losses due to evaporation.

Material with the ability to hold and absorb water makes up the middle layer. Bottom

3.1.1 LAYER 1 (INNERMOST LAYER):

The innermost layer consists of a NET for allowing the water to come in contact with the concrete of the respective member. This layer of pad is help to percolate the water from middle layer to the surface of concrete. This layer also help for proper connection of water to the surface of concrete without any obstacles.



3.1.2 LAYER 2 (MIDDLE LAYER):

This layer consists of material which is TEXTILE INDUSTRY WASTE. The material used in this layer having good water absorption properly to resist water and percolate for curing.



3.1.3 LAYER 3 (OUTERMOST LAYER):

The outermost layer is the PLASTIC layer. Plastic layer is provided in order to control the loss of water from the second layer due to evaporation. This layer of Curing pad also helps to increase the service life of curing pad to make method effectively.



Fig.11 Plaster used in curing pad to prevent water from evaporation.

3.2 Process of making curing pad:

Making a curing pad involves taking a plastic sheet, some net material, and trash from the textile industry. First, lay a plastic sheet on top of it, then distribute trash from the textile industry over it and cover it with net material. This three-layer was stitched together with care using a needle and thread. The effective curing pad is also prepared for usage.



Fig 12. Efficient curing pad for curing to concrete.

IV. HAND MIXING

This method is only permitted for little tasks. The ingredients must be mixed on a flat iron sheet or brick platform. For 1:1.5:3 concrete, one bag of cement and the first two sand boxes must be thoroughly mixed dry, turning the material up and down with a spade or shawarma. This homogenous dry mix must then be spread over a spreader stack of four boxes of coarse aggregate, and the entire mixed dry must be turned up and down with a spade or phawarha at least three times to achieve a uniform mix. After that, water must be added gradually and carefully. Next, the mixture must be turned by a shovel up and down at least three times to create a plastic mix of the necessary

4.1 Compressive Strength Test on concrete:

Casting concrete cubes for compressive strength test

1. Take 9 cube mould having size 150mm X 150mm X 150mm.
2. Place concrete in it and compact it up to removing all voids.
3. Keep the mould for 24 hours.
4. Carefully concrete cube removes from mould.

Curing to concrete cubes:

1. Three cubes immerse in water.
2. Other three cube cure with conventional curing method.
3. And remaining three cubes cure with efficient curing pad.

4.2 CALCULATION OF COMPRESSIVE STRENGTH:

After the specimen has had time to cure, remove it from the water and wipe off any excess moisture. 2. Determine the specimen's dimensions that it will be subjected to. Put the specimen in the test machine where it belongs. Keep in mind that the face will receive the load in a direction perpendicular to the casting direction. Place the specimen in the centre of the machine's base plate. Make sure the machine's moving part makes contact with the specimen's top surface. Until the specimen fails, apply the load progressively at a rate of 140 kg/cm²/minute. 7- Note the maximum load.

COMPRESSIVE STRENGTH ALCATION:

Size of cube: 15 cm by 15 cm by 15 cm

The specimen's load-subject area is $150 \times 150 = 22,500 \text{ mm}^2$. maximal weigh

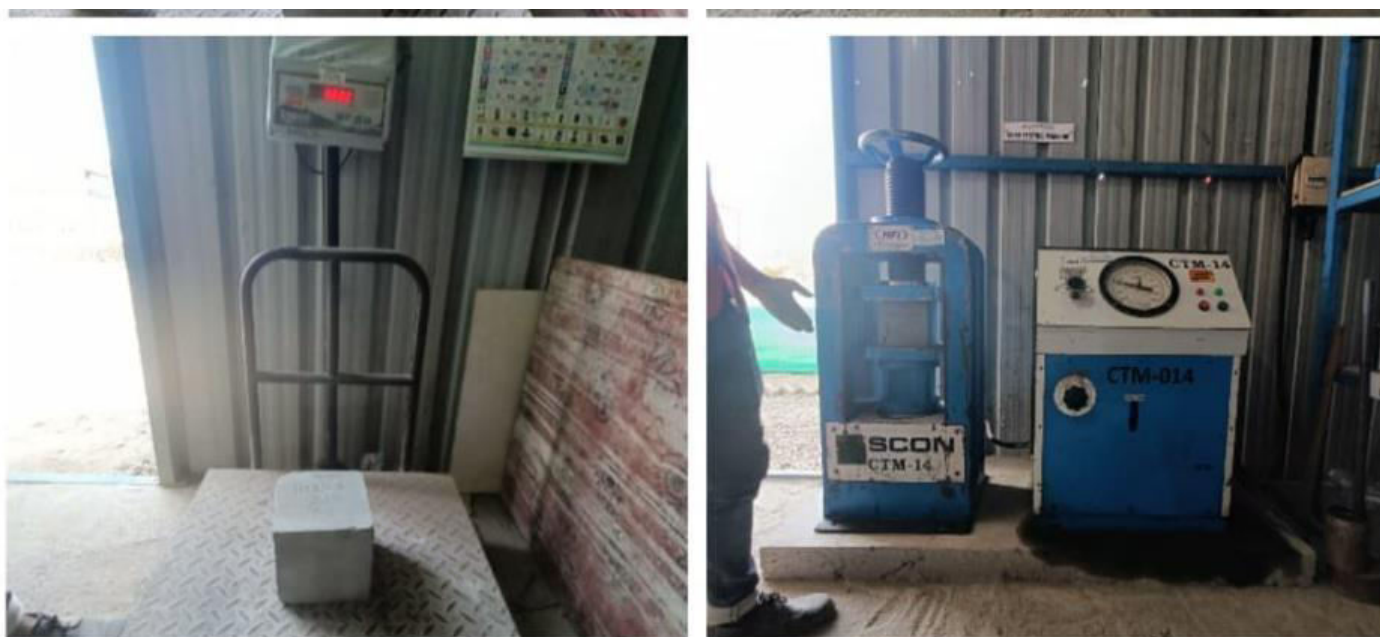


Fig. 13 Compressive Testing Machine.

4.3 Spitting Tensile Strength of Concrete:

Casting concrete cubes for Split Tensile Strength Test

Once the mixture is ready, it is layered, about 5 cm deep, into the greased mould. Next, either by vibration or by hand, each layer is compacted. Use a tamping bar to manually compact material. uniformly distributed bar stroke to ensure appropriate compaction. Each layer's minimum tamping bar stroke is thirty. Strikes through to the layer underneath Use the rode to reach the bottom layer's full depth. full compaction of the upper layer In order to stop evaporation, the concrete's surface should lastly be leveled with the mold's top using a trowel and covered with a glass or metal plate.

Curing to concrete cubes:

- 4.3.1 Three cubes immerse in water
- 4.3.2 Other three cube cure with conventional curing method
- 4.3.3 And remaining three cubes cure with efficient curing pad

Method:

First, remove the wet specimen from the water after 7, 28, or any other desirable age at which the tensile strength is to be determined. Next, remove any water from the specimen's surface. To make sure the two ends of the specimen are in the same axial location, draw diametrical lines on them after that. Next, note the specimen's dimensions and weight. Adjust the compression testing apparatus to the necessary range. After positioning the specimen, place a plywood strip on the lower plate. Orient the specimen so that the center of the vertical lines on the ends lies over the lower plate. Position the second piece of plywood on top of the specimen. Lower the top plate until it barely touches the piece of plywood. Utilize



Fig.14: testing cylindrical concrete specimen.

Crucial Stages in the Compressive Strength Test Process:

1. Concrete cylinders from the curing chamber or tank must be tested for compressive strength while still wet.
Important actions to complete the test:

2. Set the cylinder carefully in relation to the loading axis of the compression machine by positioning it on the bottom platen.
3. Set the compression machine's loading indicator to zero.
4. To line the spherically seated upper platen with the cylinder's top surface, tilt it manually.
5. Put the weight on it. Use a verification tool to ensure that the sample is perpendicular if you are using unbonded caps before the load exceeds 10% of the predicted strength.
6. If desired, a higher regulated rate might be applied to the first half of the total projected load. The final segment of the

4.4 Splitting tensile strength calculation:

Concrete's split tensile strength is equal to $0.7 \times F_{ck}$, per IS 456. $T_{sp} = 2P / \pi DL$ is the splitting tensile strength, where D is the specimen's diameter, L is its length, and P is the applied load. Thus, $P = 0.7 F_{ck} \times \pi DL / 2$ Expected load = P x safety factor. Tensile splitting strength is expressed as $T_{sp} = 2P / \pi DL$, where P represents the real failure load.

Therefore, the concrete's splitting tensile strength is equal to 5.605 N/mm^2 .

Sr.No.	Mix designation	3 Days N/mm^2	7 Days N/mm^2	28 Days N/mm^2
1	M0	1.51	2.06	2.88
2	M10	1.71	2.26	3.15
3	M30	1.85	2.47	3.34
4	M50	1.65	2.13	3.02

Table No. 1 Splitting tensile strength of concrete.

Grade

M25

Test Results:						
Sr.No	Size-Length (mm)	Size-Width (mm)	Size-Height (mm)	Weight of Cube (kg)	Crushing Load (kN)	Compressive Strength (N/Sq mm)
1.	150.12	149.76	151.20	9.114	606.4	26.97
2.	149.80	150.12	149.76	9.000	612.8	27.25
3.	151.11	149.70	149.81	9.121	614.9	27.18
Average Compressive Strength (N/mm^2)				27.13		
Test Method Used				IS:516 (Part-1/Sec-1):2021		

Note: i) The test report and result relate to the particular specimen/ sample (s) of the material as delivered /received and tested in the laboratory.

ii) Any test report shall not be reproduced except in full, without the written permission from Constrovision Engineering Consultants Pvt. Ltd.

iii) Statement of conformity to a specification is provided considering the level of risk associated with decision rule applied.

iv) Measurement Uncertainty is not taken into consideration while stating conformity with the specified requirements as requested by the customer.

Table No. 2 Result of compressive strength.

Application:

Water conserved by employing Curing Pads: Below is a description of the standard procedure used to cure columns, along with the approximate water requirement. Assume that the column measures 0.3 m by 0.45 m. Assume 4.575 meters from floor to ceiling. Total surface area is therefore equal to $(2 \times 0.3 \times 4.575) + (2 \times 0.45 \times 4.575) = 6.8625 \text{ m}^2$. Assume that there is a 2 mm layer of water applied. Consequently, $6.8625 \times 2 \times 10^{-3} = 13.725 \text{ m}^3 = 13.725 \text{ liters}$ + waste = 35 liters is the volume of water to be applied. Water is distributed out three times a day on average, so the total volume of water needed each column per day is $35 \times 3 = 105 \text{ liters}$. Regarding Curing Pads Based on calculations, the pad intended for a 6.8625 m^2 column will hold approximately 53.91 liters.





V. CONCLUSION

This curing pad is constructed in three layers: the innermost layer is made of net fabric, the middle layer is made of water-absorbing textile industry waste, and the topmost layer is made of plastic to assist prevent evaporation. Economically and environmentally friendly, this curing pad is. This curing pad strengthens the concrete that is close to submerged Concrete curing strength. Water can be saved in this curing pad for a variety of purposes, including preventing water losses from evaporation. This curing pad also aids in preventing the need for repeated curing during construction. Because textile materials that absorb a lot of water keep water available in the curing pad for an extended period of time, this approach requires fewer personnel for the curing process.

REFERENCES

1. Effects of Curing Condition and Curing Period on the Compressive Strength Development of Plain Concrete by Akinwumi, I.I., Gbadamosi Z.O.
2. Experimental Study on Curing Methods of Concrete by D. Gowsika, P. Balamurugan, R. Kamalambigai
3. Study of Different Methods of Curing of Concrete & Curing Periods by Perna Tighare, Mr. R.
4. C. Singh Post Graduate Student, Civil Engineering, H.O.D, RSR Rungta College of Engineering and Technology (C.G.)
5. Effect on concrete by different curing method and efficiency of curing compounds – A review Nirav R Kholia, Prof. Binita A Vyas, Prof. T. G. Tank



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details