Study of Effects of Curing Compound on Concrete

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Abstract- *Ordinary certain was equipped with a water-cement ratio of 0.50. cube specimens were cast for difficult the compressive concentration at 7 and 28 time of curing correspondingly by means of three curing methods that is immersion, smattering and forced sheeting, curing to alleviate the cube specimens until the day of testing. assessment fallout indicates that fill up curing(WAC) as all right as smidgen (spraying) curing provided greatly top domino effect that casing (Plastic Sheeting) sense of curing. The appraise of drying was considerable once the specimens were subjected to casing (Plastic sheeting) system of curing. This in consequence in an inferior position the hydration procedure and in this fashion artificial the compressive power land of the hardened concrete. The taken as a whole sentence of this look at carefully suggests that definite must be cured by stream curing to get a top compressive strength.*

Keywords- Curing, Grade of Concrete, Concrete

I. INTRODUCTION

Curing is the name given to the methods used to promote cement hydration and to control the temperature and the flow of moisture from and into concrete. Curing is also a key player in the relief of concrete cracks, which has a major impact on durability. Proper healing can help mitigate the appearance of unplanned cracking and increase durability, strength and volume stabilization. While concrete healing is one of the most critical and final phases of concrete construction, it is also one of the most underestimated and overlooked procedures. During the hardening process, it is the treatment of newly placed concrete so it maintains sufficient moisture to avoid cracking and shrinking. The research shows the effect of various healing approaches on the compressive strength of concrete using Portland cement and eventually describes the most successful healing process for normal concrete.

II. METHOD AND MATERIAL

2.1Water Curing
- **2.1.1 Ponding and Immersion**
- **2.1.2 Fogging and Spraying**
- **2.1.3 Wet Covering**

2.2. Application Of Heat
- **2.2.1 Steam Curing At Ordinary Pressure**
- **2.2.2 Steam Curing At High Pressure**
- **2.2.3 Electrical Curing**

2.3. Membrane Curing
2.4. Hot Weather Curing
2.5. Cold Weather Curing

2.1.Water Curing: This method is by far the best healing method as it meets all the healing criteria, i.e. encouraging hydration, preventing shrinkage and absorbing hydration energy. It is pointed out that even if the membrane approach is followed, a certain degree of water healing is necessary before the concrete is coated with membrane.

Water Curing Are Of Following Types

2.1.1 Ponding and Immersion: Concrete can be cured by ponding on flat surfaces such as pavements and walls. Ponding is an ideal method to avoid concrete loss of moisture; it is also effective in keeping the concrete at a uniform temperature. The curing water should be no more than about 11 ° C (20 ° F) cooler than the concrete to prevent thermal stresses that could lead to cracking. Because ponding requires considerable labor and supervision, the method is usually only used for small jobs. Total immersion of the finished concrete element is the most thorough method of healing with water. This process is widely used for the curing of concrete sample samples in the laboratory. For a certain time, prefabricated concrete products are usually submerged in healing tanks. Paved slabs, roof slabs and so on are submerged under water by making small ponds.

2.1.2 Fogging And Spraying: Fogging and water sprinkling are ideal curing techniques when the ambient temperature is well above zero with low humidity. Fogging is used to prevent the cracking of plastic shrinkage before completion of finishing operations. Through spraying water, vertical wall retention or plastered surfaces or concrete pillars etc. are healed.

2.1.3 Wet Covering: Water-saturated cloth coverings, such as burlap, cotton blankets, rugs, or other fabrics that absorb moisture, are widely used for healing. Wet covers such as wet gunny bags, hessian cloth, jute matting, straw etc. are sometimes wrapped to the vertical surface to keep the concrete wet. Waterproof covers such as waterproof gunny sacks, hessian cloth, jute matting, straw etc. are in some cases wrapped to the vertical surface to keep the concrete clean. Sand, dirt or sand are used as wet cover for horizontal surfaces saw to hold the concrete in wet condition for a longer period of time so that the concrete is not unduly dry to avoid hydration.

2.2. Application Of Heat: The development of concrete strength depends not only on time, but also on temperature. When concrete is exposed to higher temperatures, the hydration process is accelerated, resulting in faster strength growth. To accelerate the hydration cycle, concrete can not be exposed to dry heat, as the presence of moisture is also an essential requirement. Therefore, the concrete can be subjected to higher temperatures and the appropriate wetness can be achieved by subjecting the concrete to steam curing. Too many other benefits listed below will lead to a faster achievement of strength.

The exposure of concrete to higher temperature is completed within the following manner:

2.2.1 Steam Curing At Ordinary Pressure: Steam curing is beneficial where early strength gain is necessary in concrete or where hydration requires additional energy,as in cold weather. For prefabricated concrete components, this method of healing is often adopted.It will be a difficult task to apply steam healing to in situ building. Steam healing is mostly applied to prefabricated elements at normal pressure. It will be a difficult task to apply steam healing to in situ building. Steam curing is mostly distributed to prefabricated items stored in a chamber at ordinary temperature. The chamber should be large enough to hold the output of a day. The steam can be applied on an intermittent or continuous basis.At this higher temperature, an increased hydration takes place and the concrete products reach the normal concrete strength of 28 days in just 3 days. In India, steam curing is often used for prefabricated components, especially pre-stressed concrete sleepers. On the entire Indian railway, concrete sleepers are being introduced. We use special type of cement, namely OPC 53 S, for rapid development of strength and also subject the sleepers to steam healing.

2.2.2 Steam Curing At High Pressure: The steam temperature is usually below 100^C in the steam curing at atmospheric pressure. The steam is liquid, so it can be named of hot water healing in a way. In an open atmosphere, this is achieved. In one day, the high pressure steam cured concrete produces, or less, the strength as a standard cured concrete's 28-day capacity. Developed endurance does not show retrogression. Concrete is subjected to a maximum temperature of approximately 175^C in high pressure steam curing which corresponds to a steam pressure of approximately 8.5 kg / sq.cm. When the concrete is subjected to high pressure steam curing, it is usually made by mixing pozzolanic material such as crushed stone dust with 20 to 30 percent.Higher resistance to sulphate attack, freezing and thawing action and chemical action is one of the advantages derived from the process of high pressure steam curing. This displays less efflorescence as well.

2.2.3 Electrical Curing: One way of curing concrete is the use of energy, which is mostly applicable to very cold climatic regions. Because of economic reasons, this approach is unlikely to find much use in ordinary environment.Through passing an alternating current through the concrete itself between two electrodes either embedded in or added to the concrete surface, concrete can be healed electrically. To prevent water from leaving the concrete completely dry, care must be taken.

2.3 Membrane Curing: This healing method is to cover the wetted concrete surface with a layer of water-proof material that is kept in contact with the seven-day concrete surface. This healing method is called membrane healing. Concrete construction is sometimes done in areas where there is an severe water shortage.It was pointed out earlier that curing does not only involve adding water, but also creating conditions for encouraging consistent and sustainable hydration.These are also classified as compounds for sealing. The popular forms of membrane used are bituminized water-proof papers, wax emulsions, bitumen emulsions and plastic films. If bitumen is added to cure the ground, it should only be cured with gunny bags after 24 house cures.The surface is allowed to dry out so that loose water is not visible and then sprayed all over the liquid asphalt. This preserves the moisture in the concrete. It's good enough to heal. This method is a good way to maintain a satisfactory wetness in the concrete body in order to promote continuous hydration when the original water / cement ratio used is not less than 0.5.To achieve the finest results, membrane is thereafter applied after one or two days of actual wet curing.

2.4 Hot Weather Curing: Hot weather is essential for faster concrete curing, protection and curing. Water recovery, if used, should be continuous due to alternating wetting and drying to prevent volume changes. During the first few days after putting concrete in hot weather, the need for adequate continuous curing is highest. Concrete can reach a high degree of maturity in a very short time during hot weather, given that favorable moisture conditions are continuously preserved.

2.5 Cold Weather Curing: Concrete exposed to cold weather is unlikely to dry at an undesirable rate; particular attention should be paid to maintaining concrete moisture satisfactory. Concrete should at least be safe from freezing until a compressive strength of 3.4Mpa is developed; In a saturated state, non-air concrete should never be allowed to freeze and thaw. Until achieving a compressive strength of 24 Mpa, air conditioned concrete should not be allowed to freeze and thaw in a saturated condition. These factors should be considered particularly for concrete late in the fall.

III. MATERIAL

Cement:

Cement (kumar cement) 53grade has been used for mix proportion of M50 and M20 grade of concrete.

Aggregate:

Two size aggregates are used 20mm and 10mm size.

Artificial sand:

In Pune region artificial sand will be used in study.

GGBS:

Ground granulated blast-furnace slag. Physical of GGBS: Fineness modulus-3.35, specific gravity -3.44. Chemical composition: carbon(C) 0.23%, iron (Fe) 93.83%, Silica 5.37%.

Curing Compound:

Curing agents are primarily used in the curing of membranes. These are available in thefollowing types: water-based, wax-based, solvent-based silicone, chlorinated rubber, etc. Rollers, sprays, brushes, etc. apply cure compounds on concrete. After applying the healing compound to the fresh concrete surface, the film conserves moisture.

IV. USE OF CURING COMPOUND

Curing agent can be used with advantages where it is difficult to curate cold.It is ideal for areas that are directly exposed to sunlight, heavy winds and other environmental influences. It can be used to heal concrete pavements, runway at the airport and deck of the bridge. Used to heal: concrete pavements, runway at the airport, decks at the bridge.

Precast concrete components

- Roof slabs, columns and beams.
- Chimneys, cooling towers and high rise structures.

V. TESTINGOF CURING COMPOUNDS

The curing compounds should be tested in accordance to ASTM:

Water retention – The Test should be conducted in accordance with test method C156. Reflectance – Determine the daylight reflectance of white –pigmented compound in accordance with test methods E97 Drying time –The test should be conducted with reference to ASTM C 309 clause 10.3

VI. RESULT

TABLE NO *1*:3 days compressive strength for M50 grade of concrete

% of GGBS	CONVENTIONAL CURING(N/mm^2)	MEMBRANE CURING(N/mm^2)
10	16.28	13.7
20	19.04	17.2
30	22.22	19.07
40	24.00	20.50
50	27.70	24.80
60	27.9	26.89

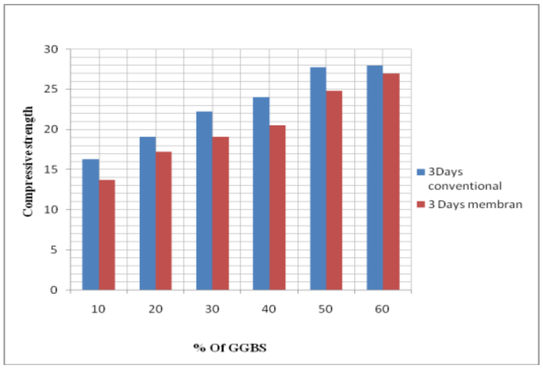

TABLE NO 2:7 days compressive strength for M50 grade of concrete

% of GGBS	CONVENTIONAL CURING(N/mm^2)	MEMBRANE CURING(N/mm^2)
10	36.66	27.44
20	40.77	33.78
30	41.8	38.37
40	49.57	40.07
50	52.0	43.87
60	56.79	49.78

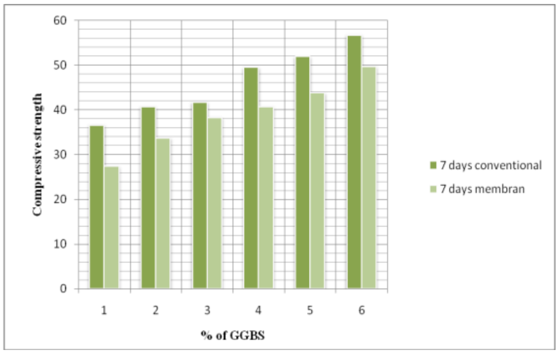

TABLE NO 3:28 dayscompressive strength for M50 grade of concrete

% of GGBS	CONVENTIONAL CURING(N/mm^2)	MEMBRANE CURING(N/mm^2)
10	58.25	50.00
20	62.20	54.25
30	67.50	59.06
40	71.70	61.28
50	79.07	67.90
60	81.81	74.87

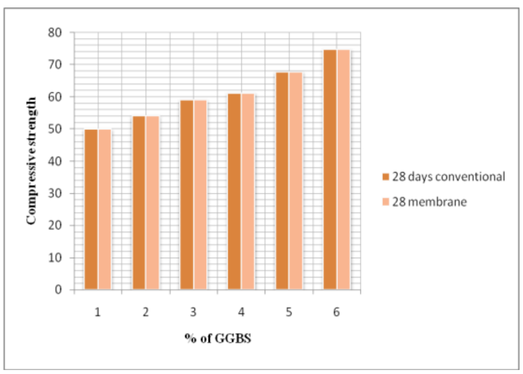

Table 4: Observation table of workability M20 and M50 grade of concrete with superpasticiser

Sr No	Percentage of GGBS	M 20 grade slump value	M 20 grade slump value
1	10	31	70
2	20	34	72
3	30	38	73
4	40	41	75
5	50	43	78
6	60	45	82

VII. CONCLUSION

- Following an experimental study, we conclude that memb rane healing power is not effective compared to conventio nal healing using GGBS.
- The power of the membrane healing process is not obtain ed by using GGBS properly
- We also remember that, using conventional methods, the i ncreased percentage of GGBS intensity increase but mem brane healing does not increase properly.

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