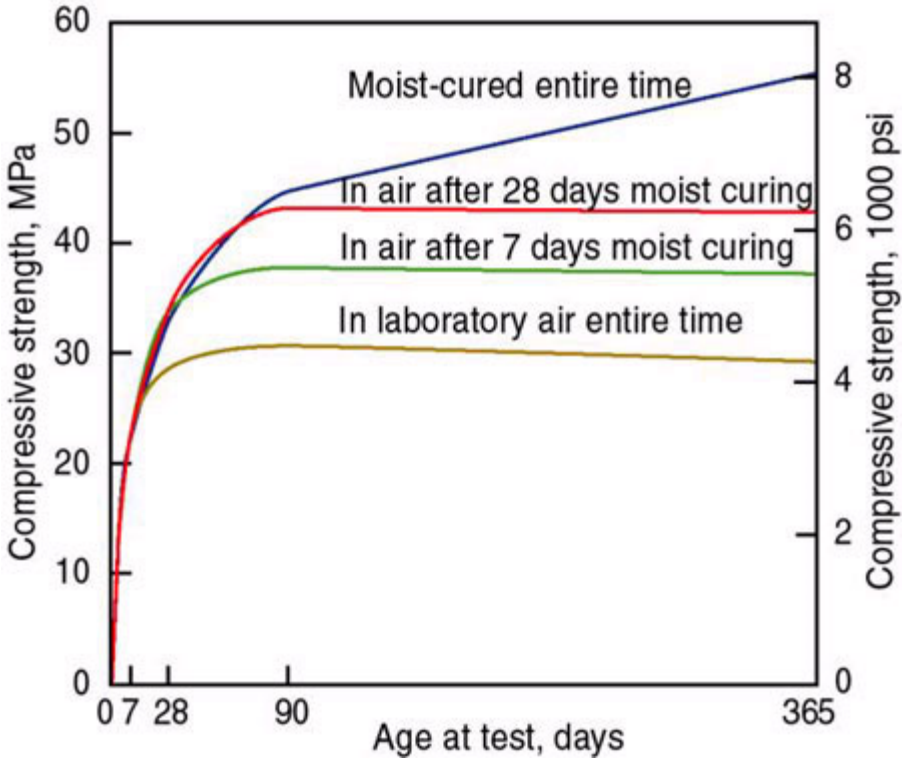
Influence of Concrete Curing on the Development of Compressive Strength in Post-Tension Floor

Most concrete placement for post-tension floor is mainly to pour concrete into a wide area which has a risk to develop plastic shrinkage. It is extremely necessary to control the quality of the work. Initially, it is necessary to render the concrete surface after pouring while concrete is in the plastic phase to initially help eliminate surface cracks. In addition, another way to improve its compressive strength is to “cure it”.

Concrete curing is a process which create continuous hydration reaction to the cement and the structural integrity of cement content is tightened which enhances its strength.



According to the graph, moist-cure dentire time or wet curing would yield maximum compressive strength and the graph goes lower as the age of curing increases until the line reaches its lowest point which is in laboratory air entire time which is to leave it in laboratory air in actual work condition. Curing can be done in numerous ways. However, it was found that some of the projects had cracking fracture problem or the concrete strength did not meet what was designed, so the question was whether each curing method is equivalent to entirely wet curing. The answer would be to adjust the working method to ensure that the concrete placement for post-tension floor meet the required quality as designed.

Studies from domestic educational institutions are also important sources of knowledge. An article on influence of concrete curing on the development of compressive strength of Rajamangala University of Technology Isan by Apichit Kumpala, Kosee Tianlom, and Jirayuth Suebsuk presented experimental curing of various methods. This article present some excerpts of that article for the use of work development.

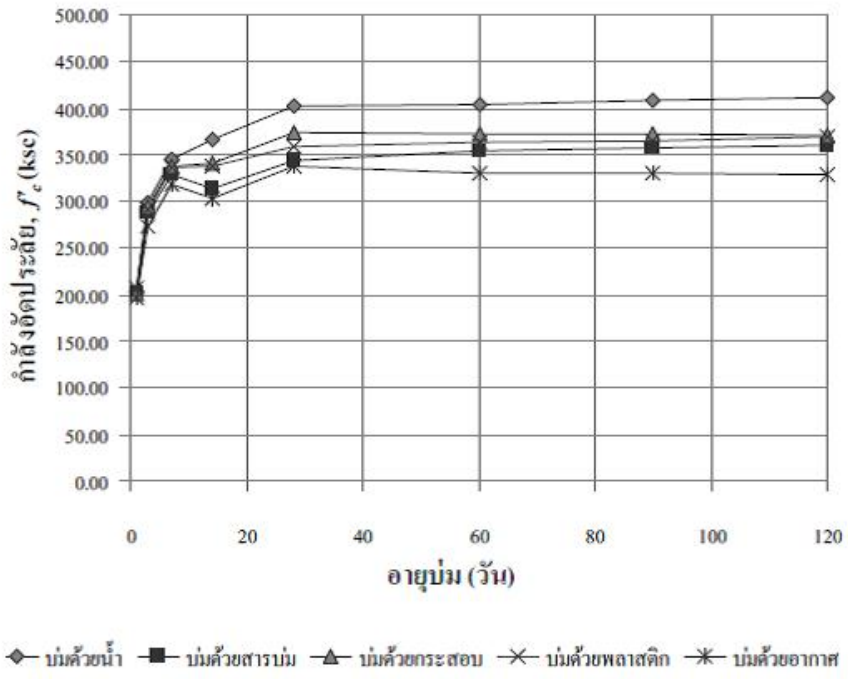
In this article, an experiment is conducted by preparing concrete samples specifying that the compressive strength at 28 days of the concrete must be at 400 kg/sq.cm FC'=400KSC). A cube mold is used to cast cube samples of 0.15X0.15X0.15M. When the samples reach 24 hours of age, the samples were removed from the mold and cured in five different ways as follows:

1. Water curing
2. Curing with wet sacks for 7 days
3. Curing with plastic wrap
4. Curing with concrete curing agent
5. Curing by leaving it in the air

Details on Different Curing Methods are Exhibited in the Table Below.

Method	Details
1.Water curing	Take a sample of hardened concrete sample and soak it in a container filled with water. Cure it according to set duration.
2.Curing with wet sacks	Cover the concrete sample with wet sacks. Cover thoroughly and regularly spray the water to the sacks for 7 days and then air cure for a period of time.
3.Curing with plastic wrap	Tightly cover the entire concrete cube sample with transparent plastic wrap. Cure it according to set duration.
4.Curing with concrete curing agent	Spray the concrete curing agent onto the surface thoroughly throughout the cube. The cube is sprayed twice. The first spray of concrete curing agent is applied at the surface of the concrete when it starts to harden. The sample cube is not yet removed from its mold. The second spray is done immediately when the hardened cube is removed from the mold. The second spray is done twice and thoroughly throughout the cube. The last spray is done perpendicularly with the previous spray pattern. Leave it cured.
5.Curing by leaving it in the air	Once the concrete sample is hardened, remove the concrete from its mold and leave it in the air without curing for a period of time.

When the experiment was completed, the derived data is used to plot a graph showing correlations as shown the picture below.



The picture above displays the development of compressive strength of concrete at FC' 400KSC which varies by age and curing method. From the picture, it can be seen that all curing methods yielded higher compressive strength of concrete as curing duration progressed. The development of compressive strength can be divided into two periods as follows: The first phase, day 1-28. During this phase, the strength of the concrete is rapidly developed and it was significant that the improvement during the last days as the time went closer to the age of 28 days, the improvement ratio of the compressive strength began to decline until the graph became a straight line. The method that achieved highest compressive strength was water curing. The rest of the results respectively sorted from the highest compressive strength to the lowest are as follows: Curing with wet sacks, curing with plastic wrap, curing with concrete curing agent, and air curing which yielded the lowest compressive strength. Based on the collected data, the researchers presented the equation used to predict the compressive strength of concrete at various ages classified by curing methods as follows:

$$\frac{f_c^{'}(D)}{f_c^{'}(28)} = A\ln(D) + B$$

โดยที่ $f_c^{'}(D)$ คือ กำลังอัดประลัยที่อายุบ่มใดๆ (วัน) $f_c^{'}(28)$ คือ กำลังอัดประลัยที่อายุบ่ม 28 วัน

A and B are the parameters for each curing method as shown in the table.

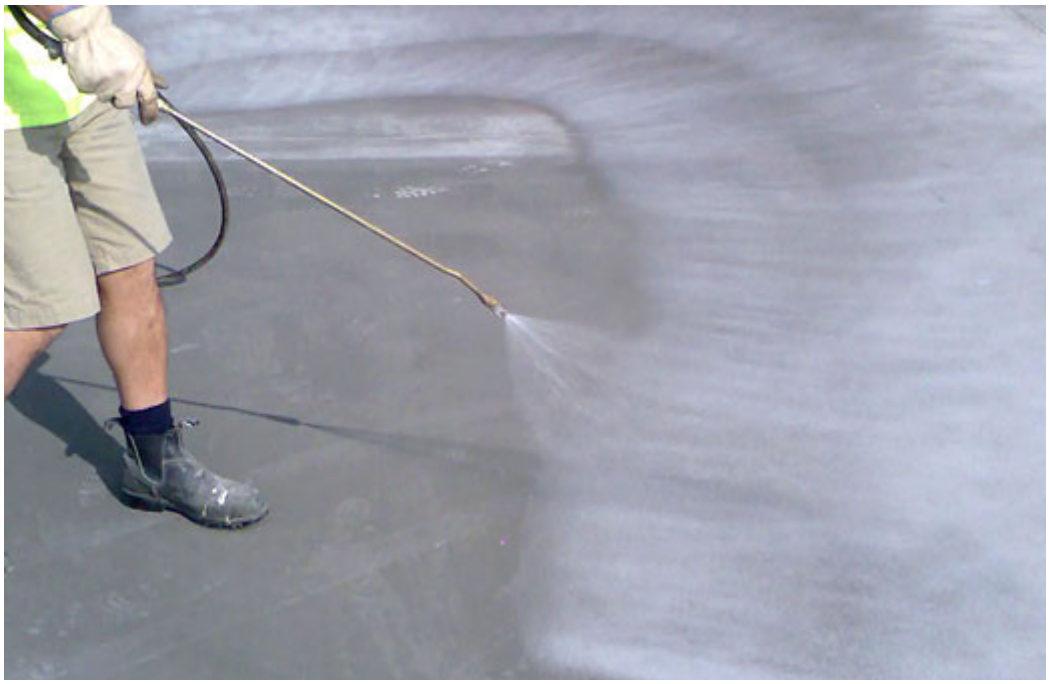
Method	*A*	*B*
1. Water curing	0.1296	0.4911
2. Curing with wet sacks	0.1264	0.5194
3. Curing with plastic wrap	0.1153	0.5643
4. Curing with concrete curing agent	0.1090	0.5487
5. Curing by leaving it in the air	0.0941	0.5603

1. Water curing

2. Curing with wet sacks

3. Curing with plastic wrap

4. Curing with concrete curing agent



5. Curing by leaving it in the air

Therefore, to place the concrete for post-tension floor aiming to yield the compressive strength as designed, the placed concrete should be cured with water or at least cured with wet sacks to prevent cracking and ensure that the floor has sufficient compressive strength as designed. In addition, this study also examined the influence of water-cement ratio (W/C) to concrete's compressive strength and the curing methods. More in details can be found at its full text. It is clear that studies and academic articles from educational institutions offer data useful to quality enhancement and development. If there is any More quality If there are any useful study and academic article, SNP Post Tension team will bring it up in the next presentation.

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