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## Control of Quality Concrete Base on Curing Methods

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# Control of Quality Concrete Base on Curing Methods

**Anisah\***, Prihantono

Building Technical Vocational Education Program, Faculty of Engineering State  
University of Jakarta

\* anisah75.awi@gmail.com

**Abstract.** This concrete maintenance procedure is very difficult to carry out in the field or construction project, because of the influence of the volume of concrete in a large field, also very high mobility. The purpose of this study is to analyze maintenance-based concrete quality control in construction projects that are in accordance with SNI-2493-2011 standards. The research method carried out by the experimental method, the test object used was cylindrical with a diameter of 15 cm and a height of 30 cm, with  $f_c$  25 MPa plan. The treatment method is to cover the concrete using wet „goni” sacks and sprinkling the concrete using water, with variations of treatments for 1 day, 3 days and 7 days such as the time of treatment in the construction project. as a concrete quality control with a method of soaking concrete for 28 days according to SNI-2493-2011. Test Results The value of concrete compressive strength that reaches only concrete control compressive strength of 25.97 MPa or greater than  $f_c$  of 3.88% and for the treatment method in the field no one reaches the plan compressive strength value. However, from the treatment method in the field, the optimum compressive strength is the maintenance method to cover concrete with „goni” sacks for 7 days at 24.11 MPa. In general, concrete treated in the field with a maintenance method closes the concrete using „goni” sacks the compressive strength value is higher than the concrete sprinkling treatment method.

## 1. Introduction

In construction projects, Concrete material is still the main choice compared to steel material. Beton has elastic and non elastic properties. The reaction of cement with water in the drying process often causes shrinkage in the concrete, so the concrete cracks before accepting the load. The curing process in concrete that can maximize the quality of concrete. According to SNI 2493-2011 the treatment of concrete specimens in the laboratory, the treatment process on concrete after being removed from the mold is stored in a water saturated room or soaked in water until the concrete age is 28 days[1]. According to Samekto and Rahmadiyanto (2001: 53) curing treatment is a action to provide the opportunity for concrete to develop its strength naturally and perfectly as possible[2]. This concrete moisture must be maintained so that the cement hydration process can occur naturally and take place perfectly. According to SNI 2493-2011 treatment of concrete specimens in laboratories with wet treatment methods. This means that the test object must have free water on the entire surface of the test object during the maintenance period. This condition is fulfilled by soaking in saturated water of lime and can be filled with storage in a water saturated space[1]. Treatment with burlap sacks („goni”) and sprinkling. treatment carried out in the field to date, is not in accordance with the standard of concrete care in the laboratory or SNI. The difference in treatment between the treatment in the field and in the laboratory will certainly affect the compressive strength of the concrete produced. Concrete treatment methods affect the strength of concrete. The concrete is treated by soaking the entire surface of the concrete on the water, while real project the concrete in the field is only moistened with the surface. Often the concrete treated in the laboratory meets the plan's compressive strength, while the concrete cast in the quality insitu does not reach the planned compressive strength during testing due to the difference in treatment. Therefore, a different treatment-based concrete compressive strength quality study needs to be done with wet „goni”burlap sacks, sprinkling and soaking.



## 2. Method and materials

### 2.1. Method

The research method used is experiment. the test object used is cylindrical with a diameter of 15 cm and a height of 30 cm, with  $f_c$  a plan of 25 MPa. This research is concrete quality control based on concrete treatment methods. Variation in treatment of the sample can be seen in table 1 below:

**Table 1.** Variation in Treatment of Test Objects

| Curing Method                      | Age of Curing (days) | Number of Samples (unit) |
|------------------------------------|----------------------|--------------------------|
| Soaking                            | 28                   | 5                        |
| Closed by Wet Burlap Sack („goni”) | 1                    | 5                        |
|                                    | 3                    | 5                        |
|                                    | 7                    | 5                        |
| Sprinkling                         | 1                    | 5                        |
|                                    | 3                    | 5                        |
|                                    | 7                    | 5                        |
| <b>Total</b>                       |                      | <b>35</b>                |

### 2.2. Materials

The results of mix design calculation based on SNI-03-2834-2002, the need for material in making  $1\text{m}^3$  of concrete for the compressive strength of  $f_c$  25 MPa with a value of  $12\text{ cm} \pm 2\text{ cm}$  Slump and FAS 0.5 value, can be seen in table 2 below this.

**Table 2.** Total Material Requirements  $1\text{m}^3$  of Concrete

| Material        | Weight (kg) |
|-----------------|-------------|
| Portland cement | 410         |
| Water           | 205         |
| Rough aggregate | 1.025       |
| Fine aggregate  | 820         |

### 2.3. Implementation of Research

The process of implementing this research can be seen in Figure 1 below.



(a) Sprinkling Method (b) Closed by “goni” Method (c) Soaking Method

**Figure 1.** Process of Research Implementation

Variation of concrete treatment methods in this study:

- The sprinkling method of treatment is watering concrete with water, watering duration 3 times a day at 8:00 a.m., 13:00 p.m. and 16:00 p.m. WIB, with a treatment time of 1 day, 3 days and 7 days.
- The treatment method covers the concrete with a wet burlap “goni” sack, the duration of wetting the sacks 3 times a day at 8:00 a.m., 13:00 p.m. and 16:00 p.m. WIB, with a treatment time of 1 day, 3 days and 7 days.
- The treatment method is to soak water for 28 days (according to SNI-2493-2011), as a control

concrete

### 3. Results and discussion

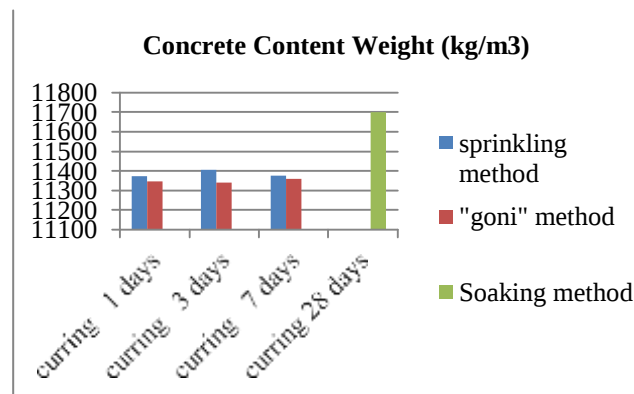
#### 3.1. Result

##### *Slum Test*

The average slump test for 35 specimens was 10.1 cm. This result is still included in the planning criteria

##### *Concrete Content Weight*

The weight of concrete contents is done after the concrete has gone through the treatment stage (curing) and is 28 days old, then lifted and cleaned of dirt and dried. The following is the result of 28 days old concrete weight for the basis of the method of sprinkling treatment for 1 day, 3 days and 7 days, and the method of using wet „goni” sacks with variations in treatment time for 1 day, 3 days and 7 days, and as a control of soaking treatment method for 28 days, can be seen in figure 2 below

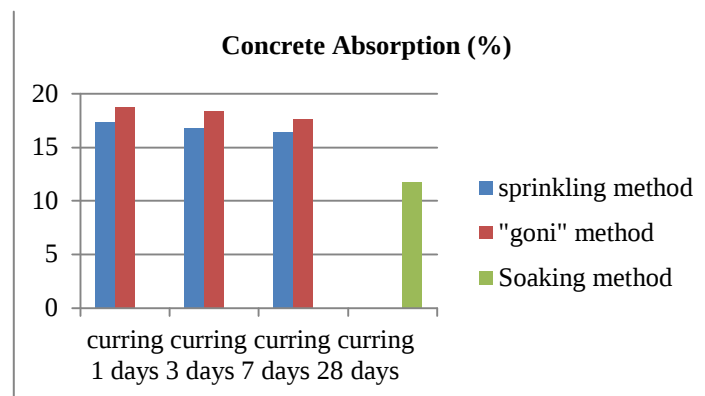


**Figure 2.** Concrete Content Weight Test Results based on the treatment method

In testing the content of concrete using the sprinkling treatment method has a greater value than the treatment method by covering the concrete using a wet „goni” sack. But the optimum content weight is control concrete, which is a 28-day soaking treatment method. Although in general, the value of the weight of concrete contents in a variety of treatment methods varies not significantly

##### *Concrete Absorption*

The absorption value of concrete is based on the method of springkling treatment for 1 day, 3 days and 7 days, and the method of using wet “goni” sacks with variations in treatment time for 1 day, 3 days and 7 days, and as a control method for 28 days of soaking treatment, can be seen in Figure 3 below

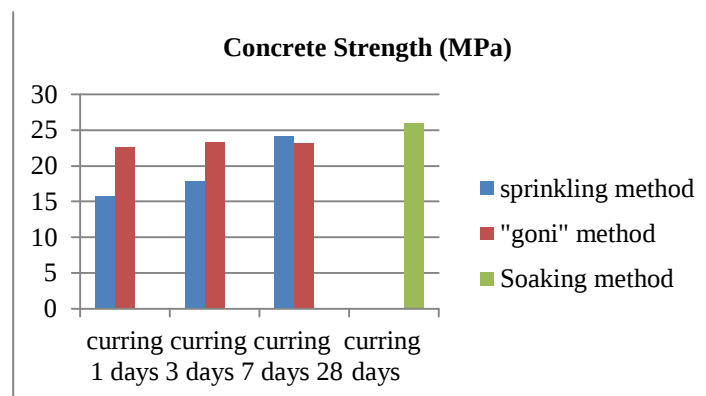


**Figure 3.** Concrete Absorption Test Results based on the treatment method

In contrast to the value of concrete content weight, in the concrete absorption test, the absorption value in the maintenance method of covering concrete using “goni” sacks was greater than that of the sprinkling treatment method. Likewise, the smallest concrete absorption value in control concrete is the 28 day soaking treatment method.

#### *Concrete Strength*

The results of testing the concrete compressive strength based on the method of sprinkling treatment for 1 day, 3 days and 7 days, and the method of using wet “goni” sacks with variations in treatment time for 1 day, 3 days and 7 days, and as a control method for 28 days soaking treatment, can be seen in figure 4 below



**Figure 4.** Concrete Strength Test Results based on the treatment method

In testing the compressive strength of concrete, only concrete control only fulfills the compressive strength of the plan, while the concrete treatment method in the field does not meet the value of the plan compressive strength. However, concrete with a maintenance method of covering concrete using wet “goni” sacks is still relatively better compared to concrete sprinkling treatment methods. The treatment time also determines significantly the value of concrete compressive strength.

### 3.2. Discussion

Of the three tests, there is a relationship between the testing of concrete content, the absorption of concrete against concrete compressive strength based on the method of sprinkling treatment for 1 day, 3 days and 7 days, and the method of using wet “goni” sacks with variations of treatment time for 1 day, 3 days and 7 days, and as a 28 day soaking treatment method control. The high absorption value in concrete indicates a large pore value, so the value of the concrete weight is smaller, this is because there is a pause of concrete testing with a treatment period of 21-27 days.

The presence of pores in the concrete, the speed of evaporation in the concrete and the hydration reaction of the cement that occurs in the concrete due to the treatment carried out, significantly influence the value of compressive strength obtained. This results in better concrete values treated in the laboratory compared to the concrete treated in the field. However, the concrete treated in the field by the treatment method closes the concrete using “goni” sacks the compressive strength value is higher than the concrete sprinkling treatment method.

### 4. Conclusion

The value of concrete compressive strength that reaches only concrete control compressive strength of 25.97 MPa or greater than  $f'_c$  of 3.88% and for the treatment method in the field no one reaches the plan compressive strength value. In general, concrete treated in the field with a maintenance method closes the concrete using “goni” sacks the compressive strength value is higher than the concrete sprinkling treatment method. The treatment method that can be recommended in the field is the maintenance method of covering the concrete with “goni” sacks for 7 days because it has the compressive strength value closest to the plan compressive strength and control concrete treatment method ie 24.11 MPa.

### 5. Acknowledgment

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