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STUDY OF THE EFFECT OF THE USE OF ADDITIONAL ADDITIVES DAMDEX AND BESTMITTEL ON THE COMPRESSIVE STRENGTH OF CONCRETE F'C 20 MPA

Dina Heldita

*Departement of Civil Engineering, Kotabaru of Polytechnic, Kalimantan, Indonesia.

ABSTRACT

Under normal circumstances, the maximum strength of the concrete will be reached at the age of 28 days, but to achieve the initial maximum strength of the concrete can be done in 2 ways, namely the use of Portland cement or the use of mineral additives or chemical admixtures. Another purpose of the use of admixture is the fulfillment of a short concrete execution time but the performance of the concrete is maintained. This study aims to determine the comparison of the compressive strength (N/mm2 unit) of normal concrete with concrete that uses Damdex and Bestmittel added materials, the test object used is cylindrical with the percentage addition of Damdex 2% and Bestmittel 0.2% of the weight of cement with composition the mixture used using the Job Mix Formula f'c 20 MPa for the Block B/F Heavy Rehab work project, Kotabaru District Prosperity Market Complex, namely for 1 m3 using 442.00 kg of cement, 681.79 kg of fine aggregate, 1065.72 kg of coarse aggregate , 215 liters of water. With the age of the tested concrete the compressive strength is 14 and 28 days. The results of the normal concrete compressive strength test at 14 and 28 days on average were 20.33 MPa and 22.19 MPa from the design compressive strength (f'c) of 20 MPa. Meanwhile, for the mixture with 2% Damdex and Bestmittel 0.2% added materials at 14 and 28 days the average was 22.93 MPa and 20.76 MPa from the design compressive strength (f'c) 20 MPa..

Keyword: *Concrete Quality, Damdex, Bestmittel, Compressive Strength*

I. INTRODUCTION

In addition to its advantages, concrete also has disadvantages, including cracking, corrosion, buckling, overload, spalling (release of concrete), it could also be due to mix design that is not in accordance with the needs of the plan, and many other damages. that can occur in concrete. In the process of working on a construction made of concrete, admixture is often used for certain types of work in order to obtain the desired concrete condition. Admixture additives are materials in the form of powder or liquid which are added to the concrete mixture during mixing, with the aim of changing the properties of the mixture or concrete. Another purpose of the use of admixture is the fulfillment of a short concrete execution time but the performance of the concrete is maintained. Under normal circumstances, the maximum strength of the concrete will be reached at the age of 28 days, but to achieve the maximum initial strength of the concrete can be done in 2 ways, namely by selecting the use of Portland cement or the use of mineral additives or chemical admixtures.

For high-rise buildings sometimes the problem of the age of concrete becomes an obstacle for the process of making the structure. Therefore, in this study, it is expected that adding additives in the form of Damdex and Besmittle will accelerate the process of hardening of the concrete and can improve the quality of the concrete without waiting for the concrete to be 28 days old.

II. LITERATURE REVIEW

Novita Hastuti Olil, et al (2015), "The Effect of Adding Damdex to the Mixture on the Compressive Strength of Concrete Experiencing High Temperatures". Conducting tests with research results showing that under normal conditions (without any treatment), concrete with a mixture of Damdex materials has an average compressive strength of 26.24 MPa or 3.33% greater than normal concrete which has an average compressive strength of 25. ,48 MPa. Concrete with a mixture of Damdex materials experienced a decrease in compressive strength of 39% or 10.24 MPa, the decrease in Damdex concrete was 13.2% smaller than normal concrete which experienced a decrease in compressive strength of 52.2% or 13.29 MPa. This decrease in compressive strength occurred in concrete heated to a temperature of 0°C - 200°C which was carried out for 7 hours, for concrete heated to a temperature of 200°C for 3 hours, concrete with a mixture of Damdex materials experienced a decrease in compressive strength of 41.6 % or 10.91 MPa, the decrease in Damdex concrete was 12.2% smaller than normal concrete which experienced a decrease in compressive strength of 53.8% or 13.71 MPa.

Nurmaidah, (2016), "Use of Damdex Added Materials (Waterproofing) in Concrete Mixtures Against Concrete Compressive Strength". Concrete is the most commonly used building material. Many various studies and experiments in the field of concrete were carried out in order to improve the quality of concrete. One way to increase the strength of concrete is compaction, which minimizes pores or voids forming in the concrete. The use of additives can help solve the problem. This experiment was used as an additive to Damdex. With the added damdex research material, it aims to determine the compressive strength of normal concrete with the compressive strength of concrete with a mixture of Damdex. Damdex was added at a ratio of 2.5% and 5% for dry weight of cement. Each variation was made of twenty stones and cast into a test cube of 15 cm x 15 cm x 15 cm in dimensions with a design compressive strength of K-225 and the test stone in a compression machine at 28 days. The results of the experiment, the compressive strength of concrete with the addition of damdex 2.5% by weight of cement, the compressive strength of concrete is 257.19 kg / cm2 with an increase of 8.17% in normal concrete compressive strength. while the compressive strength of concrete with the addition of Damdex 5% of the weight of cement in the amount of 278.04 kg / cm2 with an increase of 16.12% in the compressive strength of normal concrete. With the proportions of cement, sand, crushed stone, water and damdex respectively 28.34 kg, 50.73 kg, 82.87 kg, 16.70 kg, 1.49 kg.

Additives are usually given in relatively small amounts, and close supervision must be given so as not to overdo it, which can actually worsen the properties of the concrete. The improved concrete properties include hydration speed (setting time), ease of work, and water resistance. According to SK SNI S-18-1990 03, chemical added materials can be divided into 5 (five) types, namely:

1. Chemical added to reduce the amount of water used. With the use of this added material, a mixture with a lower water-cement factor is obtained at the same viscosity value, or a thinner mortar viscosity is obtained at the same water-cement factor.

2. Chemical added to slow down the bonding process of concrete. This material is used, for example, in a case where the distance between the place of mixing the concrete and the place of pouring the mixture is quite far, so that the time difference between starting mixing and compacting is more than 1 hour.
3. Chemical additives to speed up the bonding and hardening process of concrete. This material is used if the mortar is poured under the water surface, or on concrete structures that require an immediate completion time, such as repairing aircraft runways, prestressed beams, bridges and so on.
4. Chemical additives have a dual function, namely to reduce water and slow down the bonding process.
5. Chemicals have a dual function, namely to reduce water and speed up the bonding and hardening process of concrete.

Additives are divided into seven types, namely:

1. Type A "Water-Reducing Admixture". Water-Reducing Admixture is an additive that reduces the mixing water required to produce concrete of a certain consistency.
2. Type B "Retarding Admixtures". Retarding Admixtures are additives that function to delay the setting time of concrete. The user is to delay the setting time of concrete, for example due to hot weather conditions, or to extend the time for compaction to avoid cold joints and avoid the impact of settlement when the concrete is fresh at the time of casting.
3. Type C "Accelerating admixture". Accelerating admixture is an added material that serves to accelerate the binding and development of the initial strength of concrete.
4. Type D "Water Reducing and Retarding Admixture". Water Reducing and Retarding Admixture is an additive that has a dual function, namely reducing the amount of mixing water needed to produce concrete with a certain consistency and inhibiting initial setting.
5. Type E "Water Reducing and Accelerating Admixture". Water Reducing and Accelerating Admixture is an additive that has a dual function, namely reducing the amount of mixing water needed to produce concrete of a certain consistency and speeding up initial setting. This material is used to increase the strength of concrete.
6. Type F "Water Reducing, High Range Admixture". Water Reducing, High Range Admixture is an added material that serves to reduce the amount of mixing water needed to produce concrete with a certain consistency, as much as 12% or more. The level of water reduction in this added material is higher so it is expected that the strength of the resulting concrete is higher. This type of additive can be a super plasticizer. This type of material is also included in the new chemical additives and is referred to as water-reducing chemical additives. The recommended dose is 1% to 2% by weight of semen. Excessive doses will cause a decrease in the compressive strength of concrete.
7. Type G "Water Reducing, High Range Retarding Admixture". Water Reducing, High Range Retarding Admixture is an additive that serves to reduce the amount of mixing water needed to produce concrete with a certain consistency, as much as 12% or more and also to inhibit the binding of concrete. This type of added material is a combination of super plasticizers by delaying the setting time of concrete. Usually used for cramped working conditions due to lack of resources to manage concrete caused by limited working space.

III. METHODOLOGY

3.1. Mix Design Planning

The composition of the f'c 20 MPa concrete mix in this study refers to the JMF (Job Mix Formula) for the Block B/F Market Heavy Rehab project, Kotabaru District Prosperity Market Complex, as follows: Cement 442.00 kg, Sand 681.79 kg, Gravel 1065.72 kg, Water 215.00 liters.

3.2. Equipment Used

The equipment used is as follows:

1. Cylindrical mold size 15 cm x 30 cm.
2. A compactor stick with a diameter of 16 mm, a length of 600 mm, with a round tip made of stainless steel.
3. Metal plate with a solid, flat and water-resistant surface.
4. Concave spoon does not absorb water.
5. Scales with an accuracy of 0.3% of the sample weight.
6. And other auxiliary equipment.

3.3. Maintenance (Curing)

Treatment of test specimens is not only intended to obtain high compressive strength of concrete but is also carried out to improve the quality of the durability of the concrete, its resistance to water, the stage of wear, and the stability of the dimensions of the structure. In good treatment, it is intended that the concrete is mature, thus avoiding the emergence of cracks on the concrete surface due to too fast water loss when the concrete is still in a plastic state, and ensuring the creation of the desired compressive strength in this study after the specimen is removed from the mold then treatment is carried out. by immersion in water for 7 days. After treatment according to the specified time then the concrete sample is removed from the immersion pool before carrying out the test, the method of drying the sample is to drain it with the sample tilted so that the sample can dry at the top and bottom.

3.4. Concrete Compressive Strength Test

Tests are carried out to find out how much compressive strength of concrete produced by the sample being tested. The testing machine used has passed calibration testing which can be seen in the description of the compressive strength machine, calibration is carried out to obtain accurate compressive strength machine readings.

IV. RESULT AND DISCUSSION

4.1. Slump Test

Slump test is to measure the height of the concrete mix after it is removed from the slump tool used. This inspection is intended to obtain the amount of concrete viscosity from a mortar, from the slump test the test results are obtained as shown in Table 1 below:

Table 4.1. Concrete Slump Test Results

Types of Concrete Testing	Slump (cm)
Normal concrete	8
Concrete with Damdex 2% and Bestmittel 0.2%	7

These results are obtained by testing each concrete mix according to the existing concrete mixture, so that the results are obtained as Table 1.1 above. Because the slump test aims to find out how high the settlement occurs in each concrete mix.

4.2. Compressive Strength Test Result

The test is carried out to find out how much the compressive strength of concrete is produced by the sample being tested, whether the required compressive strength value is obtained or not. The test was carried out at the Banjarmasin State Polytechnic Laboratory. To get the compressive strength is done by using the following equation:

$$\sigma b = P/A \quad [1]$$

A = Cross-sectional area of the test object (cm2).

σb = Compressive Strength of Concrete (kg/cm2).

Based on the results of the tests carried out, the compressive strength of concrete at the age of 28 days is obtained, as tabulated in the following table.

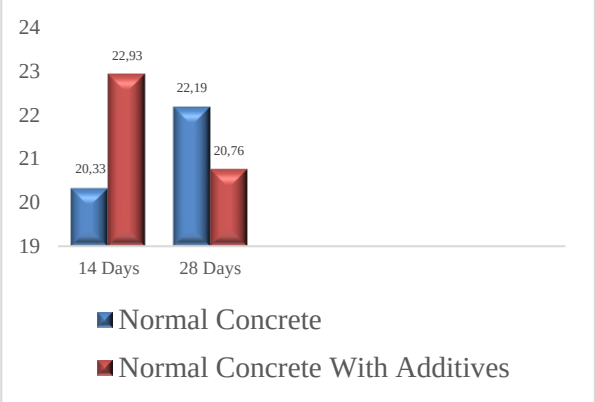

Figure 4.1. Results of Compressive Strength Testing of 14 Days of Concrete.

Table 4.2. Compressive Strength Test Results of 28 Days of Age Concrete

Sample	Type of Concrete	Sample Number	Compressive Strength (Mpa)	Compressive Strength	Target	Percentage
Days				Average (MPa)	Quality (Mpa)	%
1	2		3	4	5	6=(4-5)/(5)×(100)
28	Without Additives	1	21.23	22.19	20	10.96
		2	20.10			
		3	21.51			
		4	23.21			
		5	24.91			
	With Damdex 2% and Bestmittel 0.2%	1	21.80	20.76		3.80
		2	21.23			
		3	19.25			

V. CONCLUSION AND RECOMENDATION

5.1. Conclusion

In testing the highest compressive strength of concrete, when adding Damdex 2% and Bestmittel

0.2% from the weight of cement, it was obtained that an increase in the compressive strength of concrete at the age of 14 days was 14.65% of the compressive strength (f'c) of 20 MPa. And the compressive strength at the age of 28 days of concrete experienced a decrease in compressive strength of 3.80% of the minimum design compressive strength (20 Mpa). It can be concluded from the results above that the difference in the compressive strength of concrete at the age of 14 days and 28 days refers to the problem of Bestmittel's additives that affect the compressive strength of concrete at the age of 28 days because of its hardening process too fast so that no maintenance is required according to the provisions. It is also known that the addition of Damdex material has the advantage of reducing pores and oxygen in the concrete so that it becomes strong.

5.2. Recomendation

Based on the test results for further research, it is possible to carry out research again for the optimal proportion to add concrete compressive strength in the range of 0% to 10%.

VI. REFERENCES

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