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Effect of Utilization of Bamboo Fiber and Gypsum Substitution as Cement Against Strong Concrete Press

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Abstract

Bamboo Fiber is one of the materials that can be alternative as an added material to increase strong concretepress. The gypsum waste comes from the disposal of household flatfon dismantling, which becomes one of the added materials in the manufacture of cement. The use of both materials as concrete mixture subtitution is expected to reduce environmental pollution and exploitation of natural resources. This research aims to find out the influence of the use of SB as fiber and LG as cement subtitution semen on concrete mixture against strong concrete press. The study used a mixture of SB of 1%, 1.5%, 2%, and 3%of cement weight, as well as LG as much as 3%,and5% of cement weight. Strong press testing was conducted on the 14th and 28th days. The result of this study is that the higher percentage of SB and LG workability is decreasing. Strong press testing shows that all variations have a strong press yield of 1%B3%G above the normal concrete press strength and the rest under normal concrete. The highest press strong value is derived from the variation of 1%B3G with a mixture of 1%SB + 3% LG which is 20.81 MPa.

Keywords
Alternative, Bamboo Fiber, Compressive Strength, Concrete, Strong Press, Waste Gypsum.

1. Introduction

Concrete is a mixture of cement, aggregate, and water. Fiber concrete (*fibre reincorced concrete) is* a modification of conventional concrete by adding fiber adukannya. Fiber concrete is defined as concrete made of a mixture of cement, fine aggregate, coarse aggregate and a small amount of fiber / fibre (ACI Committee 544, 1982). Fiber materials that can be used for the improvement of concrete properties in fiber concrete include steel, plastic, glass, carbon and fiber from natural materials such as ijuk, hemp and fiber from other plants(ACI Committee 544, 1982). Cement is a hydraulic adhesive produced by smoothing the clinker consisting of the main material of calcium silicate and gypsum stone additives where the compounds can react with water and form new substances adhesive on the rocks.

Concrete mixture material other than cement is sand and stone. Sand and rock can be obtained in several places, one of which is in the river. Continuous sand and rock mining activities will cause some environmental damage ranging from ambles and damage to water breaker structures, one side of the plengseng, to a decrease in groundwater level as a result of the decline of the river floor. The use of industrial waste is a good alternative as a mixing of concrete constituent materials.

Concrete has several advantages, among others: strong ness is relatively high, easy to form as desired, maintenance is cheap and can be combined with other materials. On the other hand, concrete has a bitter nature (brittle), so practically the ability to withstand tensile voltage is relatively small (Al mufid, 2018)

Previous research has been conducted on the use of sugar cane and glass powder on concrete, but previous research has been done partially. In this study, researchers will combine or mix the two subtitution materials. That is, sugar cane sand is subtitus with cement and glass powder is subtitus with sand in one concrete mixture. But the mixing is done in various variations. With the conduct of this research is expected to know the effect of sugar cane ash that is subtitus with cement and glass powder subtitus with sand against strong press concrete.

With the development of very significant development of concrete, an alternative is needed in the concrete mixture in its application. Therefore, the need for materials that can be updated and waste wasted is added in concrete, such as fly ash, coconut shell, plastic seeds, chicken bones, sugar cane cane, and others. With these innovations can be alterative materials in the use of non-renewable natural resources such as, the use of plastic seeds as a substitute material for gravel that continues to be mined so that if continuous use can be exhausted, the increasing use of cement in concrete can cause cement raw materials to become thinning and depleted, so that gypsum and flyash waste can be a replacement solution for cement. The use of additives that are

currently used to strengthen concrete is also expensive and has a content that can pollute the environment so that using fibers such as bamboo fibers and ijuk fibers can be one of the alternatives.

This prompted research into concrete mixtures in addition to these materials with bamboo fibers and gypsum waste as substitutions to cement. The use of bamboo fibers is expected to increase the strength of the concrete press and make the concrete into one type of concrete that is environmentally friendly and can reach targets above normal concrete, in order to reduce the amount of additive and concrete use making the concrete have a strong high press, and with the use of gypsum can impact the needs of cement that can be reduced and can reduce gypsum waste that is currently less normalized as well as possible because it can potentially pollute the soil and air can also cause pollution to Environment. and it is expected that with the addition of these materials is expected to reach the target of concrete strength of 20 MPa for columns.

2. Materials And Methods

2.1. Materials

In this study the constituent materials on the concrete mixture are as follows:

a. The bamboo fibers used in this study are bamboo chopsticks that are broken and sededted into fibers.
b. The gypsum waste in this study is gypsum board waste that has been disposed of.
c. The cement used in this study is PPC Cement (*Pozollan Portland Cement)* type1 gresik brand.
d. The water used in this study came from the UMB Civil Engineering Laboratotium.
e. The sand used in this study is sand derived fromLampung.
f. The gravel used in this study is gravel derived from bogor.

2.2. Method

In this study, using experimental methods by variable mixing bamboo fibers as well as cement subtitution by using gypsum waste against concrete mixtures which is to obtain data and results from this study. According to Zulnaidi, (2007) revealing that the experimental method is a research procedure carried out to reveal the causal relationship of two or more variables, with manipulation or treatment of the influence of other variables. According to Bambang Prasetyo Lina Mifthaul Jannah Esterberg, (2002) experimental research is usually done somewhere called labolatorium.

The research variables in this study consist of two kinds. The first variable is an independent variable with X1 and X2 the second variable is a dependent variable given notation Y. Free variables (X1) and (X2) determine changes to bound variables (Y), but regardless of the effect of bo

und variables. While a bound variable (Y) is a variable that is affected by a free variable (X). In this study it was determined that variables are free. (X1) is a concrete that is added bamboo fibers, and on a free variable (X2) in the form of gypsum waste as a cement subtitution and variable bound (Y) strong press concrete.

The percentage of bamboo fiber addition as much as 0% ; 1%; 1,5%; 2% and 3% and by subtitus gypsum waste with cement of 0% ; 3% ; and 5% of the cement weight into the concrete. Concrete is printed with a cylindrical mold measuring 15x30 cm as much as 4 pieces on each test concrete quality. And will be tested strongly press at the age of 14, and 28 days. The number of strong press test objects – 2 pieces with a cylinder size of 15x30 cm, is intended to make savings in terms of concrete volume or test objects that automatically lead to the saving of raw materials, time and cost. In this study, the first step by preparing materials such as sand, gravel, cement, water and also additional materials of bamboo fiber and Gypsum waste. Then then do the testing of materials in the laboratory, then the mix design process using microsoft excel software. And done with the process of trial mix, if the result of slump test is as planned continued the process of making samples of test objects printed using cylindrical mold size 15x30 cm. Then concrete is dismantled from mold after 24 hours and immediately carried out immersion / curring concrete until the day that has been determined. As a result the concrete lives in a strong test press

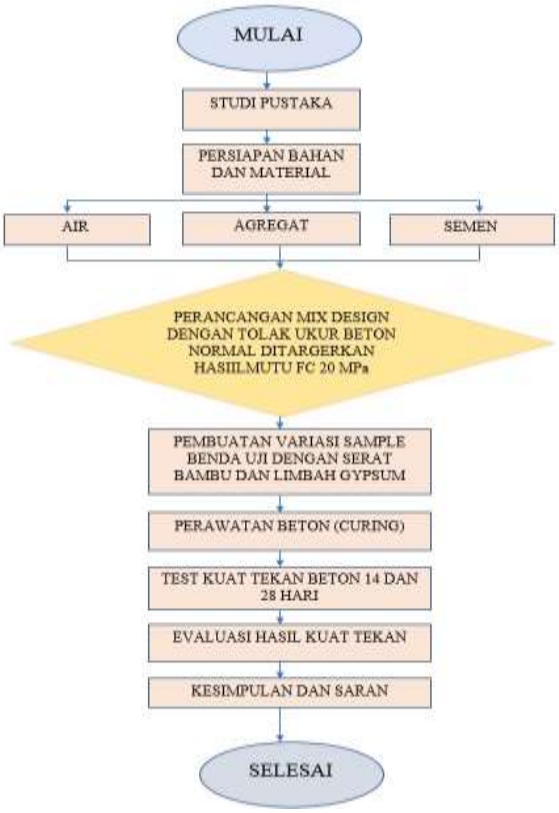

Figure 1. of The Research Flowchart
Source: Research Data

Table 1. Material requirements for 1 concrete m^3 with FC-20 MPa quality

Materials	Needs(kg/m^3)
Cement	427,083
Water	205
Sand	491,53
Gravel	1264,38

The research was conducted as many as 8 variations of the mixture plus normal concrete as control concrete. Each variation per day is 3 samples. So, a total of all variations plus normal concrete as many as 50 samples. Here is the number of material needs for each cylinder 15x30 cm:

Table 2. Material needs for 1 cylinder 15x30 cm

Bumbu	Gypsum		Semen	Air	Pasir	Kerikil
1%	27,20	3%	81,6	2638,4	1304	3126	8040
	27,20	5%	136	2584	1304	3126	8040
1,5%	40,80	3%	81,6	2638,4	1304	3126	8040
	40,80	5%	136	2584	1304	3126	8040
2%	54,40	3%	81,6	2638,4	1304	3126	8040
	54,40	5%	136	2584	1304	3126	8040
3%	81,60	3%	81,6	2638,4	1304	3126	8040
	81,60	5%	136	2584	1304	3126	8040

2.3. Research Place and Time

Venue: Laboratotium Structure and Materials

Building Civil Engineering Study Program, Faculty of Engineering, Mercu Buana University Bekasi Campus D.

When : September 2019 to January 2020

3. Results And Discussions

Gypsum Waste Gradation Testing
Figure 2. Waste Gypsum Mash
Source : Research Data

Gypsum granular gradation testing aims to determine the smooth gradation of granules in gypsum. The size of the gypsum granules should be equal to the size of the cement granules. Please note that cement granules escape from the no. 100 sieve. Here are the results of gypsum waste gradation testing:

Table 3. Gypsum gradation testing

Saringan	Berat Tahanan (Gram)	Jumalah Berat Tertahan (gram)	Jumlah Beban	
			Tertahan	Lewat
4	0	0		100
8	0	0	0	100
10	0	0	0	100
12	0	0	0	100
20	100	100	5	95
40	200	300	15	80
80	160	460	23	77
100	1200	1660	83	17
200	300	1960	98	2
Pan	40	2000	100	0

Source: Research Data

3.1 Slump Testing (Workability)

Testing *of slump* (*workability)*is necessary to know the level of fresh concrete kelecakan. The higher the *slump* value, the more diluted the concrete and easier to work with, and vice versa. In this study, researchers planned a *slump value* of 6-18 cm.

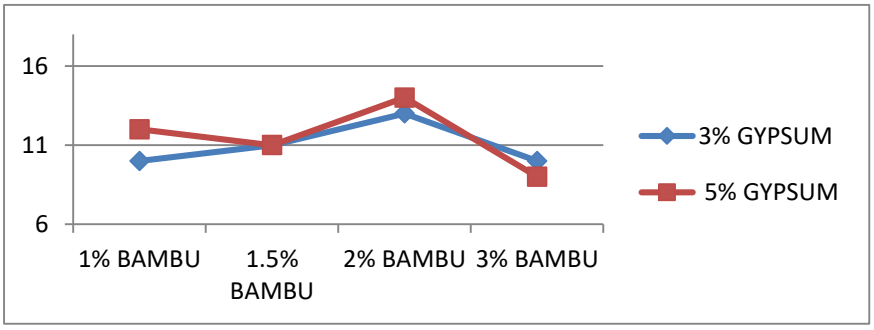

Figure 4. Value of Slump Test Results
Source: Research Data

From the data of the above test results, it can be seen that in this study the more amount of bamboo fiber and gypsum waste mixed then the lower the slump value. This can be seen from the graph of the result of the slump that is decreasing.

3.2 Strong Concrete Press Testing

Strong concrete press testing is carried out using a press test tool with 6 *concrete samples* per variation. 3 *samples* on the 14th day, 3 *other samples* on the 28th day. Here are the results of the powerful test press:

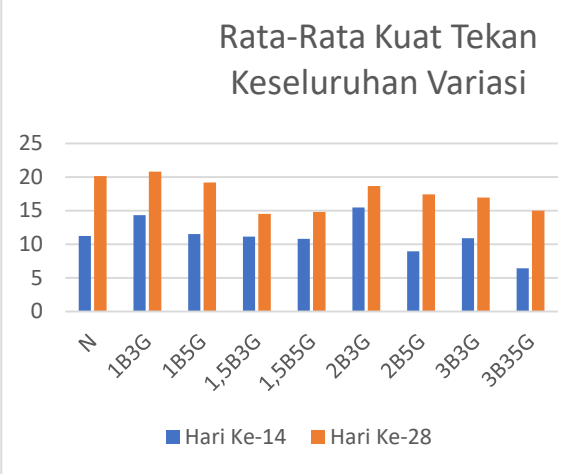

Figure 5 Results of Strong Concrete Press
Source: Research Data

From the histogram above, it can be noted that the highest press strong result on all variations on day 14 is a 1B3G variation with a mixture of 1% bamboo fiber + 3% gypsum with a strong press of 14.33 MPa. While on the 28th day strongest concrete press is at variation 1B3G which is 20.81 MPa. Meanwhile, concrete with a mixture of bamboo fibers and gypsum has decreased significantly with the value listed on the chart.

4. Conclusion

1. Based on the results of the study The larger the mixture of bamboo fibers and gypsum on the concrete mixture makes a decrease in the strong value of the concrete press due to the increasing absorption of water that occurs resulting in bitternessOn the 28th day strong press obtained from all variations of concrete mixture that has been subtitused with sugar cane sand ash and glass powder gets value below normal concrete.
2. Based on the results of the study the highest press strong value of concrete mixed with substitution material is in the mixture or variation of 1B3G (1% + 3%) with an average yield of 20.81Mpa.
3. Based on the result of concrete disalition mixed with substitution material the highest slump value is found in variations of 2B5G (2 % + 5%) 14 cm, and the lowest slump value is found in the 3B5G variation (3 % + 5 %) namely 9 cm, where the result is still in accordance with the calculation of the design mix which is between 60 - 180 mm.
4. Based on the results of concrete research with bamboo fiber as fiber and substitution material in the form of gypsum as cement substitution material with substitution variation 1B3G (1% + 3%) with an average yield of 20.81Mp for 28 days can be used on the construction of the structure because it has strong press results that correspond to the initial planning and for other variations more efficiently.

4.1 Advice

The advice that can be silenced from this research, namely:

1. At the time of research there needs to be more attention to the testing of materials materials, testing additional materials, calculation of mix design, curring control, and strong test press, in order to get maximum results.
2. At the time of the manufacture of the test material after stirring and at the time of pounding should be carried out according to the procedure so that the printed concrete does not have a large pore cavity so that the resulting concrete does not suffer from damage, in the event of damage to the concrete will affect the result of the strong value of the concrete press.
3. At the time of Curring do not be tightened with other samples because it can lower the strong value of press on concrete that is in the curring process.

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