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ANALYSIS ON THE ADDITION OF FIBER THE STRONG BENDING MIXED CONCRETE

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ABSTRACT

A concrete age of 3 days with normal mixture without fiber produces 152.60 kg/cm2 flexural strength, while the flexural strength of concrete with the addition of 0.50% bendrat fiber is 208.40 kg/cm2, up 37.00% from the beginning and so does the addition of wire bendrat 2.00% is an increase of 251.00 kg/cm2 64.48%. Concrete age of 14 days with normal mixture without fibers produces strong bending 202.00 kg/cm2, while the flexural strength of concrete with fiber additions of 0.50% is 276.45 kg/cm2 and so also with the addition of 2.00% bendrat wire is 336.14 kg/cm2 an increase of 66.41%. Concrete age of 28 days with normal mixture without fiber produces 240.00 kg/cm2 flexural strength, while the flexural strength of concrete with the addition of 0.50% bendrat fiber is 319.00 kg/cm2, up 33.00% from the beginning and so does the addition of wire 2.00% is an increase of 382.30 kg/cm2 59.29%. The addition of fiber wire able to dramatically increase both flexural strength of concrete at the age of 3 days and at 14 days or 28 days.

Keywords: as well as wire flexural strength of concrete, normal concrete mixes.

1. INTRODUCTION

Use of concrete as part of the construction elements of the building has a lot of advantages when compared to other building materials such as wood and bamboo and steel/iron. Concrete advantages which are very strong in resisting concrete compressive strength or pressed and shaped as desired and can be non-flammable and easy to obtain raw materials as well as the price is also relatively inexpensive, especially maintenance easy and cheap, and durable.

Ability of the concrete compressive load withstand possible as construction material in large buildings and a lot of supporting heavy loads experienced by the concrete itself. Concrete mixture is soft allowing molded, printed suit both tall building structures that focus on strength and careful construction calculations [1]. The execution of a simple concrete provides opportunities for anyone to carry, durability and easy maintenance make the concrete used in the building of high-rise buildings. Concrete has shortcomings that cause low brittle concrete ability to resist tensile and flexural loads and not be able to withstand a tensile load/tensile strength retention [2]. Overcome the low tensile strength of the reinforcement placement should really be taken into account carefully.

The addition of fibers in concrete are based on the assumption that the fibers will be able to increase the tensile strength and flexural strength of concrete by way of strengthening the bond between the fiber forming particles so that the concrete between the fibers with interlocking concrete particles bind to each other. With fiber and particle bonding strength concrete is likely to increase the ability of concrete to resist tensile and flexural loads. Improve load bearing ability of construction will reduce the tensile and flexural cracks too early in the construction caused shrinkage, expansion and loading.

This study uses an alternative fiber materials, readily available, inexpensive and has a shape similar to the original fiber. Using a mixture, the addition of fiber wire bendrat to increase flexural strength of concrete used in the building structure. The use of reinforced concrete construction, especially among people taking concrete steel reinforcement is often done. In the calculation of the size of the diameter of reinforcing concrete is usually determined after a comprehensive reinforcement obtained, while the extensive reinforcement of concrete is obtained as a result of the calculation is affected by the quality of concrete, steel and wide quality concrete and concrete high [2, 3].

1.1 Research objectives

The purpose of this study is to determine how much influence the addition of fiber wire to withstand flexural strength of concrete.

1.2 Understanding age concrete

Concrete is a material that resembles rock obtained by making a mixture with a certain proportion of cement, sand, coral and other aggregates and water added to make the mixture harden in the mold according to the desired shape and dimensions [1, 4].

Strength of concrete in the concrete age proved that the hydration process goes on even though not as good in the early stages after the pengesoran held the older the age of the concrete growing increasingly stronger [4, 8].

Quality concrete is influenced by many variables such as the quality of the constituent materials and proportions of each ingredient and the interactions between these materials efficiently by mixing with concrete age and the effects of temperature treatment [5].

Reinforced concrete is concrete that is a combination of plain concrete material that has high compressive strength but low with its power-rod reinforcing steel bars that can provide the required tensile strength. Concrete road is also widely used in buildings and highways with high levels of traffic [9]. The properties of concrete and reinforcing at Table-1 below.

Table-1. Properties of concrete and reinforcing steel [6].

No	Type	Concrete	Reinforcing Steel
			Good
1.	Tensile strength	Ugly	Good but a slim rod will bend
2.	Compressive strength	Good	Good
3.	Shear strength	Enough	Rust if not protected
4.	Preservation	Good	Ugly experience in grapidloss
5.	Resilience to fire	Good	of strength at high temperatures

1.3 Effect of addition of fiber wire bending

Concrete beam has to bend down to avoid the collapse of the construction because of the load it receives. When there are long load then at early stages will occur cracked hair, over time hair cracks will merge into the cracks that can lead to greater corrosion of reinforcement. Corrosion of reinforcement will reduce the diameter of the reinforcement which ultimately leads to reduced strength reinforcement in weight-bearing even if not immediately repaired to the collapse of the construction.

Flexural strength is the amount of charge that is in the middle of the second concrete block on the edge of the beam ends with a prop pedestal, because of the work load the concrete tends to bend downward. Events cracking reinforcement of concrete -forming material until the collapse of the construction due to the large bending loads are not comparable with the forces that seek to maintain the integrity of the construction in support of the load. When loads which can be offset by the damage in the style of the construction can be reduced to a minimum.

Compressive strength worth 1.4 to 1.7 times the price of strength obtained from the compressive strength of the cube axially. On testing by providing sufficient reinforcement at the bottom of the needed power to prevent the concrete bottom before it was destroyed because of the pull of the top distressed destroyed. To improve the ability of concrete to resist tensile loads and loads especially bending loads is developed making additional fiber concrete with wire bendrat given in combination. The addition of fiber reinforcement in principle is to provide evenly with random orientation. These fibers will enhance the ability of concrete to resist tensile and flexural loads.

1.4 Meaning of reinforced concrete

Material of reinforced concrete as concrete reinforcing rods normally used as concrete reinforcement iron origin, entered into collaboration in shouldering the burden. Thus reinforced concrete with steel reinforcement of concrete is the material shape of pc mix, sand and gravel as well as added water and stirred just enough so that all the media is placed in a wooden box by providing concrete and steel reinforcement material is expected to have both voltage and voltage closely considerable bending in a given burden.

How to distinguish the aggregate in the concrete is to perform the separation of the coarse grains. Fine grained aggregates will separate themselves from the coarse-grained aggregates.

2. RESEARCH AND METHODS

2.1 Stages of research

This study is an experimental research is to find a causal relationship between the two factors as the existence of a treatment, using the method of looking at the way the research object by adding fiber bendrat wire into the concrete, then concrete formed into concrete blocks (10 x 10 x 10) cm size which would then be tested strong bending at the age of 3 days, 14 days and 28 days. The study consisted of three phases: preparation, execution and processing of data. Preparation phase is the planning and preparation of materials. Implementation phase is the testing of materials, mix design, manufacture specimen. Compaction processing stage is processing the results of experiments with data obtained in the field and ultimately obtained a conclusion.

2.2 Techniques to get data

To obtain data on the bending strength bending test with bending test machine and load carried by the load point (P) with the following steps:

2.2.1 All the beams to be tested were weighed and measured along the sides

2.2.2 Setting distance roll joints on the test machine with a distance of 50 cm above the specimen and place the roller joint pedestal such that the load suppression by the testing machine right in the middle of the beam span.

2.2.3 Flexure testing machine is turned on and then begins to move the needle on the manometer will rise accordingly great imposition.

2.3 Data analysis

The flexural strength test results on the testing of reinforced concrete bending rattan is the amount of data concrete flexural test (P). because it is located symmetrical concentrated loads and then [7].

$$RA = RB = ½. P + ½ .q. L \quad (1)$$

While to calculate the maximum moment load are calculated with the equation:

$$M = ½ .P .½. L + 1/8 q L2 = ¼ .P. L + 1/8 .q. L2 \quad (2)$$

3. RESULTS AND DISCUCCIONS

3.1 Examination results content clay in sand

Taking the example of sand weighing 100 grams and then dried in an oven at a temperature of 100°C for 24 hours. After the sand was issued in the oven and aerated so as to achieve room temperature. Dry sand that has been cooled, then put into a 250 cc measuring cup, then pour water little by little into the measuring cup so that the water is 12 cm above the sand surface. Shake the sand and water in a measuring cup until the water and sand thoroughly blended for one minute.

Sludge content of less than 5% indicates that the tide/concrete sand can be directly used as fine aggregate without first washing.

As well as the testing of organic substances in the sand that is by providing a solution for 24 hours so that the solution becomes pale yellow and mean sand under conditions of organic substances which contain very little. So that the sand can be directly used immediately. Color changes arising from the observations with the existing colors in the color table changes can be immediately compared.

3.2 Examination of specific gravity gravel

From the test results obtained:

3.2.1 Oven dry weight of gravel = 3000.00 grams
3.2.2 Heavy gravel SSD = 3080.50 grams
3.2.3 Weight of pebbles in water = 1807.00 grams

To get the variation in the diameter of sand grains, the percentage weight loss of sand taken 3000.0 grams oven dried sand is then filtered using a vibrating machine.

3.3 Bending test results strong concrete age 3 days

Number of specimens for testing the age of 3 days is 25 pieces consisting of 5 pieces of specimens for each additional variation bendrat fiber wire. Water cement ratio (fas) used is 0.52. Flexural strength testing of concrete is known that the addition and wire bendrat positive effect on the increase in flexural strength of concrete when the concrete age of 3 days, the resulting flexural strength respectively 152.60 kg/cm^2, 208.40 kg/cm^2, 238.43 kg/cm^2, 258.00 kg/cm^2, 251.00 kg/cm^2 with the average increase was 30.00%, 37.00%, 56.22%, 69.06% and 64.48%. For more details shown in Figure-1 below.

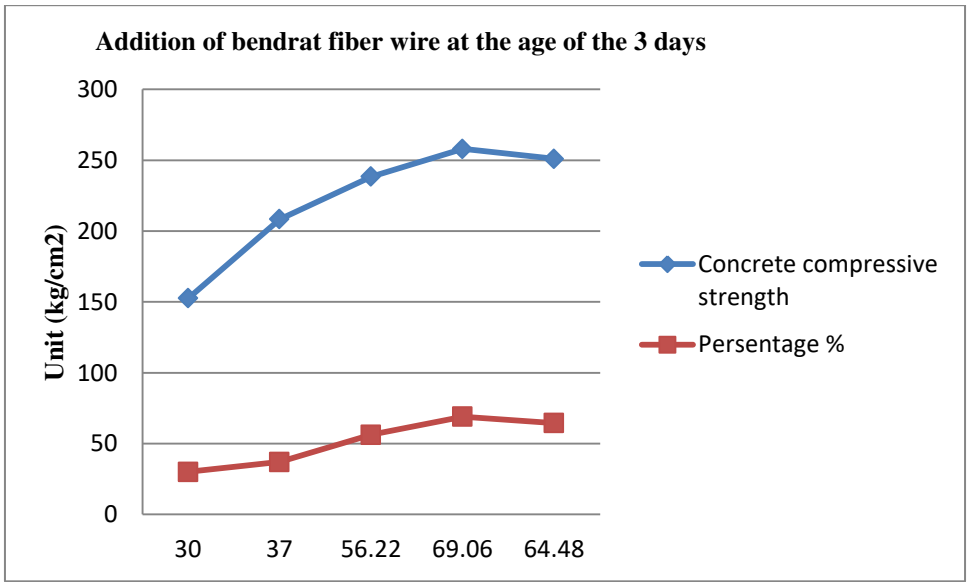

Figure-1. Results of testing the compressive strength of concrete at the age of 3 days.

3.4 Bending test results strong concrete age 14 days

Number of specimens for testing at 14 days was 25 units consisting of 5 pieces for each test specimen variation bendrat additional fiber wire. Water cement ratio (fas) used is 0.52. Flexural strength testing of concrete is known that the addition and wire positive effect on the increase in flexural strength of concrete when the concrete is from 3 days resulting flexural strength of each is 202.00 kg/cm^2, 276.45 kg/cm^2, 324.27 kg/cm^2, 346.00 kg/cm^2, 336.14 kg/cm^2 with the average increase was 30.00%, 37.00%, 61.00%, 71.28% and 66.41%. More details are shown in figure 2 given below.

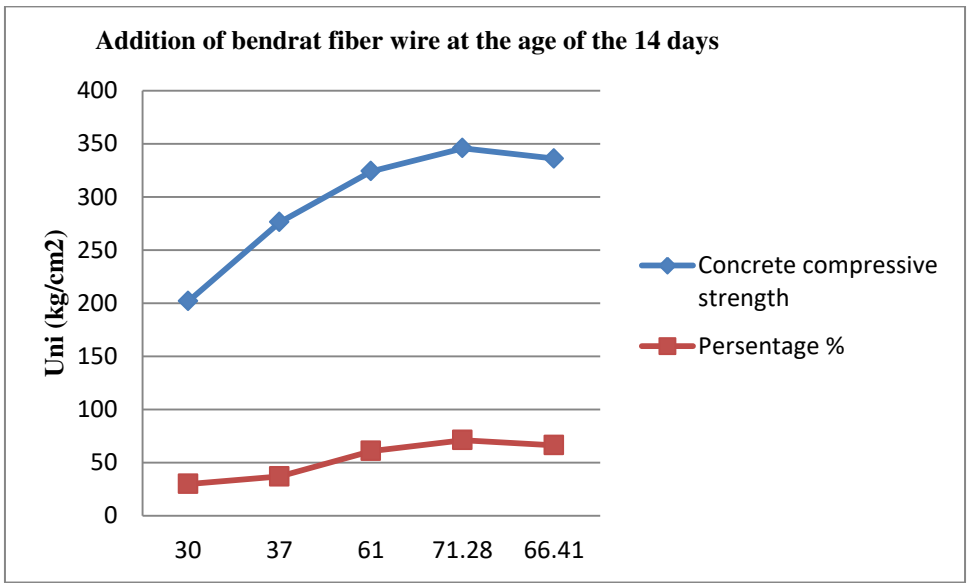

Figure-2. Results of testing the compressive strength of concrete at the age of 14 days.

3.5 Bending test results strong concrete age 28 days

Number of specimens for testing the age of 3 days is 25 pieces consisting of 5 pieces of specimens for each additional variation bendrat fiber wire. Water cement ratio (fas) used is 0.52.

Flexural strength testing of concrete is known that the addition and wire bendrat positive effect on the increase in flexural strength of concrete when the concrete age of 3 days. The resulting flexural strength respectively 240.00 kg/cm^2, 319.00 kg/cm^2, 370.00 kg/cm^2, 384.34 kg/cm^2, 382.30 kg/cm^2 with the average increase was 30.00%, 33.00%, 54.16%, 60.14% and 59.29 %. For more details shown in Figure-3 below.

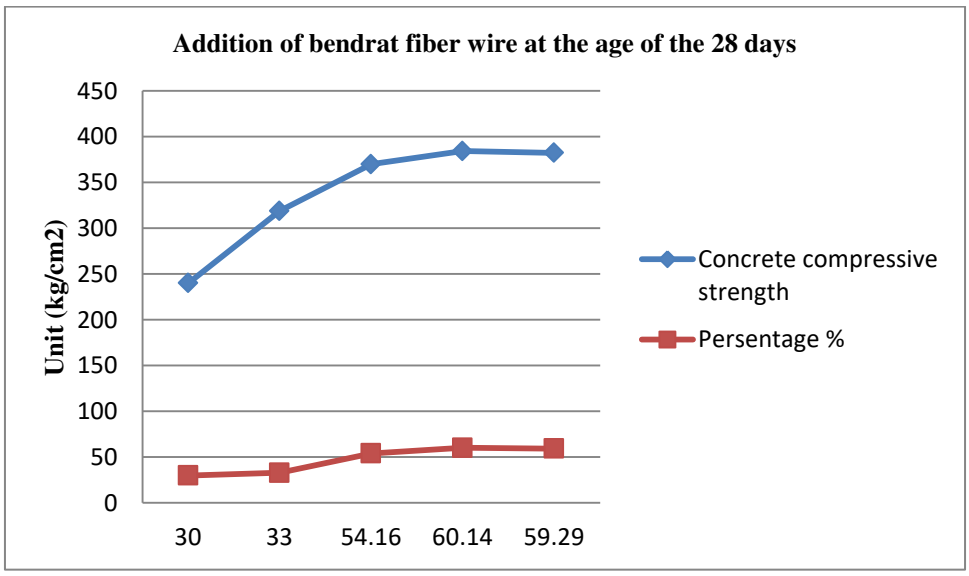

Figure-3. Results of testing the compressive strength of concrete at the age of 28 days.

3.6 Analysis of test results with strong flexible optimum concrete fiber addition

From the description above it would seem that the addition of fiber optimum levels bendrat wire is 1.50%, both at the concrete age of 3 days, 14 days or 28 days. The addition of fiber wire 1.50% on each concrete age respectively produce flexural strength kg/cm2 at 258.00 kg/cm2, 346.00 kg/cm2 and 384.34 kg/cm2 with a percentage increase of 69.06%, 71.28% and 60.14%. In Figure-4 below, a part of the test specimen and during the test and the results of the dial reading on the concrete compressive strength test equipment are shown.

The use of concrete with certain things for compressive strength of medium quality concrete can be applied to concrete roads. The emphasis on the use of traffic construction is low, with an average speed level of medium and low motorized vehicles [10-12].

Figure-4. Display of dial for normal concrete compressive strength.

Figure-5. Display of testing of concrete compressive strength for selected concrete quality.

4. CONCLUSIONS

a) Concrete age of 3 days with normal mixture without fiber produces 152.60 kg/cm^2 flexural strength, while the flexural strength of concrete with the addition of 0.50% bendrat fiber is 208.40 kg/cm^2, up 37.00% from the beginning and so does the addition of wire 2.00% is 251.00 kg/cm^2 up 64.48%.

b) Concrete age of 14 days with normal mixture without fibers produce strong lenttur 202.00 kg/cm^2, while the flexural strength of concrete with fiber additions of 0.50% is 276.45 kg/cm^2 and wire as well as the addition of 2.00% is 336.14 kg/cm^2 up 66.41%.

c) Concrete age of 28 days with normal mixture without fiber produces 240.00 kg/cm^2 flexural strength, while the flexural strength of concrete with fiber additions of 0.50% is 319.00 kg/cm^2, up 33.00% from the beginning and so does the addition of wire 2.00% is 382.30 kg/cm^2 up 59.29%.

d) The addition of fiber wire bendrat able to dramatically increase both flexural strength of concrete at the age of 3 days and at 14 days or 28 days.

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REFERENCES

[1] Alfred Johnson and Harry H Chenoweth. 1989. Applied Strength of Materials. Translation Sebayang Darwin, PublisherGrants, Jakarta.

[2] Anonymous. 1971. Regulation of the Indonesian Concrete. Department of Public Works and Electric Power, Bandung.

[3] Anonymous. 1989. General Guidelines for Concrete 1989. Directorate General of Human Settlements, Ministry of Public Works, Jakarta.

[4] Anonymous. 1988. Road Maintenance Project Help IBRD. Directorate General of Highways, Ministry of Public Works, Jakarta.

[5] Anonymous. 1990. Procedures for the Preparation of Plans Mixed Concrete. YLPMB Department of Public Works, Bandung.

[6] Mosley WH & Bungey JH. 1989. Planning Reinforced Concrete. Publisher Gramedia Pustaka Utama, Jakarta.

[7] Sudjana. 1996. Statistical Methods. Publisher Tarsito, Bandung.

[8] Syaiful and Setiana Mulyawan. 2013. Studi Penambahan Abu Batubara Sebagai Filler pada Campuran Beraspal, Prosiding Vol. 1 Geoteknik, Material, Struktur, Konteks 7, ISBN 978-979-498-859-6 Universitas Sebelas Maret Surakarta (Indonesian Language).

[9] Syaiful Syaiful. 2017. Engineering model of traffic and transportation safety with pattern of cooperation between sustainable region in Bogor, MATEC Web Conf. 138(2017) 07008DOI: https://doi.org/10.1051/matecconf/201713807008

[10] Syaiful Syaiful, Doni Hariyadi. 2019. Case Study on SustainableT-Jungtion Cibinong City Mall (CCM) in Bogor IIndonesia. ARPN Journal of Engineering and Applied Science. 14(17): 2960-2971. http://www.arpnjournals.org/jeas/research_papers/rp_2019/jeas_0919_7895.pdf

[11] Syaiful Syaiful, Yogi Pratama. 2019, Sustainable Studies about General Public Transport Performance in the City of Bogor. ARPN Journal of Engineering and Applied Science. 14(18): 3241-3247. http://www.arpnjournals.org/jeas/research_papers/rp_2019/jeas_0919_7925.pdf

[12] Syaiful Syaiful, Sri Wiwoho Mudjanarko. 2019. Noise of Motor Vehicles at from of Baiturrahman Great Mosque Semarang City, The Spirit Of Society Journal. 2(2) March 2019. https://jurnal.narotama.ac.id/index.php/scj/article/view/902