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Pemanfaatan Serat Ijuk dan *Sikacim Concrete Additive* sebagai Bahan Tambah pada Campuran Beton ditinjau dari Kuat Tarik Belah

(Utilization of Palm Fiber and Sikacim Concrete Additive as Additional Materials in Concrete Mixtures Viewed From the Strength of Pulling)

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ABSTRAK

Beton merupakan bahan penting yang digunakan dalam pembangunan daerah. Tujuan penelitian ini adalah memanfaatkan ijuk sebagai bahan tambahan untuk meningkatkan kuat tarik belah beton. Selain itu, aditif beton sicacim digunakan sebagai bahan kimia tambahan dalam campuran beton dalam upaya menghasilkan beton yang lebih berkualitas. Dalam penelitian ini, aditif beton sicacim (0,08% semen) dan ijuk (4%, 5%, dan 6% berat) digunakan sebagai pengganti semen. Komponen benda uji yang dimanfaatkan pada penelitian ini adalah bejana dengan ukuran yaitu 15 x 30 cm dengan umur 28 tahun, dan nilai rut 60-180 cm. Konfigurasi paduan menggunakan teknik SNI 03-2834-2000. Total ada 12 spesimen, tiga untuk setiap variasi. Uji selesai adalah uji elastisitas substansial. Berdasarkan hasil penelitian, daya tarik belah pada beton normal adalah diangka 3,52 MPa kuat tarik belah beton dengan campuran 4% ijuk dan 0,8% aditif beton sicacim adalah 3,69 MPa; daya tarik belah beton menggunakan bahan campuran 5% ijuk dan 0,8% aditif beton sicacim adalah 4,09 MPa; kemudian daya tarik belah beton menggunakan campuran sebesar 6% ijuk dan 0,8%.

ABSTRACT

Concrete *is an important material used in regional construction. The purpose of this study was to utilize palm fiber as an additive to increase the split tensile strength of concrete. In addition, the sicacim concrete additive is used as a chemical additive in concrete mixtures to produce higher-quality concrete. This study used sicacim concrete additives (0.08% cement) and palm fiber (4%, 5%, and 6% by weight) as cement substitutes. The components of the test object used in this study were vessels with a size of 15 x 30 cm, aged 28 years, and rut values of 60-180 cm—alloy configuration using SNI 03-2834-2000 technique. There are a total of 12 specimens, three for each variation. The finished test is a substantial elasticity test. Based on the research results, the split tensile strength of standard concrete is 3.52 MPa; the split tensile strength of concrete with a mixture of 4% palm fiber and 0.8% sicacim concrete additive is 3.69 MPa; the splitting tensile strength of concrete using a mixture of 5% palm fiber and 0.8% sicacim concrete additive is 4.09 MPa; then the tensile strength of the concrete uses a mixture of 6% palm fiber and 0.8%.*

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1. INTRODUCTION

Concrete today is one of the most widely used building materials for structural and building works. Concrete is a material that looks like stone. Concrete is made by mixing cement, sand, coral or other gravel, water, and then simultaneously stirring and forming it into a mold according to the desired shape so that the mixture of several ingredients to make the concrete hardens. so that it can be divided into one unit. Homogeneous a chemical reaction between cement and water causes the mixture to harden into rock-like consistency. The aggregate particles are bound together into a solid mass by cement's chemical reaction [1]. Concrete is a composite material that is made up of sand, gravel, or coarse aggregate, a water-based binder, and Portland cement [2]. Because concrete is a brittle material and has a compressive strength that is higher than its tensile strength, structural breakdown in high-strength concrete can happen quickly. Because concrete has a tensile strength that is only 9 to 15 percent of its compressive strength, it is frequently thought that concrete has no tensile strength when planning [3]. Derived from natural fibers which are almost black in color, they are very strong, perfectly pliable, and resilient and have resistance to the presence of salt water and humidity [4].

Sikacim compound substantial added substance, when utilized as a substantial combination, will speed up the solidifying of the substantial. In light of the consequences of past examination, As time goes by, the addition of sikakim substance to the mixture can achieve the compressive strength of the composition of the substances and so that it will support the quality of the relatively high compressive strength of the existing cement, the compressive strength value when it reaches the age of 28 days is obtained in various choices of additives. sikakim substance is a substantial combination of 0.7% by weight of concrete which can reduce the water content of 15% from the initial water content. The compressive strength of concrete begins to decrease when 1% sikacim concrete additive is used; consequently, the amount of sikacim concrete additive used should be greater than 0.5 percent and less than 1% by weight of cement [5].

Other ingredients are mixed into the concrete using ASTM C.125-1995:61 and ACI SP19 before or during mixing. To change or make the properties and characteristics of concrete stronger and more elastic, such as making it easier to work with or for other purposes, additives are required. [6]. Because palm fiber has sufficient tensile strength, it is expected to reduce the effects of loading and cracking too fast. The tensile strength of good or nearly perfect concrete will increase and the concrete will become much lighter due to the addition of palm fiber to the mixture for making concrete. The decision of palm fiber as fiber is on the grounds that this material is not difficult to get, strong, doesn't decay effectively and has financial worth.

Several issues arise in this study, including the following: how much of the concrete mix is made of palm fiber; which level of sikacim substantial added substance is utilized as an additional fixing science on concrete; does the expansion of palm fiber and sikacim substantial added substances to the substantial blend increment or abatement the rigidity of cement.

A. Fiber Concrete

Beton fiber is a blend of beton and fiber with a panjang of less than 25 millimeters and a diameter of one millimeter or less. Asbestos and plastic (polypropylene) or potongan kawat baja may be used for the bedding. However, there is a manifold and a perlindungan from the benturan [7].

Fiber Concrete is a mixture of materials such as fiber, cement, sand and gravel formed into small sizes. Steel, plastic, glass elements, carbon, and also fibers from natural materials, for example, hemp, which is a fiber to change or improve the properties of concrete. [8].

Apriyatno [9] conducting research on fiber concrete. The final results of his research explained that the use of materials such as fiber can increase or increase the mechanical properties, namely compressive hight strength, split tensile strength, beam shear strength, beam bending strength, ductility, then also increase resistance to shock.

Innovation in the utilization of natural and synthetic fibers in concrete set the stage for the use of fiber in concrete. For non-structural concrete, natural materials like palm fiber and bamboo can be used as fibers. Fiber reinforcement has the advantage of preventing concrete from cracking prematurely due to heat hydration or loading. Likewise, it is impervious to harm to substantial which has an elevated degree of porosity [10].

According to Fennil and Indra's slump theory, polymer braids with larger and thinner diameters are known to increase the workability of concrete. The combined fiber mixture with a diameter of 0.8 mm, a proportion of 0.4 percent, and a compressive strength of 62.49 MPa is expressed as the result of the compressive strength of the samples that have been tested. The large fiber width will affect the high splitting stiffness in the material without strands, the highest splitting elasticity is in the alloy fiber of 1.20 mm, and the fiber content is 0.4% with a split stiffness value of 7.06 MPa [9].

according to the results of the tensile test that we have done before, adding fiber to the concrete mix with a ratio of 0.5 percent to 2 percent with an increase of 0.5 percent each in 4 trials can increase its value. At a fiber content of 2%, the concrete produced in this test reaches a maximum value of 396.43 kg/cm2. While the basic elasticity produced is around 267.59 kg/cm² in concrete without the use of strands. Fiber concrete can be used as a structural material such as factory floors, sidewalks, fence walls, and so on because it has a higher tensile strength than concrete [11].

Other studies also explained that concrete with no fiber actually has tensile and compressive strengths of 2.04 and 24.11 MPa, respectively, which are typical of concrete. Substantial utilizing 1% fiber diminished the compressive strength from 23.31 MPa to 22.40 MPa, expanded the degree of flexibility from 2.52 MPa to 2.87 MPa. Fiber makes up 2% of the concrete, and while the tensile strength goes up to 3.10 MPa from 2.75 MPa, the compressive strength goes down to 21.92 MPa from 22.53 MPa. 3% concrete with fiber The compressive strength decreased from 22.32 MPa to 19.81 MPa, while the tensile strength actually increased from 2.92 MPa to 3.35 Mpa [12].

According to other studies that have been conducted, the results of testing the compressive strength of concrete can be seen and known as hazelnut shells and sicacim concrete additives in normal concrete combinations, which can quickly increase the

compressive strength of concrete [13]. The research that has been carried out concludes that the compressive strength of concrete is 26.2 MPa without the addition of straw ash and sicacim concrete additives, the strength percentage is 27.3% MPa with the addition of 10% straw ash and 1% sicacim concrete additives. strength1 was 27.3% MPa with the addition of 10% straw ash and 1% sicacim concrete additives. The concrete has a strength of 22.3 MPa and a compressive strength of 3.9% lower than normal concrete when straw ash and 1 sicacim concrete additive is used at %1% percentage. In addition to 30% straw ash and sicacim concrete additive, which contributes 1% of strength, this study obtained a compressive strength of 16.7 MPa, or 9.5% lower than normal concrete [13].

The function of fiber in the existing research is mentioned, among others, it is used for roofing, brooms, ropes, waterproofing, and other household items. Indonesia is a country that produces the largest palm fiber among other countries in the world with a production capacity of 164,389 tons/year and provincial palm fiber production in one of the provinces, namely Lampung, is 2004 tons/year [14].

Fiber concrete will be concrete in which fiber is added to it, which plans to up the rigidity, with the goal that it is impervious to elastic powers brought about by the impact of environment, temperature, and weather conditions changes experienced by a huge surface. The addition of fiber by itself has the potential to lessen the likelihood of weather-related cracks. The extra of fiber can likewise expand the versatility of the substantial with the goal that the construction will keep away from unexpected breakdown due to over-burdening [15].

Built up substantial designs are one of the most dependable designs right now, and are broadly utilized in the development of tall structures, long-length scaffolds, towers, etc. To supprot all loads With lean dimensions of [16], this kind of structure really needs concrete with high quality following the parameters of compressive strength of more than 6000 Psi or around 41.4 MPa (SNI T-15-1990-03).

Several of the properties of concrete that have been discovered through other studies, including tensile strength, ductility, resistance to receiving shocks, strength to bending, and fatigue strength, can be better improved by using fibrous concrete.. The quality of fibrous concrete composites can also be enhanced by adding fiber additives to concrete mixtures. Concrete can be improved in a variety of ways to improve its quality and properties, such as by replacing or adding basic ingredients like cement and aggregate to produce concrete with particular properties like heavy concrete, lightweight concrete, chemically resistant concrete, and so on. Various materials, including wire, plastic, fabric scrap, and bamboo, can be used to make the fibers [17].

Concrete is currently the building material of choice. Concrete structures are used in the construction of foundations, columns, beams, and slabs in buildings. Breakwaters, weirs, drainage systems, and other water structures frequently make use of concrete structures. Additionally, concrete is frequently utilized in the construction of road structures like bridges, rigid pavements, and other buildings. From different turns of events, both the technique for execution and the material for which it is made, different sorts of cement and strategies for execution have been made [18].

In recent years, additives have been added and combined with other ingredients to produce contemporary concrete. Cement today is mostly made using Portland concrete, stone and fine, coarse sand and water. The mixing of some of these chemicals into the concrete mix serves to control the setting of concrete characteristics which will be useful when placing concrete in extreme environments, such as windy weather conditions, presence of high or low temperatures, etc. [6].

Development in the field of design is as of now advancing quickly, which happens in different fields, for instance, structures, extensions, towers, etc. Concrete is a choice as an underlying material in building development. Concrete is in high demand due to its numerous advantages over other materials, including its ease of shaping, strength, accessibility to raw materials, durability, fire resistance, and lack of decay [19].

Concrete likewise a feeble, specifically having a low elasticity which makes it break effectively and is fragile. Research utilizing materials that can build the strength of substantial proceeds. The extra of fiber to the new substantial blend is a work to up the flexibility properties of cement [20].

Fiber composite technology is moving very quickly right now. Natural fibers and synthetic fibers are the two types of fibers. Due to its high strength and high fiber content, fiber is utilized extensively in the industrial world, including rope-making factories, the textile industry, and the paper industry. excellent for composites. In addition to synthetic composites, natural composites are being developed due to their unique properties, which can be recycled or renewed, thereby reducing petrochemical use and environmental impacts [21].

It has been found that addictive ingredients in concrete mix play a role in technological advances in development and in the fields of education and research. One of them is the expansion of fiber / fiber. Natural and synthetic fibers are utilized in the addition of concrete [22].

The properties of concrete at this time can be made better in several ways that must be done. Starting from working on the properties of substantive ingredients and also by including drugs. Fiber or liquid can improve the properties of concrete. in a study said that the compressive strength was reduced substantially when the expansion of the banana / hemp filament was given, but finally adaptation showed that with the presence of banana / jute strands, the use of crude oil in mixing the total betol substance could decrease and the flow intensity in the material also decreased (Ellie Awwad, 2012). The addition of fibers with a lower modulus of elasticity than the elastic modulus of the concrete matrix is thought to cause an increase in concrete ductility [23].

It has been proven through several studies that have been carried out in previous studies in recent years that concrete roof tiles can utilize a type of material such as fiber to improve and enhance their mechanical and physical properties to make them stronger, such as flexural strength and ductility. In addition, research by Yuwono, S. (1994) said that adding palm fiber would prevent shock cracks in the test tiles and wall panels when loaded. Fiber was chosen as fiber because of its affordability, durability, resistance to decay, and ease of availability [24].

Fiber concrete is the result of combining or combining cement added with palm fiber. The compressive strength and specific gravity of concrete can be affected by concrete fibers [25].

Sikacim Concrete Additive

Sikacim is a powder or liquid form which is added to concrete mixtures to change the properties of mortar and concrete in order to reduce water use and make the hardening process faster than usual. or make concrete that has the same compressive strength but is easier to shape and pour because the mix is thinner [5].

The materials used are very important in the process of making concrete additives, including admixtures and additives. The use of components aims to improve the desired concrete properties. Additional materials are added to the mixture of ingredients or mortar, and with these additional ingredients, the materials that are mixed will then have better properties. The added material to be used is Sikacim Substantial Added, this added material is the product of PT. In the manufacture of concrete, Sika Indonesia is often combined or combined with other materials. Sikacim Substantial Added Substance is an added substance that has the ability to accelerate cement solidification [13].

Tensile Strength Testing

Testing of cylindrical concrete specimens is the indirect tensile strength value of cylindrical concrete specimens produced by loading the specimens and leveling them horizontally with the edge of the surface of the machine's press table at the casting [15].

The elasticity is impacted by the nature of the substantial. The tensile strength of a concrete only slightly increases with every effort to improve its compressive strength. In SI, the connection between elasticity and compressive strength (f'c) is $0.5\sqrt{f'c}$ - $0.6\sqrt{f'c}$ [26]. Concrete has a tensile strength that is about 10% to 15% of its compressive strength, sometimes even 20%. This strength is more challenging to quantify and the outcomes fluctuate starting with one exploratory material then onto the next than for compacted chambers [12].

The concrete crack load of cracking moment (Mcrack), which is frequently utilized in prestressed concrete planning, can be estimated using the value of the split tensile strength test results [27]. A cylindrical sample subjected to a splitting test is used to determine the concrete's tensile strength [28]. The test uses a round and hollow object with a width ranging from 150 mm and a length of 300 mm, then it is given to the longitudinal header above the analyzer then the compressive load is applied evenly from above to reach the entire length of the tool. room as shown in Figure 1.

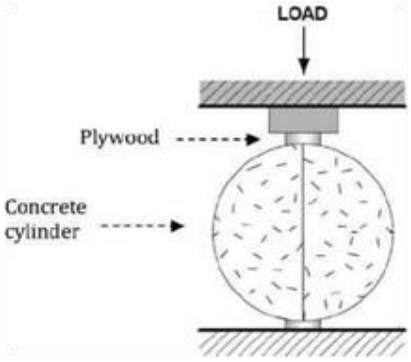

Fig. 1 Schematic of the tensile test for cylindrical concrete

Tensile strength 1 which can be seen in the figure, namely the condition when object 1 splits is called split tensile stress, calculated by the following equation according to predetermined standards (SNI 2491: 2014) :

$$F_{CT} = 2P/\pi LD \quad (1)$$

2. METHODS

A. FINE AGGREGATE SIEVE ANALYSIS

This study employs the experimental method, which entails carrying out experimental activities in order to collect data. Supporting the conducted research are technical data on SNI-03-2834-2000, as well as books or other written materials.

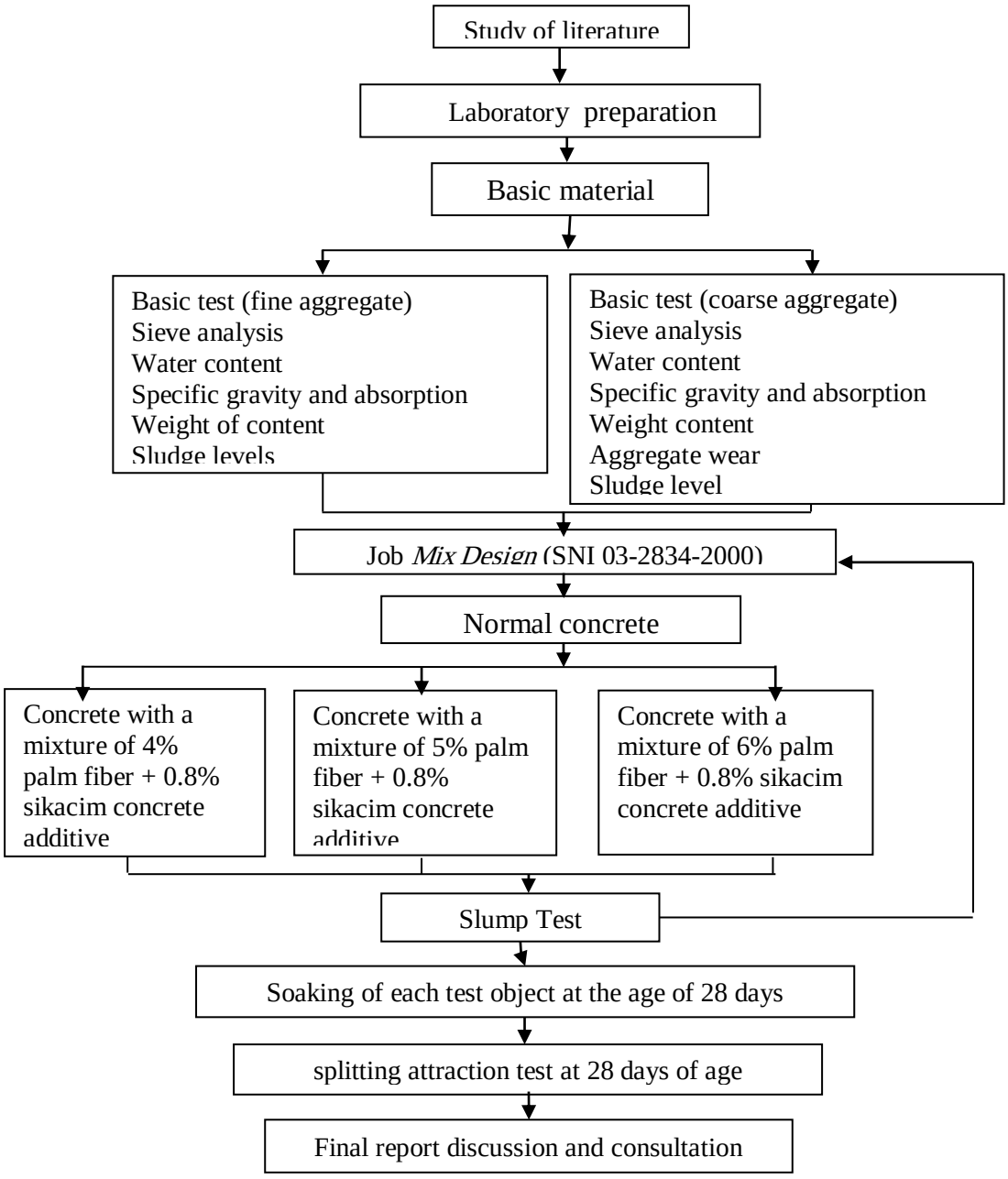

Fig. 2 Research flow chart.

Fine aggregate sieve analysis using predetermined filter numbers based on SNI 03-2834-2000 is described in Table 1, then a graph of the aggregate scoring zone is made which is obtained from the aggregate cumulative value.

Table 1. Data on results of testing and analysis of Aggregate Filters with fine materials

Sieve size	Retained Fraction				Cumulative	
	Sample 1	Sample 2	Total Weight (gr)	%	Retained	Pass-ing
9.52 (3/8 IN)	0	0	0	0,00	0,00	100,00
4.75 (NO. 4)	17	26	43	1,95	1,95	98,05
2.36 (NO. 8)	67	104	171	7,77	9,72	90,28
1.18 (NO.16)	181	219	400	18,18	27,9	72,1
0.60 (NO. 30)	287	322	609	27,68	55,58	44,42
0.30 (NO. 50)	290	331	621	28,23	83,81	16,19
0.15 (NO. 100)	135	163	298	13,54	97,35	2,65
PAN	23	35	58	2,64	100	0
TOTAL	1000	1200	2200	100		

Table 1's fine aggregate sieve analysis is depicted in Figure 3. The fine aggregate tested falls into zone 2 (medium sand) according to the test result graph, which can be seen in Figure 3. The fineness modulus value is 2.76.

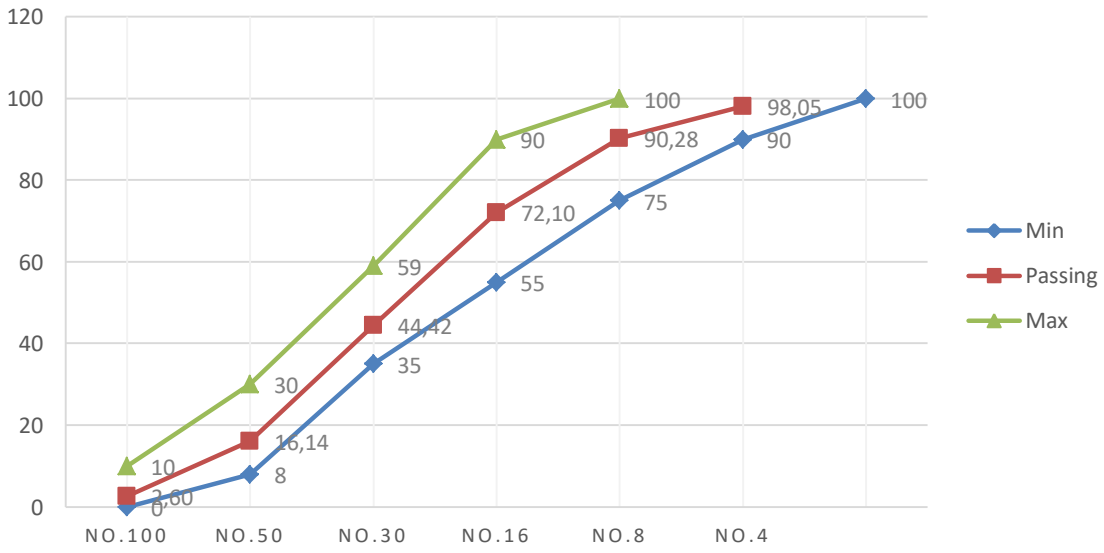

Fig. 3. Aggregate graph grading with fine materials. (medium sand zone 2).

B. COARSE AGGREGATE SIEVE ANALYSIS

ASTM C 33 is used for the materials, tools, and methods of work. From the consequences of the review, the information is gotten in Table 2. so that the coarse aggregate's modulus of fineness can be examined.

Table 2. Data Results of research conducted with Coarse Aggregate Filter

Sie-ve size	Retained Fraction				Cumulative	
	Sample 1	Sample 2	Total Weight (gr)	%	Retained	Pass-ing
9.52 (3/8 IN)	137	130	267	4,77	4,77	95,23
4.75 (NO. 4)	1015	910	1925	34,38	39,15	60,85
2.36 (NO. 8)	1130	1451	2581	46,10	85,25	14,75
1.18 (NO.16)	518	309	827	14,77	100	0
0.60 (NO. 30)	0	0	0	0	100	0
0.30 (NO. 50)	0	0	0	0	100	0
0.15 (NO. 100)	0	0	0	0	100	0
PAN	0	0	0	0	100	0
To-tal	2800	2800	5600	100		

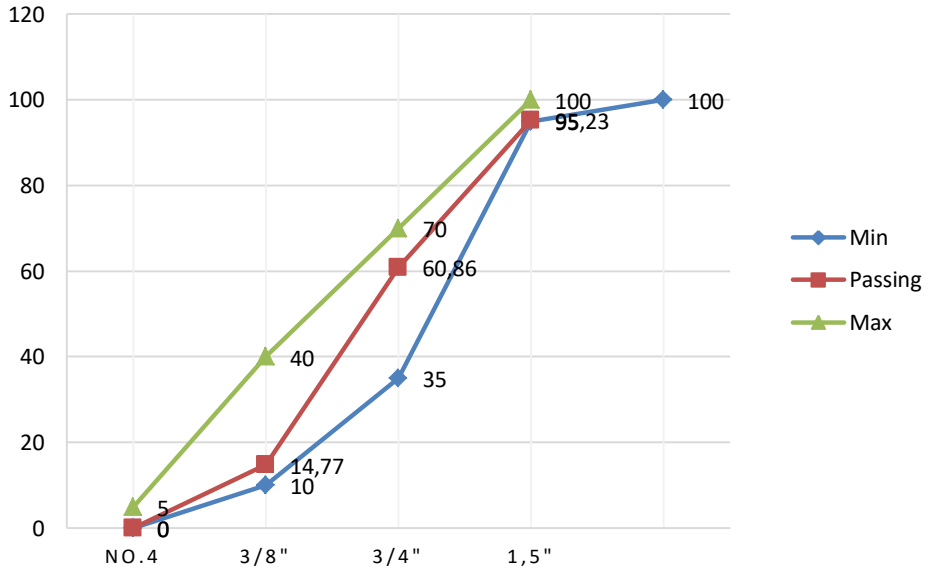

Fig. 4 Coarse aggregate gradation chart using a maximum diameter of 40 mm.

Examination of the total coarse strainer using a predetermined sieve number which has an international standard number, namely SNI 03-2834-2000, as a result of the weight content of the aggregate that passes the strainer, sand is still within the scope of the most extreme rocks of 40 mm [29].

3. RESULT AND DISCUSSION

SLUMP TEST

The slump test was carried out using the method previously used by Abrahams cone by filling it with three layers of fresh concrete [30]. After each of the three layers is filled, about a third of the contents of the cone is pierced 25 times. After each layer is filled, the stick stick must be ensured to enter the bottom of each layer, then must ensure and level the surface of the cone, and then lift the mold 300 millimeters without sideways movement or twist [31]. Complete the test in a maximum time of 2.5 minutes, starting with filling and ending with mold removal. Measure the mixing height by comparing the height of the cone and the mortar to find out and determine the slump value.

Table 3. The Results Of The Slump Value Test

No	Variation	Slump height
1	Normal concrete	10 cm
2	4% fibers + Sikacim 0.8%	9,5 cm
3	5% fibers + Sikacim 0.8%	8 cm
4	6% fibers + Sikacim 0.8%	6,5 cm

Comparison of the percentage values between normal concrete, concrete containing a percentage of 4% palm fiber and a percentage of 0.8% Sakim, concrete containing a percentage of 5% palm fiber and a percentage of 0.8% siakam, and concrete containing a percentage of 6% palm fiber and 0. described in Table 3. Concrete made with 8% siakam has the highest slump value up to a height of 10 centimeters, while concrete made with a mixture of fiber and sikacim has a slump value that is somewhat lower, as shown in Table 3. Figure 5 depicts the up and down slump values on a graph.

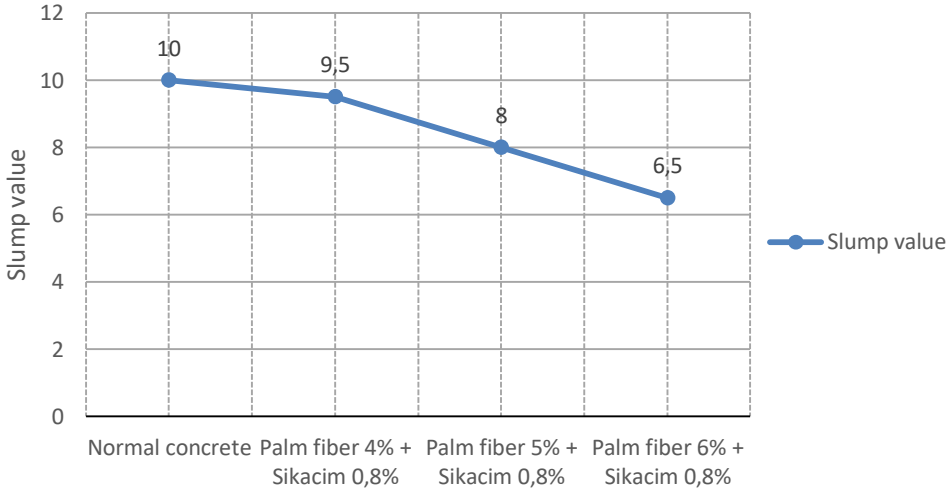

Fig. 5 The graph of the research results shows a comparison of the slump values.

THE TENSILE STRENGTH OF CONCRETE

This test was carried out on concrete for 28 days following the initial application using a compressive machine with a compressive capacity of 1500 KN and additional

compression rods. The goal of the test was to determine and obtain this tensile strength. The concrete will be tested in 12 15-cm-diameter cylinders up to 30 cm long. There are a few sorts of molds utilized, specifically a 3D square with a side of 15 cm.

The distinction in this test should be visible in the computation to acquire the firmness of the substance got subsequent to testing, particularly the variable for 3D squares is 1, while the component for space is 1 which is 0.83. After the concrete had been in place for 28 days, the expected split tensile strength of about 3.52 MPa was determined.

Table 3. The results of the Split Concrete tensile test with the Normal classification

Sample test	Load (P) (kg)	πLD = 1413 cm^2 Fct = 2P/πLD (MPa)	Cylinder Factor Fct / 0,83 (MPa)	f'_C average (MPa)
28 days old				
1	20000	2,83	3,41	
2	21000	2,97	3,58	3,52
3	21000	2,97	3,58	

1. Tensile Strength of Concrete Fiber Fiber 4% and Sikacim 0.8%

With three specimens, palm fiber concrete contained about 4% and sicacim percentage of 0.8% was tested after 28 days. The consequence of splitting elasticity of the 4% filament and 0.8% sicacim on the split stiffness of the cement was obtained from a normal value of 3.69 MPa at 28 days of cement age.

2. Tensile Strength of Concrete Fiber Fiber 5% and Sikacim 0.8%

from the research and testing that has been done, the fiber value is 5% and sicacim is 0.8%, which is tested due to split stiffness, the level of split elasticity is 4.09 MPa at 28 days old.

3. Tensile Strength of Concrete Fiber Fiber 6% and Sikacim 0.8%

Based on the data obtained from the experimental samples with samples of 6% fiber weight and 0.8% sicacim which were carried out for the split elasticity value, the typical cement stiffness value is 5.00 MPa at 28 days of cement.

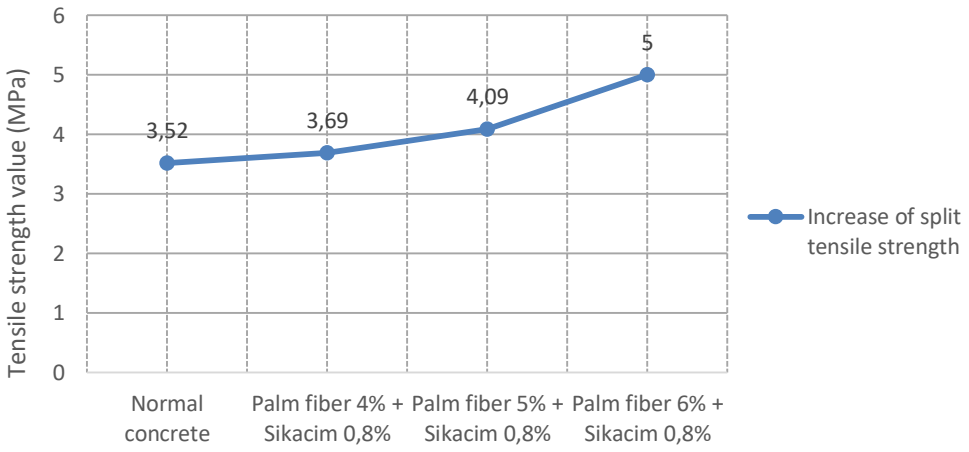

Fig. 6 Percentage of tensile strength test value of 28 days concrete graph.

The tensile strength of the sample will be much higher when connected and bonded and compared to normal concrete with 4% fiber and 10.8% sikasim, 5% fiber and 0.8% sikasim, and 6% fiber and 0.8% respectively eunuch. The following calculation results show the percentage increase in split tensile strength.

Filled with 4% palm fiber and 0.8% sikakim, the increase reached 4.83% during the concrete age of 28 days. Stockpiling with palm fiber percentage of 5% and sikakim 0.8%, the increase reached a percentage of 16.19% during the concrete age of 28 days. With 6% palm fiber and 0.8% sikasim, it will increase significantly over 28 days to 42.04%.

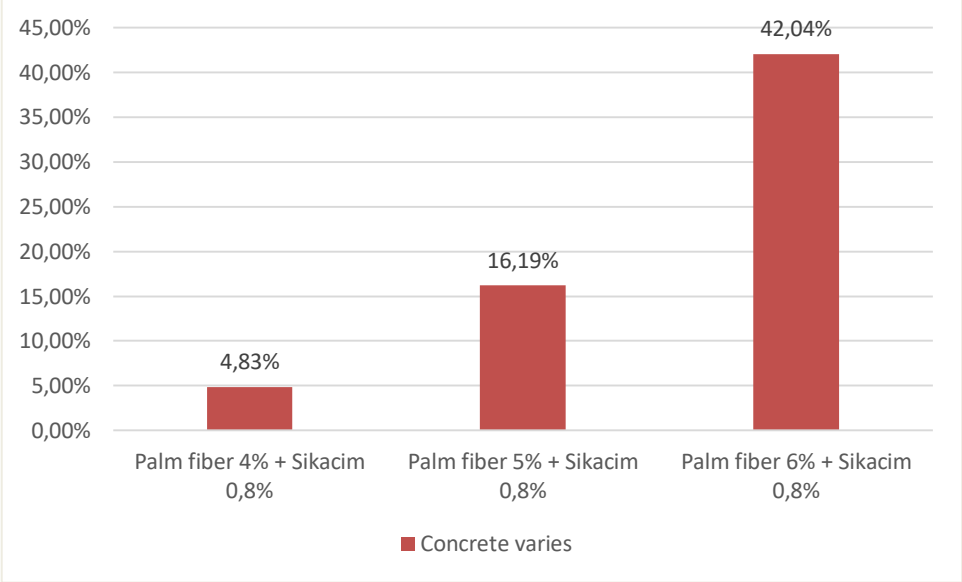

Fig. 7 Graph of the percentage increase in tensile strength of concrete for 28 days.

The percentage of data obtained will increase and increase if the split tensile strength value of normal concrete is connected and compared to concrete with 4% fiber and 0.8% sicacim, 5% fiber and 0.8% sicacim, and 6% fiber and 0.8 sicacim.

From the data and test results that have been obtained in this study regarding the increase in the tensile strength of concrete. In the test results there are several kinds of factors - factors that can increase the tensile strength value. The proportion of fiber used to increase the tensile strength of concrete and fiber continuity with sicacim concrete additive are two factors that cause this. the higher or the greater the percentage value of the fibers used, the tensile strength of the concrete will also be higher. Concrete has the highest percentage of 42.04% for 28 days, with variations of sicacim of 0.6% and palm fiber of 0.6%.

4. CONCLUSION

According to the findings of the research, the addition of additional materials to this palm fiber and sikakim concrete : The normal split tensile strength of concrete is 3.52 MPa, while the split tensile strength of concrete containing a mixture of 4 percent palm fiber and 0.8 percent sicacim concrete additive is 3.69 MPa, and the split tensile strength of

concrete containing a mixture of Concrete with a mixture of 6% fiber and 0.8 percent Si has a split tensile strength of 4.09 MPa and a fiber content of 5% and 0.8 percent sicacim. Meanwhile, the split tensile strength of cement with 1% filament was 2.98 MPa, while the split tensile strength of concrete with 12% strands was 3.10 MPa and the split tensile strength of concrete with 3% strands was 3.35 MPa from the previous inspection and test. Based on these data, we concluded that the percentage of fibers in concrete increases its tensile strength.

Concrete mixture with 6% palm fiber and 0.8% sikakim as concrete additives has an average maximum split tensile strength of 5.00 MPa. Meanwhile, from these tests, the resulting base stiffness was 3.52 MPa for typical cement.

- Based on this research that has been done, the average slump value is as follows:
- Normal concrete slump: 10 cm
- The slump of 4% fibers and sikacim 0.8% 9.5 cm
- The slump of 5% fibers and sikacim 0.8% 8 cm
- The slump of 6% fibers and sikacim 0.8% 6.5 cm

The utilization of palm fiber has an effect on the slump value, as can be seen from these data. The slump value decreases in proportion to the amount of fiber present. The level of workability decreases with the slump value.

During the research, the concrete hardening process is sped up, casting is made easier, and the concrete pores are filled in with sikacim concrete additive. Concrete mixed with palm fiber and sikacim concrete additive can be used to build structures like walls, pillars, and beams because it has a higher split tensile strength value and can reduce cracks.

According to the findings of this study, the addition of sikacim concrete additive to the concrete mixture is capable of increasing the compressive strength of the concrete to the maximum value of concrete tensile strength after 28 days and achieving the design concrete compressive strength.

5. REFERENCES

[1] Alkhaly, Y. R., & Panondang, C. N. (2015). Kuat Tekan Beton Polimer Berbahan Abu Vulkanik Gunung Sinabung Dan Resin Epoksi. Vol.5 (2), hal. 125–132.

[2] Aslamthu, H., & Andayani, R. (2017). Pengaruh Penambahan Serat Kawat Bendrat Dan Serat Ijuk Pada Beton K-225 Terhadap Kuat Geser. Vol. 16(1), hal. 76–82.

[3] Buana, F., & Gunawan, I. (2016). Pengaruh Diameter Serat Polymer Etilene Braid Terhadap Kuat Tekan Dan Kuat Tarik Belah Pada Beton Mutu Tinggi. Jurnal Fropil, Vol.4 (2), hal. 101–114.

[4] Darul, & Edison, B. (2013). Kajian Pengaruh Serat Ijuk Terhadap Kuat Tarik Belah Beton K-175. Hal. 1–8.

[5] Desmi, A., & Muliadi. (2018). Pengaruh Penggunaan Abu Jerami Dengan Penambahan Zat Additive Sikacim Concrete Terhadap Kuat Tekan Beton. Vol.8 (1), hal. 339–349.

[6] Dipohusodo, I. (1999). Struktur Beton Bertulang. Jakarta: Gramedia Pustaka.

[7] Djamaluddin, R., Akkas, M., & S, S. D. (2015). Studi Pengaruh Sumber Bahan Baku Agregat Terhadap Kuat Tekan Beton Mutu Tinggi. Hal. 1–9.

[8] Gunawan, P., Sunarmasto, & Yunanto, A. D. (2014). Studi Kuat Tekan, Kuat Tarik Belah,Dan Modulus Elastisitas Beton Ringan Teknologi Foam Dengan Bahan Tambah Serat Polyester. Vol.3, hal. 619–627.

[9] Karwur, H. Y., R. Tenda, S. E., Wallah, & Windah, R. S. (2013). Kuat Tekan Beton Dengan Bahan Tambah Serbuk Kaca Sebagai Substitusi Parsial Semen. Jurnal Sipil Statik, Vol.1 (4), hal. 276-281.

[10] Mulyati, & Adman, A. (2019). Pengaruh Penambahan Cangkang Kemiri dan Sikacim Concrete Additive terhadap Kuat Tekan Beton Normal. Vol.6 (2), hal. 38–45.

[11] Mulyono, T. (2005). Teknologi Beton. Yogyakarta: ANDI.

[12] Munandar, I., & Savetlana, S. (2013). Kekuatan Tarik Serat Ijuk (Arenga Pinnata Merr). Jurnal Ilmiah Teknik Mesin FEMA, Vol.1 (3), hal. 52–58.

[13] Novrianti, & Respati, R. (2014). Pengaruh Aditif Sikacim Terhadap Campuran Beton K 350 Ditinjau Dari Kuat Tekan Beton. Vol.2, hal. 64–69.

[14] Perdana, A. O., Wahyuni, A. S., & Elhusna. (2015). Pengaruh Penambahan Serat Ijuk Terhadap Kuat Tarik Belah Beton Dengan Faktor Air Semen 0,5. Vol.7 (2), hal. 7–12.

[15] Purnomo, H., & Setyawati, E. (2014). Pemanfaatan Serbuk Kaca Sebagai Substitusi Parsial Semen Pada Campuran Beton Ditinjau Dari Kekuatan Tekan Dan Kekuatan Tarik Belah Beton. Vol.2, hal. 45–55.

[16] SNI-2491-2014. Metode Uji Kekuatan Tarik Belah Spesimen Beton Silinder.

[17] Suhardiman, M. (2011). Kajian Pengaruh Penambahan Serat Bambu Ori Terhadap Kuat Tekan Dan Kuat Tarik Beton. Jurnal Teknik, Vol.1 (8).

[18] Widodo, A., & Basith, M. A. (2017). Analisis Kuat Tekan Beton Dengan Penambahan Serat Rooving Pada Beton Non Pasir. Jurnal Teknik Sipil Dan Perencanaan, Vol.19 (2), hal. 115–120.

[19] Wora, M., & Ndale, F. X. (2018). Pengaruh Penambahan Serat Ijuk Dapat Meningkatkan Kuat Tarik Pada Beton Mutu Normal. Jurnal IPTEK, hal. 51–58.

[20] Ahlina, D. (2016). *BAB II Tinjauan Pustaka Pestisida*. (1), 7–29. Retrieved from http://eprints.perbanas.ac.id/553/4/BAB II.pdf

[21] Chennady, W., & Nursyamsi,). (n.d.). *Pengaruh Penambahan Ijuk Dan Serat Kawat Terhadap Sifat Mekanik Beton*. (1), 1–8.

[22] Fema, J. (2013). *KEKUATAN TARIK SERAT IJUK (ARENGA PINNATA MERR)*. *1*, 52–58.

[23] Hani, S. (2018). *PENGARUH CAMPURAN SERAT PISANG TERHADAP BETON*. *4*, 40–45.

[24] Mulyono, T. (2019). *TEKNOLOGI BETON: Dari Teori Ke Praktek*. (October 2018).

[25] Pane, F. P., Tanudjaja, H., Windah, R. S., Teknik, F., Sipil, J., Sam, U., … Penelitian, T. (2015). *Pengujian kuat tarik lentur beton dengan variasi kuat tekan beton*. *3*(5), 313–321.

[26] Perdana, A. O., Wahyuni, A. S., & Elhusna. (2015). *Pengaruh Penambahan Serat Ijuk Terhadap Kuat Tarik Belah Beton Dengan Faktor Air Semen 0,5*. *7*(2), 7–12.

[27] Rachmawati, N. Q., Prayitno, S., & Rismunarsi, E. (2015). *PADA BETON MUTU TINGGI METODE DREUX TERHADAP KUAT*. (September), 726–733.

[28] Rochmah, N. (2017). *Pengaruh Serat Ijuk Sebagai Bahan Tambah Terhadap Kuat Tarik Belah Beton*. *02*(01), 52–56.

[29] Sihotang, Y., & Surbakti, D. B. (n.d.). *ANALISA LENTUR DAN EKSPERIMENTAL PENAMBAHAN SERAT IJUK AREN (Arenae Pinnafa Merr) PADA DAERAH TARIK BALOK BETON BERTULANG*. (1).

[30] Suhardiman, M. (2012). *KAJIAN PENGARUH PENAMBAHAN SERAT BAMBU ORI*.

[31] Wora, M., & Ndale, F. X. (2019). Pengaruh Penambahan Serat Ijuk Dapat Meningkatkan Kuat Tarik pada Beton Mutu Normal. *Jurnal IPTEK*, *22*(2), 51–58. https://doi.org/10.31284/j.iptek.2018.v22i2.435