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Variation of SikaBond use on connection with 45° angle on flexed beam on normal concrete

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Abstract. This concrete aims to know the effect of SikaBond additive material on concrete connection. Made three types of testing of the shear strength, tensile strength and flexural strength of the connection. For flexural tests measuring 15 x 15 x 75 cm with 45° grafting angle, shear strength and tensile strength with size of 5 x 10 x 20 cm which are both bonded. The planned concrete quality of $F'c$ 22.5 Mpa, ACI method of modifying F_{as} value 0.5, Slump value 93.33 mm. Strong flexure without voltage connection 34.69 Kg / cm², beam grafting with the addition of a voltage cycles of 32.92 Kg / cm². Voltage beam with the addition of cement water 38.41 Kg / cm². The comparison of the shear stress test voltage of the cementless joint of the cement is 15.57 Kg / cm², the beam which is grafted with the addition of a 12.48 Kg / cm² voltage cyclone, decreased by 19.81% from without cement. The beam stress with the addition of cement water of 9.60 Kg / cm² decreased by 38.34%, the cementless block. The connection with the addition of a stronger cyclone retains a shear force than the junction of water. Comparison of tensile strength test of cement tensile strength without cement connection 3.67 Kg / cm², beam grafting with addition of 3.15 Kg / cm² voltage SikaBond decreased 14.18% from without cement. The beam stress with the addition of 2.88 Kg / cm² of cement water has decreased by 21.46% of the beam without cement connection. The connection with the addition of a stronger cyclone retains tensile strength than the connection with cement water at 28 days.

1. Introduction

Concrete is a building material whose use varies with various forms. Concrete is a mixture of compositions from several rock materials - rocks which are bonded by a binder. When casting concrete in the field the work location is often a barrier - so the concrete must be stopped temporarily. So it is necessary to do joint casting, in the event that this event can reduce the strength of the structure. When casting the concrete connection is done with add Adip if SikaBond material to increase power stick to concrete on the joint. Concrete using SikaBond Materials after casting for 24 hours is done by casting connection by affixing \pm 2 cm of SikaBond first to the concrete surface to be connected. The purpose of this study is to determine the effect of the connection using SikaBond material, on the beam which is connected using an angle 45°.

2. Research Methodology

The material used in this study was type I field cement, fine aggregate, from Kreung Tingkeum planned for zone 2, 31.5 mm Kreung Mane coarse aggregate and distilled water as concrete mixture.



Tool which are used include modified press machines, sieves, mold cylinders, compactor iron, concrete mixer, Abram's cone, shear machine, cement spoon.

2.1. Planning $F'c$ 22.5 Mpa concrete mixture.

The planning used was based on the ACI-211 method. 412 - 93 namely specimens made with a mixture of gravel, sand, cement and water with a predetermined proportion with Mix Design inserted into the concrete mixer (concrete mixer) which has been turned on. Concrete mixture was stirred approximately 5 minutes. Next the concrete mixture is poured into the spinning concrete mixer which has been doused with as much as 50% water first, so that the mixture is not sticky in concrete mixer for the remaining 50%. If the concrete is evenly distributed between the aggregate cement, enter the remaining water into concrete mixer which is rotating so that the concrete becomes homogeneous. Before the concrete is printed into the mold cylinder Slump is measured between 75 - 100 mm using a cone abram which is a cone, has a diameter of 20 cm, diameter above 10 cm, made of 30 cm high steel. The concrete mixture is inserted into the cone mold as much as 3 layers and each layer is compressed by stabbing the stick compactor 25 times. The mold is pulled vertically upwards and measured is the decrease in peak of the concrete mixture.

2.2. Making test items

The casting process to make cylindrical specimens with a diameter of 15 x 30 cm making test objects based on Tri Mulyono [1] is done by weighing all the ingredients for the concrete mixture according to those calculated in mix design. Mixer until the mixture becomes homogeneous. Prepare mold cylindrical test specimens measuring 15 x 30 cm. Check the dimensions, then adjust the lock and lubricate with oil. Before stirring, all material has been weighed in accordance with the proportion of the concrete mixture (mix design). The next preparation is to enter the sand, gravel, cement and finished water mix stirring into concrete mixer. Fill the mold with 3 layers of fresh concrete in layers. Each first layer of concrete is compacted with 15 times the compactor stick with a falling height of 30 cm and using a vibrating device between 10-15 seconds so that the trapped air bubbles can come out and can also use compactors to tap the mold using the rubber hammer each side tapping 8 times. Flatten the mold surface using a cement spoon or spatula. The mold is opened after the test object is \pm 24 hours. Soaked in water for 28 days after 28 days concrete is ready to be tested.

Table 1. Number of samples of test specimens for testing SikaBond shear strength.

No	Test item code	Number of specimens	Dimension (cm)	FAS	Type of testing
1	1	2	20 x 10 x 5	0.5	Test object with direct casting
2	2	2	20 x 10 x 5	0.5	
3	3	2	20 x 10 x 5	0.5	
4	I	2	20 x 10 x 5	0.5	The test object is affixed with an additional SikaBond
5	II	2	20 x 10 x 5	0.5	
6	III	2	20 x 10 x 5	0.5	
7	A	2	20 x 10 x 5	0.5	The test object is affixed without additional SikaBond
8	B	2	20 x 10 x 5	0.5	
9	C	2	20 x 10 x 5	0.5	

2.3. Slump Test

Slump Test The purpose is to find out the slippage in the concrete while the slump is a decrease in concrete. The tool used was the Abram's cone which was lifted in a field until the concrete became decrease, the greater the decrease or the greater the slump value, the less viscosity and the easier it is to do it. The smaller the value of the slum, the more concrete mixture is harder to do.

Table 2. The number of samples of test specimens for testing tensile strength of SikaBonds.

No	Test item code	Number of specimens	Dimension (cm)	FAS	Type of testing
1	1	2	20 x 10 x 5	0.5	Test object with direct casting
2	2	2	20 x 10 x 5	0.5	
3	3	2	20 x 10 x 5	0.5	
4	I	2	20 x 10 x 5	0.5	The test object is affixed with an additional SikaBond
5	II	2	20 x 10 x 5	0.5	
6	III	2	20 x 10 x 5	0.5	
7	A	2	20 x 10 x 5	0.5	The test object is affixed with additional cement
8	B	2	20 x 10 x 5	0.5	
9	C	2	20 x 10 x 5	0.5	

Table 3. The number of samples of test specimens for flexural strength of SikaBond.

No	Test item code	Number of specimens	Dimension (cm)	FAS	Type of testing
1	1	1	15 x 15 x 75	0.5	Beams without connection
2	2	1	15 x 15 x 75	0.5	Beams added with SikaBond
3	3	1	15 x 15 x 75	0.5	Beams added with cement water

Table 4. The number of samples of test specimens for testing the normal concrete compressive strength.

No	Test item code	Number of specimens	Dimension (cm)	FAS	Type of testing
1	1	3	Ø 15, T 30	0.5	Cylindrical compressive strength

2.4. Concrete treatment

Concrete treatment is a job of keeping the fresh concrete surface moist since the concrete mixture is compacted until the concrete is considered quite hard. The humidity of the concrete surface must be maintained to ensure the hydration process of cement (reaction of cement with sand) takes place perfectly. If this is not done the concrete will occur less strongly and also fine cracks (hair cracks). There are several methods of concrete treatment that are usually done are:

- Put fresh concrete in a humid room
- Put fresh concrete over puddles
- Put fresh concrete in the water
- Water the concrete surface at all times continuously

2.5. Press Strength Testing

- Compression strength testing is carried out after the concrete treatment reaches the age of 28 days. The method of implementing compressive strength testing is:
- Take the test object that has been soaked, dry the surface of the test object with a cloth so that the concrete surface becomes dry. The test object is weighed by weight Put the specimen on a modified pressure machine, the position of the object must be centric.
- Run the engine constantly with the addition of the load until the specimen has cracked.
- Calculate the compressive strength of the test object.

3. Results and Discussion

The data obtained by this test include examining the concrete mixture material and testing the Variation in the Use of SikaBond against Angular Connections 450 in Beams Banged in Normal

Batons. Values are taken on average a number of repetitions. Then the results are made in the form of tables and a relationship to facilitate the analysis and discussion of conclusions based on the testing of aggregate physical properties which then calculated the composition of the concrete mixture material (Mix Design) with f'_c 22.5 Mpa using the ACI (American Concrete Institute) method using the formula:

$$\text{Press Strength} = \sigma = (P \times g) / A$$

Where:

σ = Compressive strength (Mpa)

P = Maximum load (Kg)

G = Gravity acceleration = 10 m / det²

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

$$S = \frac{\sqrt{\sum_1^N (\sigma b' - \sigma b m')^2}}{N - 1}$$

Where:

S = Standard deviation

$\sigma b'$ = Maximum load (Kg)

$\sigma b m'$ = Gravity acceleration = 10 m / det²

1,64 = Constant value

$$\sigma b k' = \sigma b m' - 1,64 \cdot S$$

So that the composition of the concrete mixture for each specimen is as attached to the table below:

Table 5. Mix Design Planning for 5 cylindrical specimens.

No	Material	Weight (Kg)	Cylinder volume used (m ³)	Total of use (kg)
1	water	219.1	0.03	6.574
2	Cement	374.48	0.03	11.234
3	Fine aggregate	621.12	0.03	18.634
4	Coarse aggregate	043.28	10.03	31.298

Table 6. Mix Design Planning for 3 flexible beam specimens.

No	Material	Weight (kg)	Cylinder volume used (m ³)	Total of use (kg)
1	water	219.14	0.0506	11.088
2	Cement	374.48	0.0506	18.948
3	Fine aggregate	621.12	0.05063	1.426
4	Coarse aggregate	1043.28	0.05065	2.789

Table 7. Mix Design Planning for 9 shear beam test pieces.

No	Material	Weight (kg)	Cylinder volume used (m ³)	Total of use (kg)
1	water	219.14	0.018	3.945
2	Cement	374.48	0.018	6.742
3	Fine aggregate	621.12	0.018	11.802
4	Coarse aggregate	1043.28	0.0181	8.779

Table 8. Mix Design Planning for 9 pieces of tensile beam test pieces.

No	Material	Weight (kg)	Cylinder volume used (m ³)	Total of use (kg)
1	water	219.14	0.018	3.945
2	Cement	374.48	0.018	6.741
3	Fine aggregate	621.12	0.018	11.802
4	Coarse aggregate	1043.28	0.0181	8.779

The results of testing the physical properties of fine aggregate concrete mixtures of mud content of 2.18% meet the permitted requirements of < 5%, so this aggregate is suitable for use in making concrete. The fine aggregate for concrete has a calibration number (FM) of 2.35 fulfilling the requirements of 2.3 - 3.1, according to ASTM E-11-81 standards. Fine aggregate density of 2.58 desired requirements 1.6 - 3.2, water content 4.70 desired requirements < 10. From the results of rough aggregate examination of sludge content of 0.41%, the requirements allowed 1%. The density of coarse aggregate is 2.44, the desired requirements are 1.6 - 3.2, the water content is 0.28, the desired requirements are < 10, according to ASTM C-33-95 standard. The volume weight of 1643.33 desired requirements is 1445. From the results of testing the physical properties of the material, the compressive strength of each specimen at the age of 28 days with normal concrete compressive strength shows that the average compressive strength is 23.95 Mpa at 28 days, Results beam shear strength averaged 15.57 Kg / Cm² at 28 days with a beam without connection, 12.48 Kg / cm² at the age of 28 days with a beam connected to the addition of a SikaBond, resulting in a voltage drop of 19.81%, 9 , 60 Kg / Cm² at the age of 28 days with the beam connected with cement water, resulting in a voltage drop of 38.34%. The average tensile strength of the beam is 3.67 Kg / Cm² at the age of 28 days with beams without connection, while the average tensile strength results are 3.15 Kg / Cm² at 28 days with the beam connected with an additional SikaBond, resulting in a voltage drop of 14.18%, 2.88 Kg / Cm² at 28 with beams connected without additional SikaBond, so that a voltage drop of as much as 21.46%. The results of beam flexural strength were an average of 34.69 Kg / Cm² at the age of 28 days with a beam without a connection, 32.92 Kg / Cm² at the age of 28 days with a beam connected with an additional SikaBond. 38.41 Kg / Cm² at the age of 28 days with the beam connected without additional SikaBond.

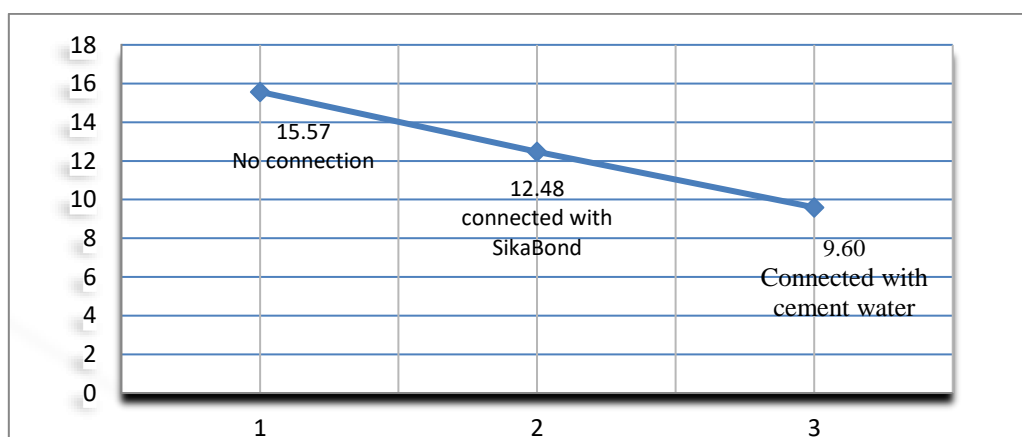


Figure 1. Shear strength of beam joint

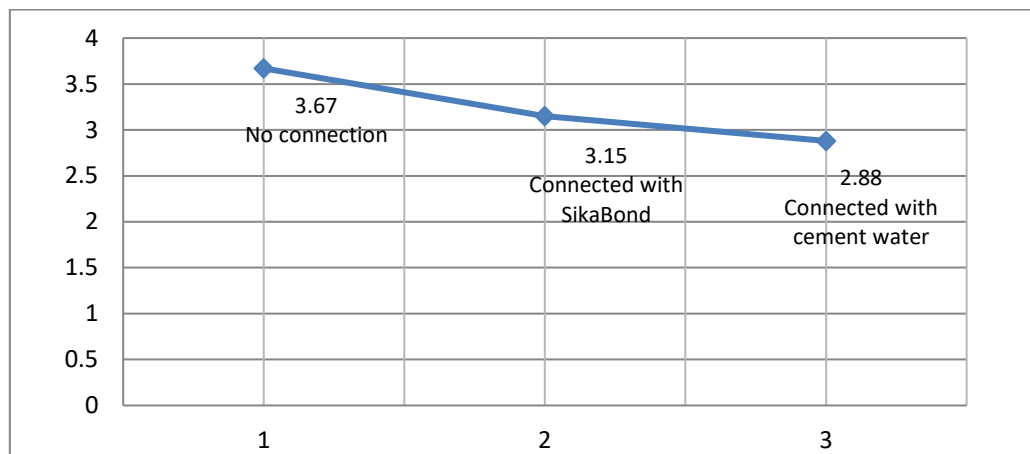


Figure 2. Tensile strength of beam joint

Based on the picture above, it can be seen that the use of SikaBond influences the shear strength and tensile strength, which is the stress on the connection with the SikaBond is greater than the connection with cement water at the age of 28 days.

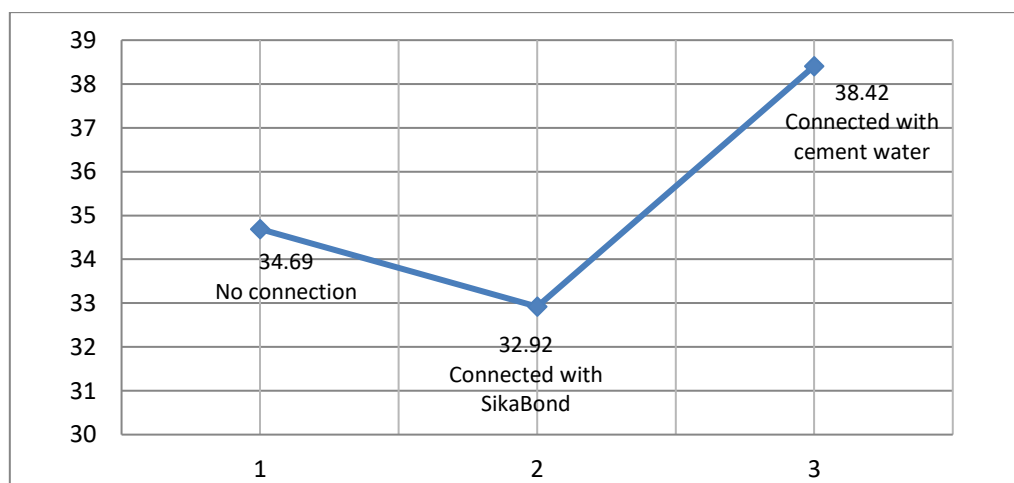


Figure 3. Bending strength of beam joint

Based on the picture above, the results of flexural strength are not the same as the results of the tensile test and joint shear test. where the beam connected to the addition of SikaBond has decreased flexural strength compared to the beam connected with cement water. This is because the test for each type is 1 (one) specimen, so it is not obtained accurate data. However, if it is observed from a broken area, it is clear that the beams which are connected with cement water are broken in the connecting area, while the beams without connection with the beam that is connected with the addition of fractional SikaBond do not occur in the connecting area.

4. Conclusions

The use of concrete using joint material SikaBond in casting has an effect on the flexural strength, shear strength, flexural strength of concrete. The results of the beam flexural strength carried out by splicing without the addition of a maximum voltage SikaBond were 34.69 Kg / cm² and the beam was connected by the addition of a maximum voltage SikaBond of 32.92 Kg / cm². Maximum beam tension with the addition of cement water 38.41 Kg / cm². The voltage comparison that occurs in the

testing of beam shear strength without cement joints is 15.57 Kg / cm² and the beam is connected with the addition of a cyclabond voltage of 12.48 Kg / cm² or decreased by 19.81% from without cement. Maximum beam tension with the addition of cement water 9.60 Kg / cm² decreased by 38.34% from beams without cement. From the data above, it can be seen that the connection with the addition of cicondonds is stronger to withstand shear forces than the connection with cement water. The voltage comparison that occurs in testing the tensile strength of a beam without a cement connection is 3.67 Kg / cm² and the beam is connected with the addition of tension cycles of 3.15 Kg / cm² or decreased by 14.18% from without cement. The maximum beam tension with the addition of 2.88 Kg / cm² cement water has decreased by 21.46% of the beam without cement connection. From the data above, it can be seen that the connection with the addition of cicondonds is stronger to withstand tensile forces than the connection with cement water at the age of 28 days.

5. References

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