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The Effectiveness Of The Water Additional Ingredient Urea Co(Nh $_2$) ^{2} To The Concrete Fc' 20 Mpa On Curing Process

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ABSTRACT

The quality of Concrete depends on the value of the ratio of materials, how to blend and how to pour the concrete blend, how to compact and how to treat it during the hardening process. One of them is the appearance of cracks on the surface of the concrete. This study aims to determine how much influence the curing process using water with a mixture of Co(NH2)2 (urea) and normal water has on the compressive strength of the concrete quality fc' 20 Mpa. The sample of test object is cylindrical with a diameter of 15 and a height of 30 cm. Samples were made 3 test objects with ages 7, 14, 21, 28 days and tested in a coherent manner. the compressive strength of normal concrete has increased in quality and its quality with age between 7 were 9.1 Mpa to 28 days were 17 Mpa. Meanwhile, concrete with the curring/soaking process using water with a mixture of urea increased at age 7 with a value of 10.8 Mpa to 21 days with a value of 14.4 Mpa, but at age 28 the strength of the concrete decreased at 12 Mpa. And there are 7 cone fracture types, 1 cone
And shear crack pattern, there were conical crack type pattern that consists of 7 test object. There were 2 shear patterns, 4 columnar crack patterns and 4 test specimens. The cracks with cone and split type and 10 pieces and most of them, it is very likely that during the mixing process in the concrete making process, the material in the concrete mixer has not been mixed well or mixed evenly.

1. Introduction

Concrete quality depends on the value of the ratio of materials, how to mix and how to pour the concrete mixture, how to compact and how to treat during the hardening process. Concrete construction is often faced with certain problems which are usually caused by negligence in the manufacture of concrete. One of them is the appearance of cracks on the concrete surface. These cracks are usually caused by an incorrect hardening process or excessive use of cement. Generally, the heat in the concrete will expand the concrete whereas when the concrete hardens then the concrete will shrink. In concrete hardening is usually faster on the outside than on the inside. Things like this cause internal stresses in the concrete which, if they exceed the stability of the separation of the concrete, will cause cracks on the concrete surface. (Setiawan and Supartono, 2018).

So that this research is expected to provide answers regarding the effect of additional ingredient urea $Co(\ Nh_2)_2$ water on the 20 MPa fc' concrete in the planned curing process. The purpose of this study was to determine how much influence the curing process using water with a mixture of urea and normal water had on the compressive strength of the concrete quality fc' 20 Mpa.

2. Research Method

The design in this research is the process of analyzing and collecting data. This research uses experimental research methods. Design planning begins with observations and literature studies that have been carried out and known, to the formation of the formulation of framework ideas. Then proceed with direct sample examination at the Comprehensive Laboratory of Civil Engineering, Lamongan Islamic University which aims to find out, get data to compare the value of the results obtained in the study with the condition of the specified plan value. The experimental specimens in this study used the ASTM and SNI standards because they were in accordance with the guidelines at the Lamongan Islamic University Laboratory.

The stages of data analysis in this study were to determine the effect of the *Additional Water Ingredient Urea* $CO(NH_2{}^{)}$ Against Concrete Fc' 20 Mpa In the Curing Process , broadly includes:

1. Cement Investigation
   a. Semen Normal Consistency Check
   b. Cement Hardening Inspection and Bonding Time
   c. Cement Density Check
2. Fine Aggregate Investigation
   a. Fine Aggregate Sieve Analysis Examination

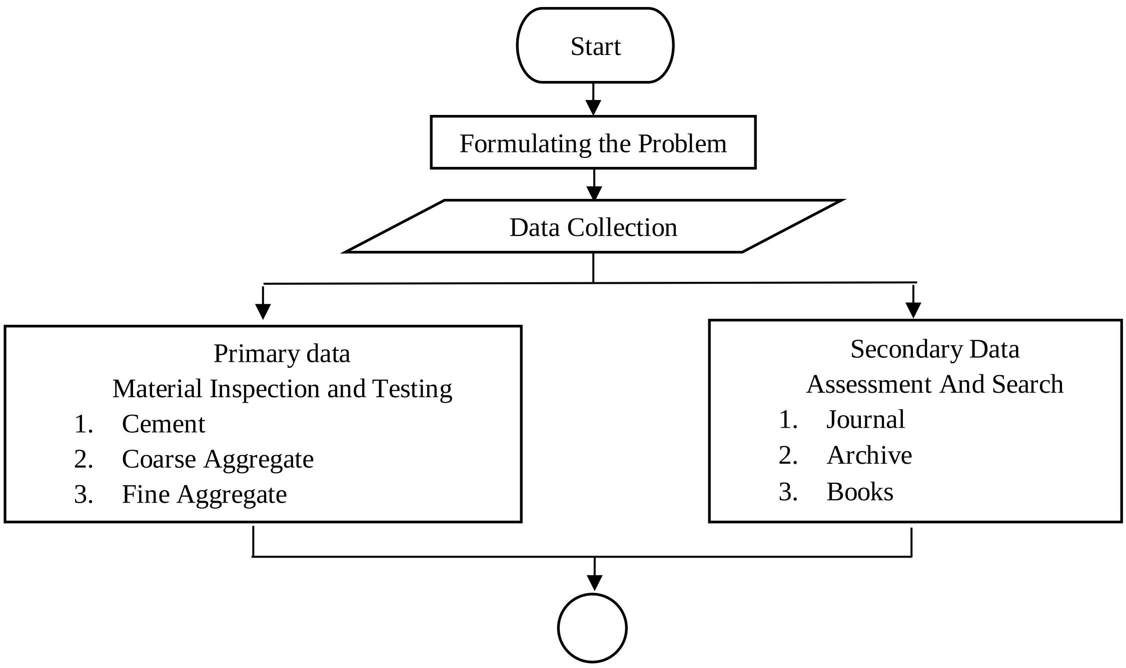
b. Fine Aggregate Density Check on SSD Condition
c. Inspection of Fine Aggregate Infiltration Moisture Content
d. Fine Aggregate Volume Weight Check
e. Fine Aggregate Moisture Check

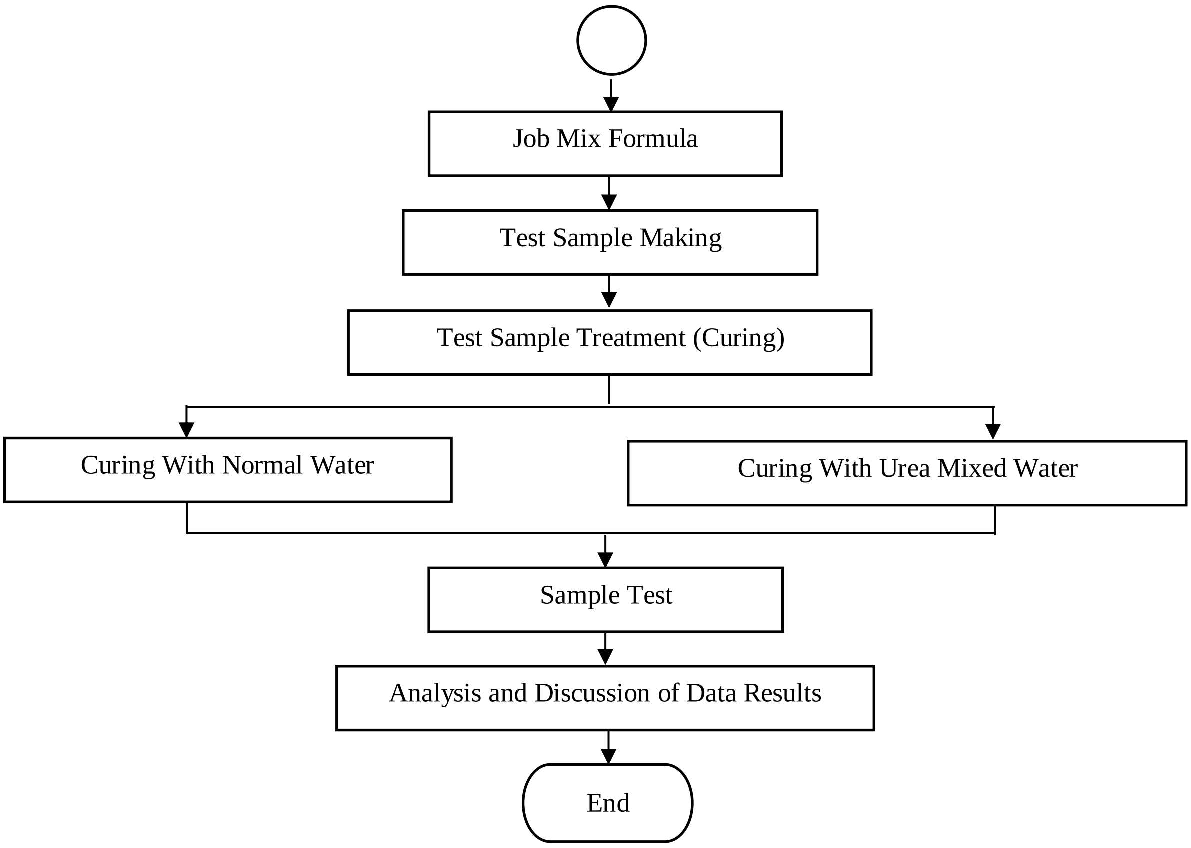
3. Coarse Aggregate Investigation
   a. Coarse Aggregate Sieve Analysis Examination
   b. Coarse Aggregate Density Check on SSD Condition
   c. Inspection of Coarse Aggregate Infiltration Moisture Content
   d. Coarse Aggregate Fill Weight Check
   e. Coarse Aggregate Moisture Check

After testing the mixed concrete mixture to determine the content and levels of its characteristics, the next step is planning the production of a concrete mixture based on SNI 03-2834-2000, testing the compressive strength of concrete based on the guidelines and referring to medium quality concrete with a compressive strength of fc 20 MPa. The specific test data are as follows:

1. Making Concrete Design Mix
2. Concrete Slump Inspection
3. Cylindrical Concrete Manufacturing Process
4. Fresh Concrete Weight Volume Test
5. *Curing* Process (Concrete Treatment and Soaking)
6. Cylindrical Concrete Compressive Strength Testing Experiment
7. Analysis of Compressive Strength and Crack Type

Research Flowchart





3. Results and Discussion

3.1 Analysis of Fine Aggregate Inspection

From the results of the examination of fine aggregates, the following results are obtained:

1) Based on the test, the results of the analysis of the sand filter are classified as zone II, namely the sand is quite coarse, and the results of FM (fine modulus value) or fine modulus value are 3.46 % . In accordance with ASTM C 33-78, the fineness modulus of the sand filter analysis obtained from the test meets the standards set by ASTM
2) According to the test results, the average density of fine sand aggregate is 2.78 grams. Based on ASTM C 128-78, the specific gravity of 46 sand is between 2.4 to 2.7 grams, which indicates if the test results meet the standards set by ASTM.
3) Based on the test results obtained an average of 3.34 % sand infiltration water. Based on ASTM C 128-93, sand seepage water is worth between 1 47 to 4%, indicating if the test results meet the standards set by ASTM.
4) Based on the results of the volumetric test, the average mass of air contents and voids in the sand is 1649 kg/l. based on ASTM C 29M-91, the weight of the volume of sand ranges from 1.40 to 1.90 kg/L, which indicates if the test results meet the standards set by ASTM.

5) Based on the test results, the average water content of the sand is 1.94 %. Referring to ASTM C 566-89, the moisture content of sand 50 ranges from 3-5%, which indicates if the inspection and test results meet the standards set by ASTM.

Table 4.34 Analysis Fine Aggregate Examination Results with Theoretical Basis

No	Examination Description	Theoretical basis	Check up result	Information
1	Filter analysis	ASTM C 136 - 95a , the fine modulus of grain is 2.20% - 3.10%,	3,46 % .	Not Qualify
2	Fine Aggregate BJ Inspection	ASTM C 128-78, specific gravity 46 sand, between 2.4 and 2.7 grams	2.78 grams	Qualify
3	Checking the moisture content of fine aggregate absorption	ASTM C 128-93, sand seepage water value between 1 47 to 4%	3.34%	Qualify
4	Fine aggregate volume check	ASTM C 29M-91, sand volume weight ranges from 1.40 to 1.90 kg/L	1649 kg/l	Qualify
5	Fine aggregate moisture check	ASTM C 566-89, moisture content of sand 50 ranges from 3-5%	1.94%	Qualify

Source: Research Results, 2022

3.2 Coarse Aggregate Inspection Analysis

From the results of the examination of fine aggregates obtained the following results:

1) Based on the test results, FM (Fhinness modulus) or the smoothness value is 6.59 % . Based on SNI 03-1968-1990, the fineness value of coarse aggregate sieve analysis does not exceed 8%, which indicates if the results of the examination of the test values meet the standards set by SNI.
2) According to the test results, the average density of crushed stone is 2.66 g/cm3. Referring to ASTM C 128-78, the specific gravity of crushed stone as coarse aggregate ranges between 2.4 - 2.7 g / cm3, which indicates if the results of the test meet the standards set by ASTM
3) Based on the test results, the average water absorption rate of crushed stone is 2.92 % . Referring to ASTM C 127-88-93, the coarse aggregate water infiltration is between 1 – 4%, which indicates that the result of the absorption test is in accordance with the standards determined by ASTM.

4) Based on the test results, the average volume of crushed stone content is 1.443 kg/l. Based on ASTM C 29-91, the bulk density of crushed stone is between 1.4 - 1.7 kg / l, which indicates if the aggregate volume test results meet the standards set by ASTM
5) Based on the test results, the average water content of coarse aggregate is 1.25 %. Referring to ASTM C 566-89, coarse aggregate has a moisture content of 1-4%, which indicates if the test results meet the standards set by ASTM

Table 4.33 Analysis Coarse Aggregate Examination Results with Theoretical Foundation

No	Examination Description	Theoretical basis	Check up result	Information
1	Filter check	SNI 03-1968-1990, the fineness value of coarse aggregate sieve analysis does not exceed 8%	6.59 % .	Qualify
2	Coarse Aggregate BJ Inspection	ASTM C 128-78, i.e. the specific gravity of crushed stone as coarse aggregate value ranges between 2.4 - 2.7 g / cm3	2.66 g/cm3	Qualify
3	Checking the Infiltration Moisture Content of Agg. Rough	ASTM C 127-88-93, namely coarse aggregate water infiltration of between 1 – 4%,	2,92 % .	Qualify
4	Fill Weight Check agg. Rough	ASTM C 29-91, the bulk density of crushed stone is between 1.4 - 1.7 kg/l	1,443 kg/l	Qualify
5	Coarse aggregate Moisture Check	ASTM C 566-89, coarse aggregate has a moisture content of 1- 4%	1.25%	Qualify

Source: Research Results, 2022

3.3 Portland cement analysis

1) From the results of the cement examination, the following results were obtained: As indicated by the results of the examination, the consistency value of Portland cement was 27.2%. Regarding ASTM C 187-86, the consistency of ordinary concrete is somewhere in the range of 26% and 29%, which indicates that the experimental results meet the norms set by ASTM.
2) Based on the test, the initial setting time is 45 minutes and the final setting time is 180 minutes. Based on ASTM C 119-92, the time for Portland cement setting and

hardening is from 49 minutes to no more than 375 minutes, while the test results meet the standards set by ASTM.

3) According to the test results, obtained an average density of 3.05 grams. Referring to SNI 15-7064-2004, the specific gravity of Portland cement is less than 3.00 grams, which indicates that the test results meet the standards set by SNI.

Table 4.32 Analysis Cement Material Inspection Results with Theoretical Foundation

No	Examination Description	Theoretical basis	Check up result	Information
1	Cement consistency check	ASTM C 187-86, regular concrete consistency is somewhere in the range of 26% and 29%	27.2%	Qualify
2	Time to harden and bind cement	according to ASTM C 119-92, i.e. the setting and setting time of Portland cement is from 49 minutes to not more than 375 minutes	45 minutes and the final binding time is 180 minutes	Qualify
3	BJ Cement Inspection	SNI 15-7064-2004, namely the specific gravity of Portland cement is less than 3.00 grams	3.05 grams	Qualify

Source: Research Results, 2022

3.4 Slump Nilai Value Analysis

From the results of the examination, the slump value of the concrete mixture during the first mixture was 120 mm, and during the second mixture - 115 mm. The test results show that the results of all tests to meet the standard are included in the planned draft according to SNI 03-2834-2000, namely 60 - 180 mm.

3.5 Compressive Strength Value Test Results

From the results of the research on testing the strength of concrete using normal water baths and soaking using a mixture of $Co(NH2)_2$ as follows: Table **4.28**

Concrete Test Results Using Normal Water Immersion

Concrete Code	Age (days)	Specific Gravity (kg/m^3)	Strong Press (MPa)
H1	7	2385	9.6
H2	7	2366	10.5
H3	7	2460	7.4
	Average	**2403**	**9.1**
H4	14	2438	10.5

H5	14	2396	11.4
H6	14	2430	10.7
	Average	**2421**	**10.9**
H7	21	2381	11.4
H8	21	2438	11.6
H9	21	2411	12
	Average	**2410**	**11.6**
H10	28	2408	20.4
H11	28	2404	15.0
H12	28	2415	16.9
	Average	**2409**	**17**

Source: Research Results, 2022

It can be seen from table 4.28 that the average value of specific gravity at the age of 7 days is 2403 and the compressive strength value is 9,1 MPa , at the age of 14 days the specific gravity is 2421 and the compressive strength is 10.9 Mpa, then at the age of 21 days the specific gravity is 2410. and the compressive strength value is 11.6 MPa and at the age of 28 days the specific gravity is 2409 and the compressive strength value is 17 MPa.

Table 4.29 Concrete Test Results Using Mixed Water Bathing $Co(NH_2)^2$

Concrete Code	Age (days)	Specific Gravity (kg/m ^{3})	Strong Press (MPa)
H1	7	2400	11.75
H2	7	2426	8.7
H3	7	2408	11.88
	Average	**2410**	**10.8**
H4	14	2438	13.21
H5	14	2419	13.45
H6	14	2426	13.28
	Average	**2427**	**13.3**
H7	21	2408	12.56
H8	21	2415	15.27
H9	21	2430	15.50
	Average	**2417**	**14.4**
H10	28	2411	10,20
H11	28	2385	15.57
H12	28	2374	10.34
	Average	**2390**	**12**

Source: Research Results, 2022 Based on the values contained in table 4.29 the average value of the specific gravity of concrete using a mixture of urea at the age of 7 days is 2410 and the compressive strength value is 10.8 MPa, at the age of 14 days the specific gravity is 2427 and the compressive strength is 13 ,3 MPa, then at the age of 21 days the specific gravity is 2417 and the compressive strength value is 14.4 MPa and at the age of 28 days the specific gravity is 2390 and the compressive strength value is 12 MPa.

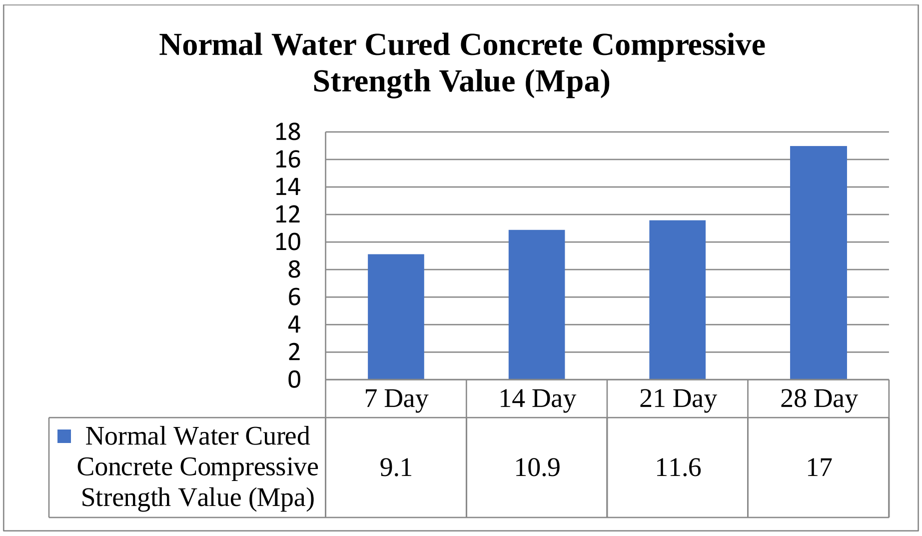


Figure 4.26 Graph of Compressive Strength Testing of Normal Water Cured Concrete

Source: Research Results Data, 2022

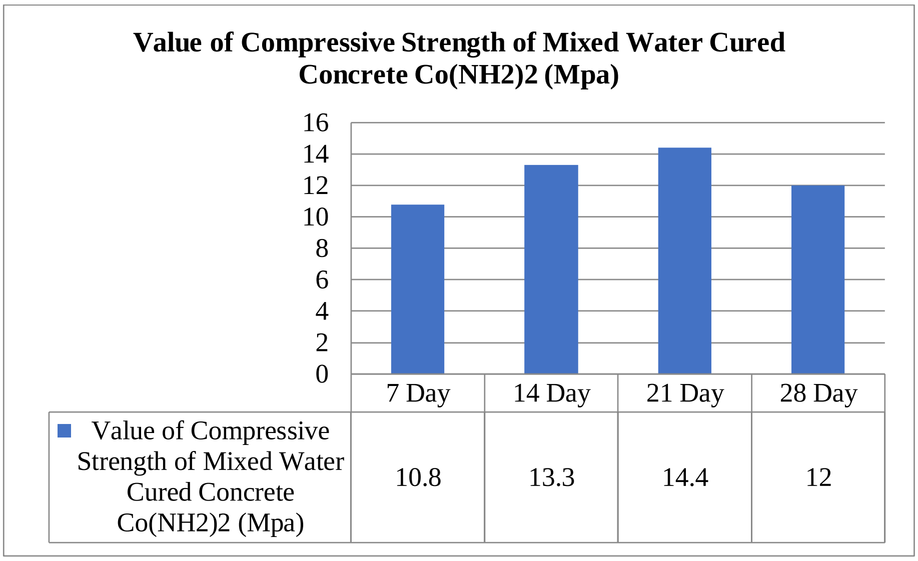


Figure 4.27 Graph of Compressive Strength Testing of Cured Concrete Mixed Water $Co(NH_2)_2$

Source: Research Results Data, 2022

Based on Figures 4.26 and 4.27, it can be seen that the comparison between concrete with a quality of fc 20 Mpa in the curing process that is soaked using normal water and water with a mixture of $Co(NH_2)_2$, namely the compressive strength value of normal concrete has increased in quality and quality over time. the increase in age between 7 is 9.1 Mpa to 28 days is worth 17 Mpa. Meanwhile, concrete with curring/soaking process using water with a mixture of urea increased at age 7 with a value of 10,8 Mpa to 21 days with a value of 14.4 Mpa, but at age 28 the strength of concrete decreased at 12 Mpa.

3.6 Crack Type Analysis

The pattern of concrete cracks according to ASTM C39 and SNI 1974:2011 is divided into 5 types , namely:

1) *cone* crack pattern is a common type, because the loading of the test object is evenly distributed.
2) The pattern of cone and split cracks (*cone and split*), these cracks occur in homogeneous test specimens / coarse aggregate mixture during manufacture so that the loading is uneven.
3) Cone and shear crack pattern , this type of crack occurs in *unbonded capping* specimens / specimens that do not fit on the test surface of the machine.
4) *Shear* crack pattern , this crack identifies that the load given by the compression test machine is uneven. If many test results are like this, it is necessary to re-calibrate the machine.

columnar crack pattern can occur due to uneven loading due to the compression test equipment and the uneven surface cross-section caused by other materials.

Table 4.30 Analysis of Concrete Crack Type Pattern After Compressive Strength Test

concrete code	Crack Type	concrete code	Crack Type
H1	shear	H13	cone and split
H2	cone	H14	cone and split
H3	columnar	H15	cone
H4	cone and split	H16	cone and split
H5	cone and split	H17	cone
H6	cone and split	H18	cone
H7	shear	H19	cone
H8	columnar	H20	cone and split
H9	cone and split	H21	columnar
H10	cone and shear	H22	columnar
H11	cone	H23	cone and split
H12	cone	H24	shear

Source: Research Results, 2022

Table 4.31 Number of Grouping Types of Concrete Cracks

Description	Amount
Cone	7
Cone And Shear	1
Shear	2
Cone And Split	10
Columnar	4
Total	24

Source: Research Results, 2022

Based on tables 4.30 and 4.31, after being analyzed there are 7 *cone and shear crack patterns, 1 cone and shear* crack pattern, 2 shear crack patterns, *2* columnar crack patterns. 4 test specimens and crack patterns with cone *and split* types, 10 pieces and the most, it is very likely that during the mixing process in the concrete making process, the material in the *concrete mixer* has not been mixed well or mixed evenly.

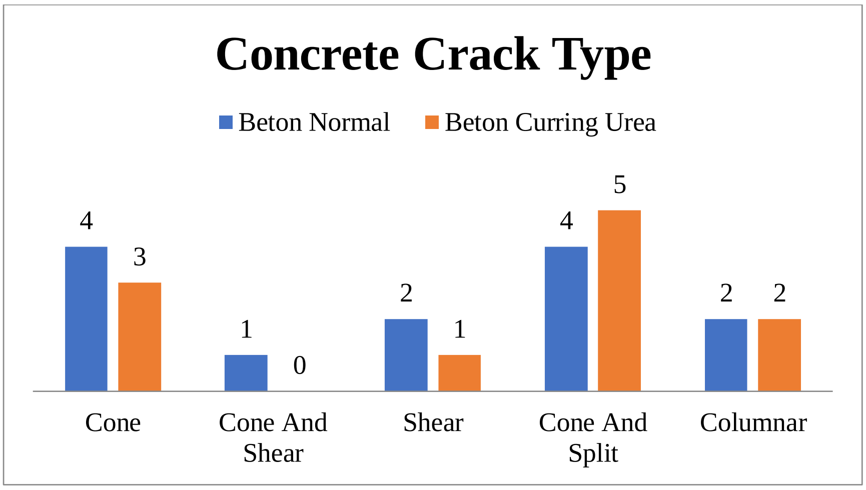


Figure 4.29 Graph of Concrete Crack Comparison Value
Source: Research Results Data, 2022

Based on Figure 4.29, there is the highest value between normal concrete and urea curing concrete, in the cone and split crack pattern, due to not mixing the coarse aggregate mixture perfectly, it causes the distribution of strength in the sample specimens to be uneven so that the concrete cracks follow the weakening point in the sample. in a cylindrical concrete specimen.

4. Conclusion

From the results of the data obtained in a study entitled The Effect of Additional Water Ingredient Urea Co(NH ^{2}) ^{2} Against Concrete Fc 20 Mpa In Curing Process, it can be concluded that:

1) The results of the examination of the compressive strength of concrete using normal water baths, the average value of specific gravity at the age of 7 days is 2403 kg/m and the compressive strength value is 9,1 MPa , at the age of 14 days the specific gravity is 2421 kg/m³ and the compressive strength is 10 ,9 MPa, then at the age of 21 days the specific gravity is 2410 kg/m and the compressive strength value is 11.6 MPa and at the age of 28 days the specific gravity is 2409 kg/m and the compressive strength value is 17 MPa. The compressive strength value of normal water-immersed concrete has increased in quality and its quality with increasing age between 7 is 9,1 Mpa to 28 days, it is 17 Mpa. While the results of the examination of the compressive strength of concrete using a mixture of Co(NH ^{2}) ^{2} water bath, the average value of the specific gravity of concrete at the age of 7 days is 2410 kg/m³ and the compressive strength value is 10.8 MPa, at the age of 14 days the specific gravity is worth 2427 kg/m and compressive strength of 13.3 MPa, then at the age of 21 days the specific gravity was 2417 kg/m and the compressive strength value was 14.4

MPa and at the age of 28 days the specific gravity was 2390 kg/m and the compressive strength value was 12 MPa. The value of the compressive strength of concrete with the curring/soaking process using water with a mixture of urea increased at the age of 7 with a value of 10.8 Mpa to 21 days with a value of 14.4 Mpa, but at the age of 28 the strength of the concrete decreased at 12 Mpa.

2) From the results of the analysis, there are 7 cone and shear crack patterns, 1 cone and shear crack pattern, 2 shear crack patterns, 4 columnar crack patterns and 4 test specimens. crack pattern with cone and split type 10 pieces. There is the highest value between normal concrete and urea curing concrete, in the cone and split crack pattern, because the coarse aggregate mixture is not completely mixed, it causes an uneven distribution of strength in the sample specimen so that the concrete cracks follow the weakening point in the concrete specimen. cylinder

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Table 4.26 Results of Compressive Strength of Concrete Using Normal Water Curing Process

Tanggal Pembuatan	Tanggal Tes	Curing Air Normal	Diameter (cm)	Tinggi (cm)	Umur (hari)	Berat (kg)	Luas Penampang (cm^2)	Volume Silinder (m^3)	Berat Jenis Beton (kg/m^3)	Kuat Tekan (kN)	Kuat Tekan (MPa)	Rata rata Kuat Tekan (Mpa)
31 Maret 2022	07-Apr-22	H1	15	30	7	12,64	176,625	0,0053	2385	168,9	9,6	9,1
31 Maret 2022	07-Apr-22	H2	15	30	7	12,54	176,625	0,0053	2366	184,9	10,5	
31 Maret 2022	07-Apr-22	H3	15	30	7	13,04	176,625	0,0053	2460	130,6	7,4	
31 Maret 2022	14-Apr-22	H4	15	30	14	12,92	176,625	0,0053	2438	185,9	10,5	10,9
31 Maret 2022	14-Apr-22	H5	15	30	14	12,7	176,625	0,0053	2396	201,6	11,4	
31 Maret 2022	14-Apr-22	H6	15	30	14	12,88	176,625	0,0053	2430	188,9	10,7	
31 Maret 2022	21-Apr-22	H7	15	30	21	12,62	176,625	0,0053	2381	207,0	11,4	11,6
31 Maret 2022	21-Apr-22	H8	15	30	21	12,92	176,625	0,0053	2438	205,6	11,6	
31 Maret 2022	21-Apr-22	H9	15	30	21	12,78	176,625	0,0053	2411	211,3	12,0	
31 Maret 2022	28-Apr-22	H10	15	30	28	12,76	176,625	0,0053	2408	361,4	20,4	17
31 Maret 2022	28-Apr-22	H11	15	30	28	12,74	176,625	0,0053	2404	265,6	15,0	
31 Maret 2022	28-Apr-22	H12	15	30	28	12,8	176,625	0,0053	2415	298,4	16,9	

Source : Lamongan Islamic University of Civil Engineering Laboratory of (2022).

Table 4.27 Results of Compressive Strength of Concrete Using a Mixed Water Curing Process of $Co(NH_2)^2$

Tanggal Pembuatan	Tanggal Tes	Curing Air Normal	Diameter (cm)	Tinggi (cm)	Umur (hari)	Berat (kg)	Luas Penampang (cm^2)	Volume Silinder (m^3)	Berat Jenis Beton (kg/m^3)	Kuat Tekan (kN)	Kuat Tekan (MPa)	Rata rata Kuat Tekan (Mpa)
31 Maret 2022	07-Apr-22	H13	15	30	7	12,72	176,625	0,0053	2400	207,65	11,75	10,8
31 Maret 2022	07-Apr-22	H14	15	30	7	12,86	176,625	0,0053	2426	153,76	8,70	
31 Maret 2022	07-Apr-22	H15	15	30	7	12,76	176,625	0,0053	2408	210,08	11,88	
31 Maret 2022	14-Apr-22	H16	15	30	14	12,92	176,625	0,0053	2438	233,45	13,21	13,3
31 Maret 2022	14-Apr-22	H17	15	30	14	12,82	176,625	0,0053	2419	237,71	13,45	
31 Maret 2022	14-Apr-22	H18	15	30	14	12,86	176,625	0,0053	2426	234,74	13,28	
31 Maret 2022	21-Apr-22	H19	15	30	21	12,76	176,625	0,0053	2408	222,35	12,58	14,4
31 Maret 2022	21-Apr-22	H20	15	30	21	12,8	176,625	0,0053	2415	269,89	15,27	
31 Maret 2022	21-Apr-22	H21	15	30	21	12,88	176,625	0,0053	2430	274,07	15,50	
31 Maret 2022	28-Apr-22	H22	15	30	28	12,78	176,625	0,0053	2411	180,25	10,20	12
31 Maret 2022	28-Apr-22	H23	15	30	28	12,64	176,625	0,0053	2385	275,18	15,57	
31 Maret 2022	28-Apr-22	H24	15	30	28	12,58	176,625	0,0053	2374	182,84	10,34	

Source : Lamongan Islamic University of Civil Engineering Laboratory of (2022).