

CHAPTER VI

CONCLUSION AND SUGGESTION

6.1. Conclusion

From the main achievements of the research work embodied in this thesis, the following conclusions can be drawn:

- a. The result of slump flow test that conducted without silica fume is 632 mm. In the other side, the replacement of 5%, 10%, 15%, and 20% of silica fume for cement consecutively is 718 mm, 678 mm, 658 mm, and 626 mm.
- b. The result of L-Box test that conducted without silica fume is 0.830. In the other side, the replacement of 5%, 10%, 15%, and 20% of silica fume for cement consecutively is 0.860, 0.843, 0.840, and 0.817.
- c. The increment of slump flow test result for the replacement of 5%, 10%, and 15% of silica fume for cement are 13.61%, 7.28%, and 3.96% compare with concrete without silica fume. While concrete with replacement of 20% of silica fume has worse result compare with concrete without silica fume with 0.95% decrement of slump flow test result.
- d. In line, the increment of l-box test result for the replacement of 5%, 10%, and 15% of silica fume for cement are 3.61%, 1.57%, and 1.21% compare with concrete without silica fume. While concrete with replacement of 20% of silica fume has worse result compare with concrete without silica fume with 1.57% decrement of slump flow test result.
- e. It can be concluded that all the SCC mixtures has satisfied the workability test result which conducted since the result of Slump Flow Test and L-Box test fulfilled the requirement that set by EFNARC in its fresh state. The requirement standard for the slump flow test that required by EFNARC should range between 650 mm – 800 mm of diameter while the requirement standard for the L-Box test that required by EFNARC should range between 0.80 – 1.0 of block ratio.

- f. In hardened properties, the compressive strength has not reached the target of SCUHPC (<100 MPa) in 28 days which means the concrete cannot be concluded to be SCUHPC but Self Compacting High-Performance Concrete (SCHPC) and needs further research.
- g. The use of 5% silica fume increases 7.14% compared with SCUHPC without silica fume, while the use of 10%, 15%, and 20% consecutively increases 48.35%, 53.85%, and 7.14% compared with SCUHPC without silica fume.
- h. The modulus of elasticity that achieved consecutively from 0%, 5%, 10%, 15%, and 20% of SCHPC are 21883.3, 22410.8, 22590.1, 22680.6, 21874.7.
- i. The hydration process of the concrete is not going as expected (continuous after 28 days). The hydration process stops around 21st -28th days after concrete mixing. In this case, the cessation of the hydration process is suspected due to the evaporation process that lasts longer than usual (the concrete takes 2-3 days before it is put into the water bath).
- j. Therefore, the optimum usage amount of silica fume as the cement replacement material in order to improve the workability and compressive strength of Self-Compacting Ultra High-Performance Concrete still varies from 10% - 15%.

6.2. Suggestion

The development of SCUHPC with utilization of quartz sand, quartz powder, and silica fume is being widely. Despite of that, the specific amount of silica fume still being questioned. some recommendations are given below:

- a. Variations of the amount of silica fume as cement replacement material should be narrowed down (7.5% - 12.5%) since some studies already shown the same number of optimum ranges of silica fume to replace cement.
- b. Since the compressive strength result cannot reach the target expected due to the cessation of hydration process, variations of aggregate size are recommended. Quartz sand that uses in this study absorb too much water, so that after keep for several hours, the water will be raise and the sand and gravel will be settled down. with the use of various size of aggregate, including the coarse aggregate, higher strength can be achieved

REFERENCES

- Akbar Ghanbari, 2011, "Self-Compacting High and Ultra High-Performance Concretes", Department of Civil Engineering, Cardiff University.
- Al-Sanusi, S, 2013, "Influence of Silica Fume on the Properties of Self Compacting Concrete", World Academy of Science, Engineering and Technology International Journal of Civil and Environmental Engineering Vol.7, No. 5.
- Chen, J J and Kwan A K H, 2013, "Triple Blending with Fly Ash Microsphere and Condensed Silica Fume to Improve Performance of Cement Paste", American Society of Civil Engineers, Vol. 25, No. 5: 618-626.
- Duval, R. and E.H. Kadri, 1998, "Influence of Silica Fume on the Workability and the Compressive Strength of High-Performance Concretes", Cem. Concr. Res., Vol. 28: 533-547
- Ghafari E, Costa H, Julio E, 2013, "Development of Ultra High-Performance Self Compacting Concrete", The Fifth North American Conference on the SCC Design and Use of Self-Consolidating Concrete.
- Harianto H, 2009 "Aspek-Aspek Teknis Beton - Ultra-High-Performance Concrete (UHPC)", Konferensi Nasional Teknik Sipil.
- Ma Jianxin and Jörg Dietz 2002, "Ultra-High-Performance Self Compacting Concrete", Institut für Massivbau und Baustofftechnologie, Universität Leipzig.
- Mazloom, M, Ramezani pour A A, and Brooks J A, 2004, "Effect of silica Fume on Mechanical Properties of High-Strength Concrete", Cem. Concr. Composites, Vol. 26: 347-357.
- Park, J., G. Ryu, S. Kang and S. Kim, 2008, "The Influence of the Amount of Silica Fume on the Mechanical Property of Ultra-High-Performance Concrete", Key Engineering Material 385-387: 701-704

- Peter S, Oliver M, Lowke D, 2007, “SCC and UHPC – Effect of Mixing Technology on Fresh Concrete Properties”, *Advances in Construction Materials* pp 513-522.
- Rahul V, Sashidhar C, Guru Jawahar J, and Kumar D P, 2017, “Study of Macro Level Properties of SCC using Silica Fume and Fly Ash by using Robosand”, *International Journal of Civil Engineering and Technology*, Vol. 8, Issue 2: 182–189.
- Saleem M A, Nehdi L, Abbas S, 2016, “Ultra-High-Performance Concrete: Mechanical Performance, Durability, Sustainability and Implementation Challenges”. *International Journal of Concrete Structures and Materials*.
- Schmidt M and Fehling E, 2007, “Ultra-High-Performance Concrete (UHPC)”, Kassel University Press
- Šerelis E, Vaitkevičius V, Kerševičius V, 2016, “Influence of Silica Fume on The Workability and Hydration Process of Ultra-High-Performance Concrete”, *Cheminė Technologija Journal*
- Shihada S and Arafa M, 2010 “Effects of Silica Fume, Ultrafine and Mixing Sequences on Properties of Ultra High-Performance Concrete”, *Asian Journal of Materials Science*, 2: 137-146.
- Sohail M.G, Wang Ben, Amit Jain, Kahraman R, 2017 “Advancements in Concrete Mix Designs: High-Performance and Ultra High-Performance Concretes from 1970 to 2016”, *ASCE Journal*.
- Srishailla J M, Akshay K A, Prakash P, and Jawali V, 2015, “Influence of GGBS and Silica Fume on Workability and Mechanical Properties of Self Compacting Concrete”, *IOSR Journal of Mechanical and Civil Engineering*, Vol. 12, Issue 4 Ver. II: 64-69.

Turk K, Karatas M, Gonen T, 2013, “Effect of Fly Ash and Silica Fume on compressive strength, sorptivity and carbonation of SCC”, KSCE Journal of Civil Engineering, Vol. 17, Issue 1: 202–209.

Vivek S S and Dhinakaran G, 2015, “Effect of Silica Fume in Flow Properties and Compressive Strength of Self Compacting Concrete”, International Journal of ChemTech Research Vol. 8, No. 1: 01-05.



A.2 MUD INVESTIGATION IN THE COARSE AGGREGATE

I. Tested : 22 April 2019

II. Materials:

Split From : Merapi

Water From : Laboratory of CV. Jati Kencana Beton

III. Tools

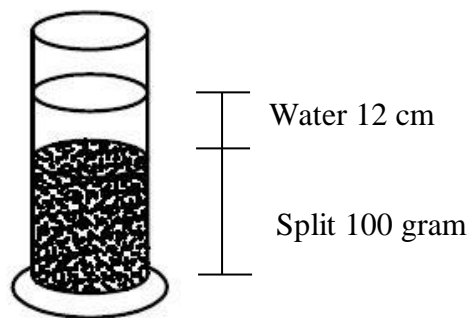
- Measurement Glass 250 cc

- Digital Scale

- Oven

- Sand

IV. Sketch



V. Result

After Sand+Plate taken out form oven

a. Weight of sand+plate = 159.55 gram

b. Weight of plate = 61.6 gram

c. Weight of sand = 97.95 gram

$$\text{Mud} = \frac{100-97.95}{100} \times 100\% = 2.05\%$$



A.1 MUD INVESTIGATION IN THE SAND

I. Tested : 22 April 2019

II. Materials:

Sand From : Bangka Belitung

Water From : Laboratory of CV. Jati Kencana Beton

III. Tools

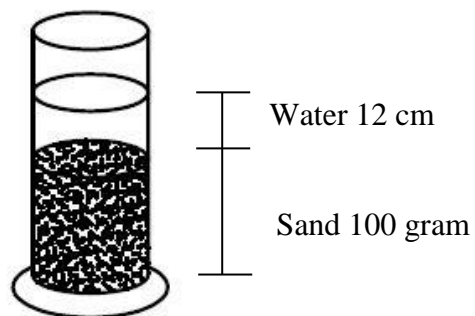
- Measurement Glass 250 cc

- Digital Scale

- Oven

- Sand

IV. Sketch



V. Result

After Sand+Plate taken out form oven

a. Weight of sand+plate = 158.45 gram

b. Weight of plate = 61.9 gram

c. Weight of sand = 96.55 gram

$$\text{Mud} = \frac{100-96.55}{100} \times 100\% = 3.55\%$$



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

A.4 WATER CONTENT IN COARSE AGGREGATE

Material : Split

From : Merapi

	Test	H1	H2
1	Weight of wet split	73.476	73.373
2	Weight of dry split	72.692	72.521
3	Weight of water = (1)-(2)	0.784	0.852
4	Water content (w) = (3)/(2)*100%	1.07	1.174
	Average	1.122	



A.3 THE DENSITY AND ABSORPTION TEST OF SPLIT

Material : Split

From : Merapi

	Test	I
A	Dry Weight	500 Gram
B	Weight of SSD Sample	505 Gram
C	Weight in the Water	294.6 Gram
D	Bulk Specific Gravity = $\frac{(A)}{(B-C)}$	2.3764
E	Bulk Specific Gravity SSD = $\frac{(B)}{(B-C)}$	2.4001
F	Apparent Specific Gravity = $\frac{(A)}{(A-C)}$	2.4342
G	Absorption = $\frac{(B-A)}{(A)} \times 100\%$	1%



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

C. MODULUS OF ELASTICITY DATA

Cylinder YP-UAJY 0% - A1

Compressive Strength : 36.22 MPa

Area : 17974 mm²

Po : 199.8

fp : 10.1859

ep : 0.00046

Correction : 3.0621

Modulus : 21883.3

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm ²)	Strain	Strain Correction
0	0	0	0	-3.0621	0
5	0	0	0.282942	0.000000	3.0621
10	0	0	0.565884	0.000000	3.0621
15	3	1.5	0.848826	0.750751	3.812850751
20	10	5	1.131768	2.502503	5.564602503
25	12	6	1.414711	3.003003	6.065103003
30	15	7.5	1.697653	3.753754	6.815853754
35	22	11	1.980595	5.505506	8.567605506
40	27	13.5	2.263537	6.756757	9.818856757
45	32	16	2.546479	8.008008	11.07010801
50	36	18	2.829421	9.009009	12.07110901
55	42	21	3.112363	10.510511	13.57261051
60	47	23.5	3.395305	11.761762	14.82386176
65	54	27	3.678248	13.513514	16.57561351
70	59	29.5	3.961190	14.764765	17.82686476
75	65	32.5	4.244132	16.266266	19.32836627



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm ²)	Strain	Strain Correction
80	72	36	4.527074	18.018018	21.08011802
85	78	39	4.810016	19.519520	22.58161952
90	84	42	5.092958	21.021021	24.08312102
95	90	45	5.375900	22.522523	25.58462252
100	94	47	5.658842	23.523524	26.58562352
105	101	50.5	5.941785	25.275275	28.33737528
110	107	53.5	6.224727	26.776777	29.83887678
115	113	56.5	6.507669	28.278278	31.34037828
120	118	59	6.790611	29.529530	32.59162953
125	127	63.5	7.073553	31.781782	34.84388178
130	133	66.5	7.356495	33.283283	36.34538328
135	140	70	7.639437	35.035035	38.09713504
140	145	72.5	7.922379	36.286286	39.34838629
145	150	75	8.205322	37.537538	40.59963754
150	152	76	8.488264	38.038038	41.10013804
155	159	79.5	8.771206	39.789790	42.85188979
160	166	83	9.054148	41.541542	44.60364154
165	173	86.5	9.337090	43.293293	46.35539329
170	179	89.5	9.620032	44.794795	47.85689479
175	181	90.5	9.902974	45.295295	48.3573953
180	186	93	10.185916	46.546547	49.60864655
185	190	95	10.468858	47.547548	50.60964755
190	197	98.5	10.751801	49.299299	52.3613993
195	211	105.5	11.034743	52.802803	55.8649028
200	224	112	11.317685	56.056056	59.11815606



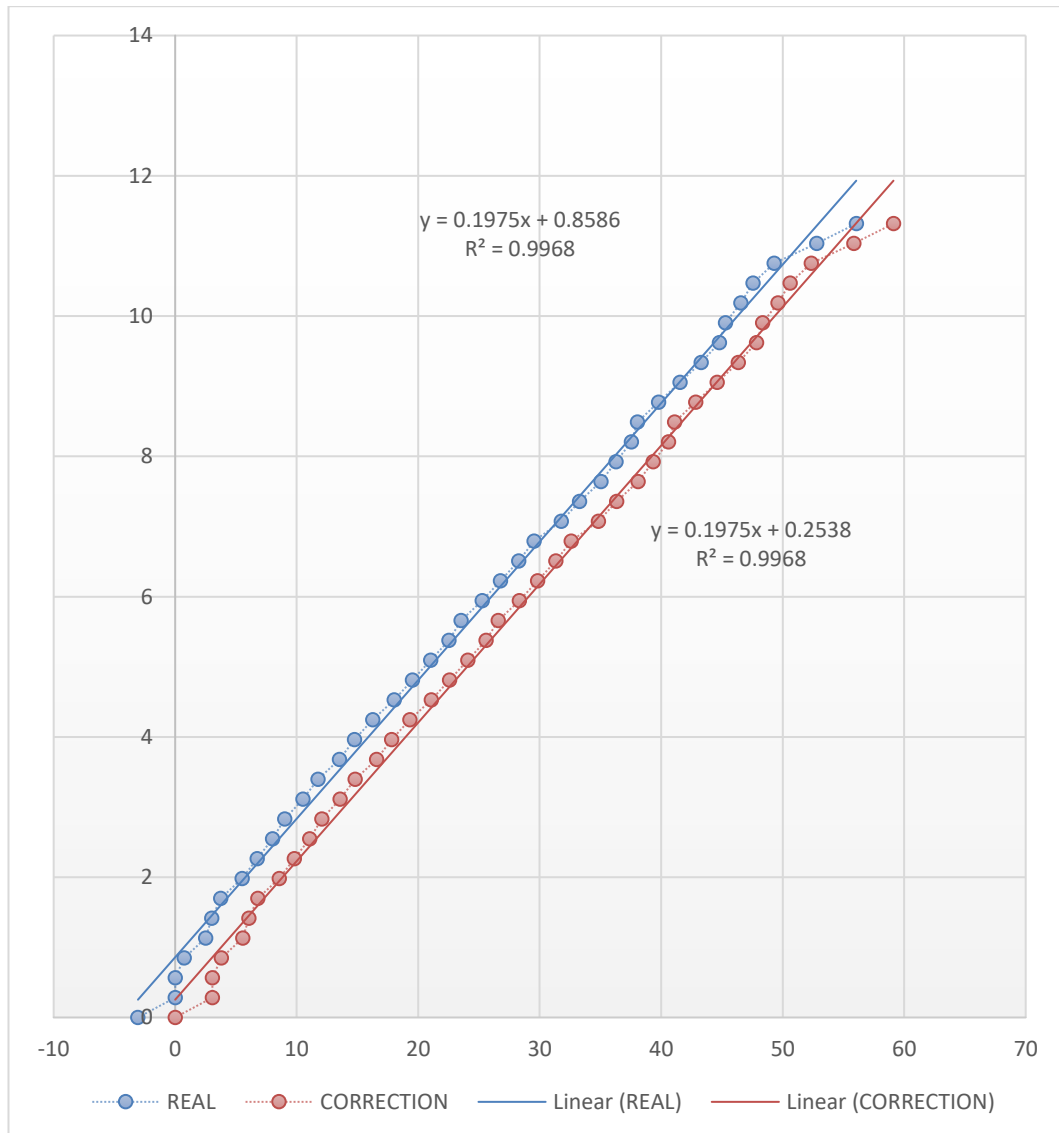
UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748





UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

C. MODULUS OF ELASTICITY DATA

Cylinder YP-UAJY 5% - A1

Compressive Strength : 36.78 MPa

Area : 17974 mm²

Po : 200.1

fp : 10.751

ep : 0.00048

Correction : 2.433

Modulus : 22410.8

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm ²)	Strain	Strain Correction
0	0	0	0	-2.4333	0
5	0	0	0.282942	0.000000	2.4333
10	0	0	0.565884	0.000000	2.4333
15	2	1	0.848826	0.499750	2.933050125
20	5	2.5	1.131768	1.249375	3.682675312
25	10	5	1.414711	2.498751	4.932050625
30	14	7	1.697653	3.498251	5.931550875
35	18	9	1.980595	4.497751	6.931051124
40	23	11.5	2.263537	5.747126	8.180426437
45	27	13.5	2.546479	6.746627	9.179926687
50	36	18	2.829421	8.995502	11.42880225
55	40	20	3.112363	9.995002	12.4283025
60	45	22.5	3.395305	11.244378	13.67767781
65	49	24.5	3.678248	12.243878	14.67717806
70	53	26.5	3.961190	13.243378	15.67667831
75	58	29	4.244132	14.492754	16.92605362



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm ²)	Strain	Strain Correction
80	65	32.5	4.527074	16.241879	18.67517906
85	69	34.5	4.810016	17.241379	19.67467931
90	73	36.5	5.092958	18.240880	20.67417956
95	82	41	5.375900	20.489755	22.92305512
100	87	43.5	5.658842	21.739130	24.17243043
105	92	46	5.941785	22.988506	25.42180575
110	98	49	6.224727	24.487756	26.92105612
115	104	52	6.507669	25.987006	28.4203065
120	110	55	6.790611	27.486257	29.91955687
125	115	57.5	7.073553	28.735632	31.16893218
130	121	60.5	7.356495	30.234883	32.66818256
135	128	64	7.639437	31.984008	34.417308
140	130	65	7.922379	32.483758	34.91705812
145	135	67.5	8.205322	33.733133	36.16643343
150	142	71	8.488264	35.482259	37.91555887
155	146	73	8.771206	36.481759	38.91505912
160	150	75	9.054148	37.481259	39.91455937
165	157	78.5	9.337090	39.230385	41.66368481
170	165	82.5	9.620032	41.229385	43.66268531
175	172	86	9.902974	42.978511	45.41181074
180	180	90	10.185916	44.977511	47.41081124
185	186	93	10.468858	46.476762	48.91006162
190	192	96	10.751801	47.976012	50.40931199
195	204	102	11.034743	50.974513	53.40781274



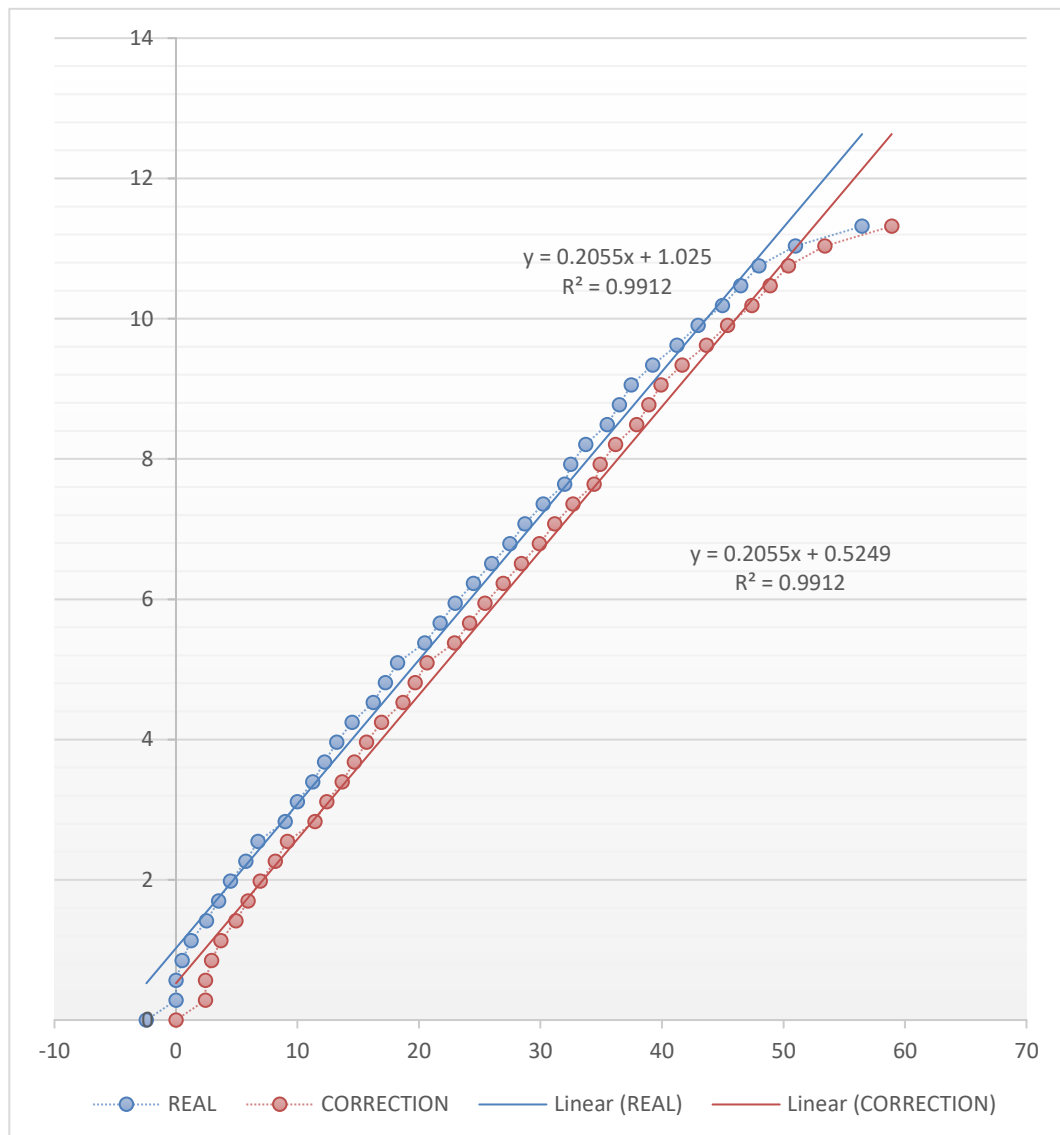
UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748





C. MODULUS OF ELASTICITY DATA

Cylinder YP-UAJY 10% - A1

Compressive Strength : 50.93 MPa

Area : 17974 mm²

Po : 200.1

fp : 10.186

ep : 0.00045

Correction : 3.1221

Modulus : 22590.1

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm2)	Strain	Strain Correction
0	0	0	0	-3.1221	0
5	0	0	0.282942	0.000000	2.4333
10	0	0	0.565884	0.000000	2.4333
15	2	1	0.848826	0.501002	2.934302004
20	5	2.5	1.131768	1.252505	3.68580501
25	10	5	1.414711	2.505010	4.93831002
30	14	7	1.697653	3.507014	5.940314028
35	18	9	1.980595	4.509018	6.942318036
40	23	11.5	2.263537	5.761523	8.194823046
45	27	13.5	2.546479	6.763527	9.196827054
50	36	18	2.829421	9.018036	11.45133607
55	40	20	3.112363	10.020040	12.45334008
60	45	22.5	3.395305	11.272545	13.70584509
65	49	24.5	3.678248	12.274549	14.7078491
70	53	26.5	3.961190	13.276553	15.70985311



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm ²)	Strain	Strain Correction
75	58	29	4.244132	14.529058	16.96235812
80	65	32.5	4.527074	16.282565	18.71586513
85	69	34.5	4.810016	17.284569	19.71786914
90	73	36.5	5.092958	18.286573	20.71987315
95	82	41	5.375900	20.541082	22.97438216
100	87	43.5	5.658842	21.793587	24.22688717
105	92	46	5.941785	23.046092	25.47939218
110	98	49	6.224727	24.549098	26.9823982
115	104	52	6.507669	26.052104	28.48540421
120	110	55	6.790611	27.555110	29.98841022
125	115	57.5	7.073553	28.807615	31.24091523
130	121	60.5	7.356495	30.310621	32.74392124
135	128	64	7.639437	32.064128	34.49742826
140	130	65	7.922379	32.565130	34.99843026
145	135	67.5	8.205322	33.817635	36.25093527
150	142	71	8.488264	35.571142	38.00444228
155	146	73	8.771206	36.573146	39.00644629
160	150	75	9.054148	37.575150	40.0084503
165	157	78.5	9.337090	39.328657	41.76195731
170	165	82.5	9.620032	41.332665	43.76596533
175	172	86	9.902974	43.086172	45.51947234
180	180	90	10.185916	45.090180	47.52348036
185	186	93	10.468858	46.593186	49.02648637
190	192	96	10.751801	48.096192	50.52949238
195	204	102	11.034743	51.102204	53.53550441



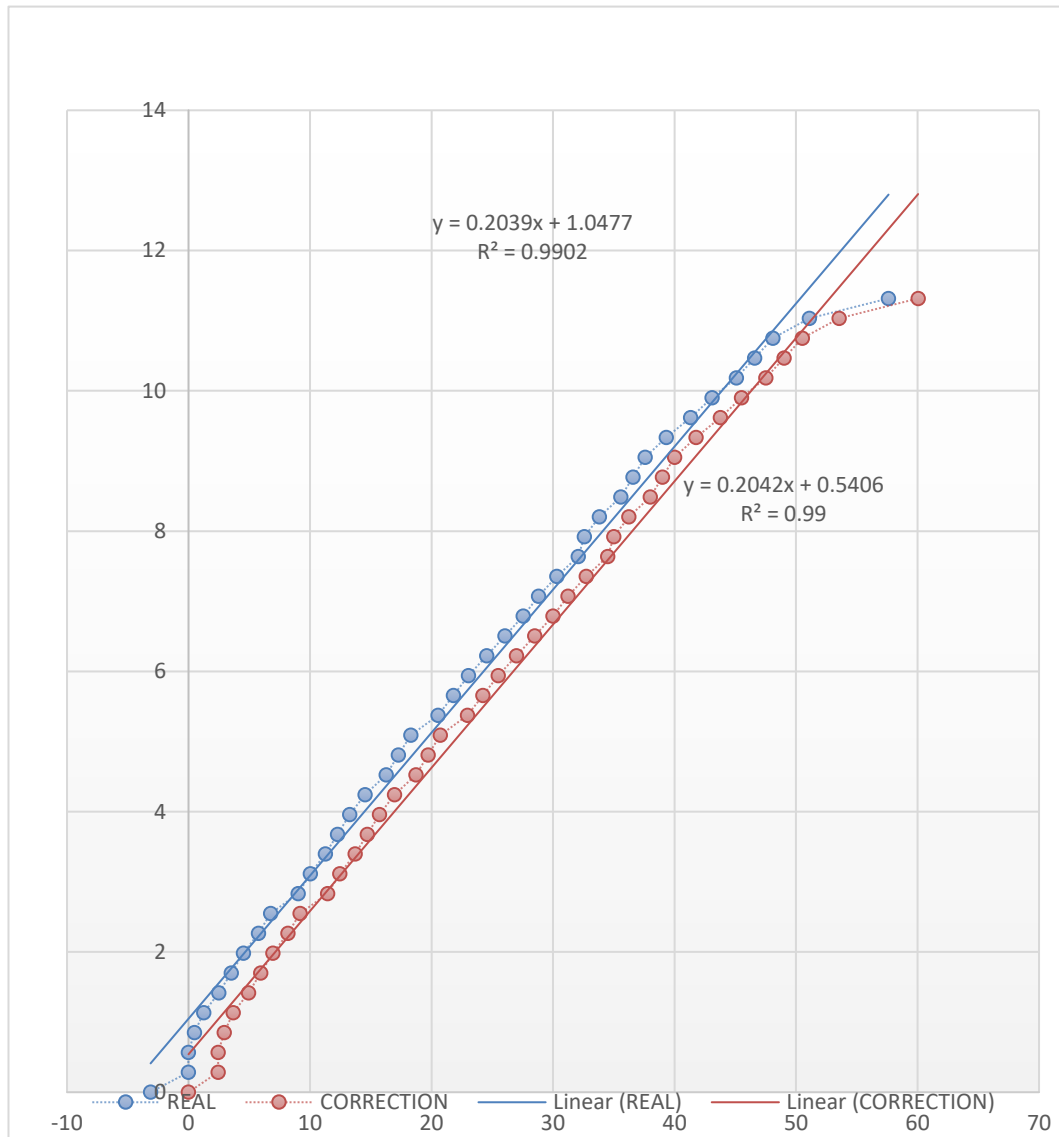
UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748





C. MODULUS OF ELASTICITY DATA

Cylinder YP-UAJY 15% - A1

Compressive Strength : 52.82 MPa

Area : 17974 mm²

Po : 200.4

fp : 10.186

ep : 0.00045

Correction : 2.622

Modulus : 22680.6

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm2)	Strain	Strain Correction
0	0	0	0	-2.622	0
5	0	0	0.282942	0.000000	2.622
10	0	0	0.565884	0.000000	2.622
15	3	1.5	0.848826	0.748503	3.370502994
20	6	3	1.131768	1.497006	4.119005988
25	11	5.5	1.414711	2.744511	5.366510978
30	15	7.5	1.697653	3.742515	6.36451497
35	19	9.5	1.980595	4.740519	7.362518962
40	24	12	2.263537	5.988024	8.610023952
45	28	14	2.546479	6.986028	9.608027944
50	35	17.5	2.829421	8.732535	11.35453493
55	40	20	3.112363	9.980040	12.60203992
60	44	22	3.395305	10.978044	13.60004391
65	48	24	3.678248	11.976048	14.5980479
70	52	26	3.961190	12.974052	15.5960519



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm ²)	Strain	Strain Correction
75	57	28.5	4.244132	14.221557	16.84355689
80	65	32.5	4.527074	16.217565	18.83956487
85	69	34.5	4.810016	17.215569	19.83756886
90	73	36.5	5.092958	18.213573	20.83557285
95	82	41	5.375900	20.459082	23.08108184
100	87	43.5	5.658842	21.706587	24.32858683
105	94	47	5.941785	23.453094	26.07509381
110	98	49	6.224727	24.451098	27.0730978
115	103	51.5	6.507669	25.698603	28.32060279
120	109	54.5	6.790611	27.195609	29.81760878
125	114	57	7.073553	28.443114	31.06511377
130	120	60	7.356495	29.940120	32.56211976
135	124	62	7.639437	30.938124	33.56012375
140	130	65	7.922379	32.435130	35.05712974
145	135	67.5	8.205322	33.682635	36.30463473
150	142	71	8.488264	35.429142	38.05114172
155	148	74	8.771206	36.926148	39.5481477
160	152	76	9.054148	37.924152	40.5461517
165	159	79.5	9.337090	39.670659	42.29265868
170	165	82.5	9.620032	41.167665	43.78966467
175	172	86	9.902974	42.914172	45.53617166
180	180	90	10.185916	44.910180	47.53217964
185	188	94	10.468858	46.906188	49.52818762
190	202	101	10.751801	50.399202	53.0212016
195	213	106.5	11.034743	53.143713	55.76571257



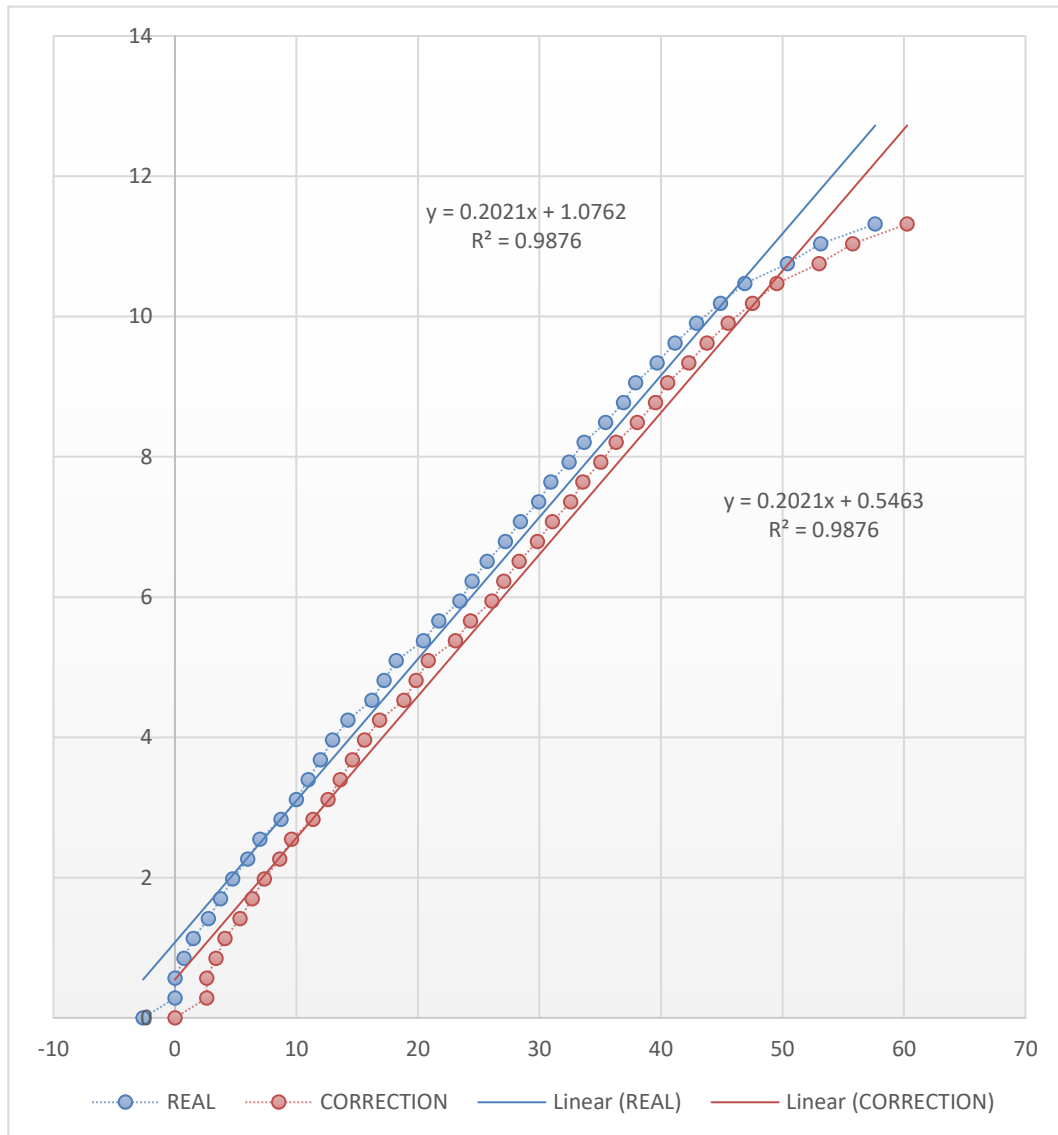
UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748





C. MODULUS OF ELASTICITY DATA

Cylinder YP-UAJY 20% - A1

Compressive Strength : 36.78 MPa

Area : 17974 mm²

Po : 200.4

fp : 10.751

ep : 0.00049

Correction : 2.5858

Modulus : 21874.7

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm2)	Strain	Strain Correction
0	0	0	0	-2.5858	0
5	0	0	0.282942	0.000000	2.585800
10	0	0	0.565884	0.000000	2.585800
15	5	2.5	0.848826	1.247505	3.833305
20	10	5	1.131768	2.495010	5.080810
25	12	6	1.414711	2.994012	5.579812
30	15	7.5	1.697653	3.742515	6.328315
35	22	11	1.980595	5.489022	8.074822
40	27	13.5	2.263537	6.736527	9.322327
45	32	16	2.546479	7.984032	10.569832
50	36	18	2.829421	8.982036	11.567836
55	42	21	3.112363	10.479042	13.064842
60	47	23.5	3.395305	11.726547	14.312347
65	54	27	3.678248	13.473054	16.058854
70	59	29.5	3.961190	14.720559	17.306359



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748

Load (kn)	Gauge reading	Deformation (mm)	Stress (kN/mm ²)	Strain	Strain Correction
75	65	32.5	4.244132	16.217565	18.803365
80	72	36	4.527074	17.964072	20.549872
85	78	39	4.810016	19.461078	22.046878
90	84	42	5.092958	20.958084	23.543884
95	90	45	5.375900	22.455090	25.040890
100	94	47	5.658842	23.453094	26.038894
105	101	50.5	5.941785	25.199601	27.785401
110	107	53.5	6.224727	26.696607	29.282407
115	113	56.5	6.507669	28.193613	30.779413
120	118	59	6.790611	29.441118	32.026918
125	127	63.5	7.073553	31.686627	34.272427
130	133	66.5	7.356495	33.183633	35.769433
135	140	70	7.639437	34.930140	37.515940
140	145	72.5	7.922379	36.177645	38.763445
145	150	75	8.205322	37.425150	40.010950
150	152	76	8.488264	37.924152	40.509952
155	159	79.5	8.771206	39.670659	42.256459
160	166	83	9.054148	41.417166	44.002966
165	173	86.5	9.337090	43.163673	45.749473
170	179	89.5	9.620032	44.660679	47.246479
175	181	90.5	9.902974	45.159681	47.745481
180	186	93	10.185916	46.407186	48.992986
185	190	95	10.468858	47.405190	49.990990
190	197	98.5	10.751801	49.151697	51.737497
195	211	105.5	11.034743	52.644711	55.230511



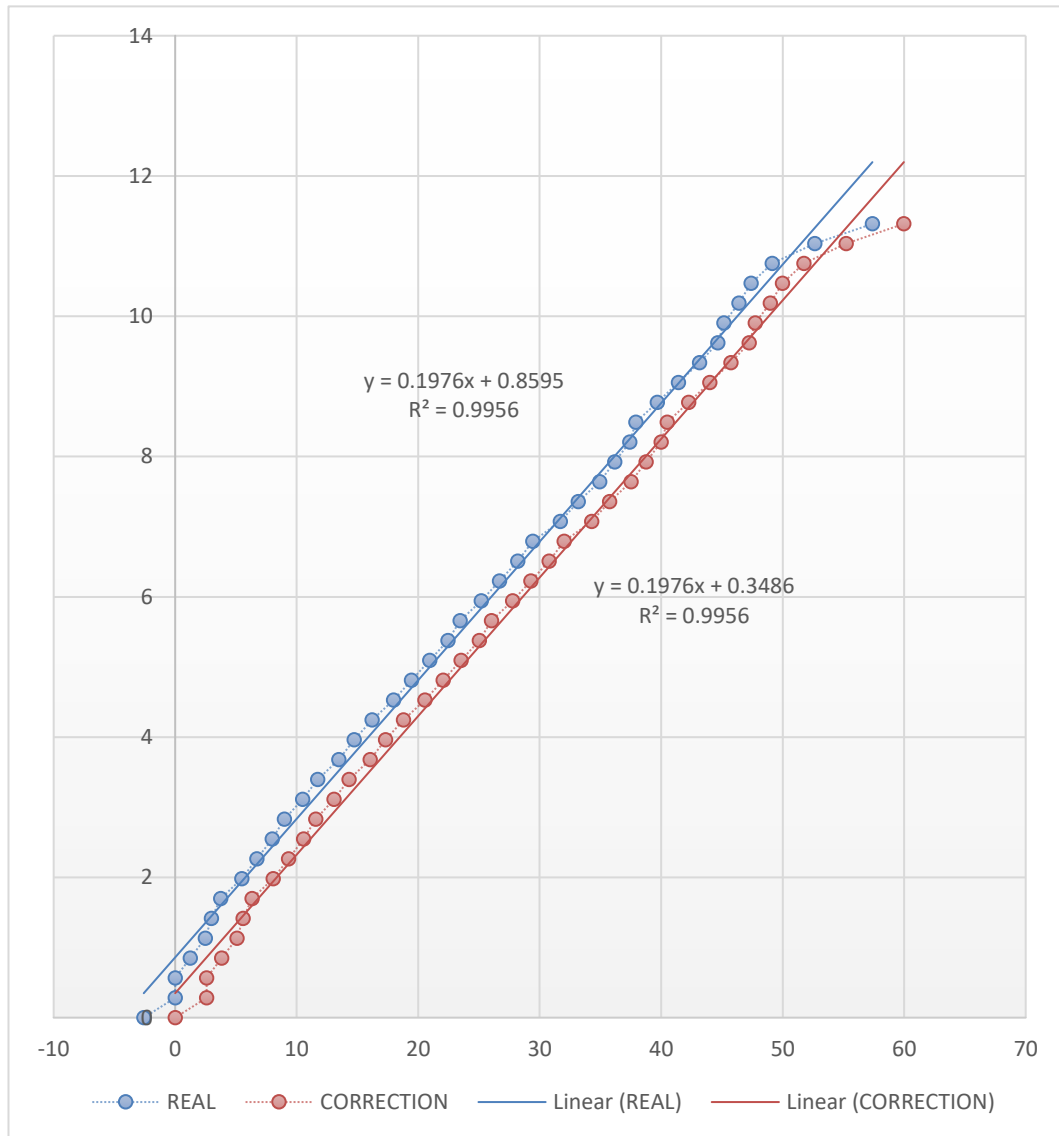
UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering

Program, Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp.+62-274-487711 (hunting) Fax. +62-274-487748





UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering Program,

Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp. +62-274-487711 (hunting) Fax. +62-274-487748

COMPRESSIVE STRENGTH TEST OF 0% SILICA FUME

No	Kode Benda Uji	Tgl. Dibuat	Tgl. Diuji	Tinggi (mm)	Dia (mm)	Berat (Kg)	Berat jenis (Kg/m ³)	Umur (hari)	Beban Maks (kN)	Kuat Tekan (Mpa)	Kuat Tekan Rata-Rata (Mpa)
1	YP 0% - D1	10/5/2019	17/5/2019	300	150	12.47	1176.096	7	500	28.29421	28.48284
2	YP 0% - D2	10/5/2019	17/5/2019	300	150	12.28	1158.176	7	500	28.29421	
3	YP 0% - D3	10/5/2019	17/5/2019	300	150	12.37	1166.665	7	510	28.8601	
4	YP 0% - C1	10/5/2019	24/5/2019	300	150	12.37	1166.665	14	580	32.82129	30.74638
5	YP 0% - C2	10/5/2019	24/5/2019	300	150	12.33	1162.892	14	550	31.12363	
6	YP 0% - C3	10/5/2019	24/5/2019	300	150	12.26	1156.29	14	500	28.29421	
7	YP 0% - B1	3/5/2019	24/5/2019	300	150	12.46	1175.153	21	750	42.44132	33.00991
8	YP 0% - B2	3/5/2019	24/5/2019	300	150	12.24	1154.404	21	500	28.29421	
9	YP 0% - B3	3/5/2019	24/5/2019	300	150	12.17	1147.802	21	500	28.29421	
10	YP 0% - A1	3/5/2019	31/5/2019	300	150	12.12	1143.086	28	640	36.21659	34.33031
11	YP 0% - A2	3/5/2019	31/5/2019	300	150	11.97	1128.939	28	620	35.08482	
12	YP 0% - A3	3/5/2019	31/5/2019	300	150	12.02	1133.655	28	560	31.68952	



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering Program,

Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp. +62-274-487711 (hunting) Fax. +62-274-487748

COMPRESSIVE STRENGTH TEST OF 5% SILICA FUME

No	Kode Benda Uji	Tgl. Dibuat	Tgl. Diuji	Tinggi (mm)	Dia (mm)	Berat (Kg)	Berat jenis (Kg/m ³)	Umur (hari)	Beban Maks (kN)	Kuat Tekan (Mpa)	Kuat Tekan Rata-Rata (Mpa)
1	YP 5% - D1	11/5/2019	18/5/2019	300	150	12.21	1151.574	7	580	32.82129	32.06677
2	YP 5% - D2	11/5/2019	18/5/2019	300	150	12.33	1162.892	7	520	29.42598	
3	YP 5% - D3	11/5/2019	18/5/2019	300	150	12.39	1168.551	7	600	33.95305	
4	YP 5% - C1	11/5/2019	25/5/2019	300	150	12.6	1188.357	14	600	33.95305	34.33031
5	YP 5% - C2	11/5/2019	25/5/2019	300	150	12.58	1186.471	14	640	36.21659	
6	YP 5% - C3	11/5/2019	25/5/2019	300	150	12.19	1149.688	14	580	32.82129	
7	YP 5% - B1	4/5/2019	25/5/2019	300	150	12.25	1155.347	21	640	36.21659	36.9711
8	YP 5% - B2	4/5/2019	25/5/2019	300	150	12.35	1164.778	21	680	38.48013	
9	YP 5% - B3	4/5/2019	25/5/2019	300	150	12.17	1147.802	21	640	36.21659	
10	YP 5% - A1	4/5/2019	31/5/2019	300	150	12.47	1176.096	28	640	36.21659	36.78248
11	YP 5% - A2	4/5/2019	31/5/2019	300	150	12.55	1183.641	28	670	37.91424	
12	YP 5% - A3	4/5/2019	31/5/2019	300	150	12.21	1151.574	28	640	36.21659	



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering Program,

Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp. +62-274-487711 (hunting) Fax. +62-274-487748

COMPRESSIVE STRENGTH TEST OF 10% SILICA FUME

No	Kode Benda Uji	Tgl. Dibuat	Tgl. Diuji	Tinggi (mm)	Dia (mm)	Berat (Kg)	Berat jenis (Kg/m ³)	Umur (hari)	Beban Maks (kN)	Kuat Tekan (Mpa)	Kuat Tekan Rata-Rata (Mpa)
1	YP 10% - D1	9/5/2019	16/5/2019	300	150	12.30	1160.063	7	640	36.21659	35.83934
2	YP 10% - D2	9/5/2019	16/5/2019	300	150	12.33	1162.892	7	600	33.95305	
3	YP 10% - D3	9/5/2019	16/5/2019	300	150	12.33	1162.892	7	660	37.34836	
4	YP 10% - C1	9/5/2019	23/5/2019	300	150	12.40	1169.494	14	760	43.0072	43.38446
5	YP 10% - C2	9/5/2019	23/5/2019	300	150	12.59	1187.414	14	800	45.27074	
6	YP 10% - C3	9/5/2019	23/5/2019	300	150	12.19	1149.688	14	740	41.87543	
7	YP 10% - B1	2/5/2019	23/5/2019	300	150	12.25	1155.347	21	910	51.49547	51.11821
8	YP 10% - B2	2/5/2019	23/5/2019	300	150	12.35	1164.778	21	880	49.79781	
9	YP 10% - B3	2/5/2019	23/5/2019	300	150	12.17	1147.802	21	920	52.06135	
10	YP 10% - A1	2/5/2019	30/5/2019	300	150	12.55	1183.641	28	880	49.79781	50.92958
11	YP 10% - A2	2/5/2019	30/5/2019	300	150	12.36	1165.722	28	920	52.06135	
12	YP 10% - A3	2/5/2019	30/5/2019	300	150	12.11	1142.143	28	900	50.92958	



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering Program,

Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp. +62-274-487711 (hunting) Fax. +62-274-487748

COMPRESSIVE STRENGTH TEST OF 15% SILICA FUME

No	Kode Benda Uji	Tgl. Dibuat	Tgl. Diuji	Tinggi (mm)	Dia (mm)	Berat (Kg)	Berat jenis (Kg/m ³)	Umur (hari)	Beban Maks (kN)	Kuat Tekan (Mpa)	Kuat Tekan Rata-Rata (Mpa)
1	YP 15% - D1	8/5/2019	15/5/2019	300	150	12.15	1145.916	7	680	38.48013	38.66876
2	YP 15% - D2	8/5/2019	15/5/2019	300	150	12.33	1162.892	7	690	39.04601	
3	YP 15% - D3	8/5/2019	15/5/2019	300	150	12.4	1169.494	7	680	38.48013	
4	YP 15% - C1	8/5/2019	22/5/2019	300	150	12.59	1187.414	14	740	41.87543	44.51623
5	YP 15% - C2	8/5/2019	22/5/2019	300	150	12.57	1185.527	14	780	44.13897	
6	YP 15% - C3	8/5/2019	22/5/2019	300	150	12.13	1144.029	14	840	47.53428	
7	YP 15% - B1	1/5/2019	22/5/2019	300	150	12.25	1155.347	21	940	53.19312	50.74095
8	YP 15% - B2	1/5/2019	22/5/2019	300	150	12.35	1164.778	21	900	50.92958	
9	YP 15% - B3	1/5/2019	22/5/2019	300	150	12.17	1147.802	21	850	48.10016	
10	YP 15% - A1	1/5/2019	29/5/2019	300	150	12.4	1169.494	28	920	52.06135	52.81586
11	YP 15% - A2	1/5/2019	29/5/2019	300	150	12.36	1165.722	28	940	53.19312	
12	YP 15% - A3	1/5/2019	29/5/2019	300	150	12.11	1142.143	28	940	53.19312	



UNIVERSITAS ATMA JAYA YOGYAKARTA

Faculty of Engineering, International Civil Engineering Program,

Construction Material Technology Laboratory

Jl. Babarsari No.44 Yogyakarta 55281 Indonesia Kotak Pos 1086

Telp. +62-274-487711 (hunting) Fax. +62-274-487748

COMPRESSIVE STRENGTH TEST OF 20% SILICA FUME

No	Kode Benda Uji	Tgl. Dibuat	Tgl. Diuji	Tinggi (mm)	Dia (mm)	Berat (Kg)	Berat jenis (Kg/m ³)	Umur (hari)	Beban Maks (kN)	Kuat Tekan (Mpa)	Kuat Tekan Rata-Rata (Mpa)
1	YP 20% - D1	7/5/2019	14/5/2019	300	150	12.18	1148.745	7	580	32.82129	32.63266
2	YP 20% - D2	7/5/2019	14/5/2019	300	150	12.33	1162.892	7	550	31.12363	
3	YP 20% - D3	7/5/2019	14/5/2019	300	150	12.56	1184.584	7	600	33.95305	
4	YP 20% - C1	7/5/2019	21/5/2019	300	150	12.77	1204.39	14	600	33.95305	35.65071
5	YP 20% - C2	7/5/2019	21/5/2019	300	150	12.57	1185.527	14	660	37.34836	
6	YP 20% - C3	7/5/2019	21/5/2019	300	150	12.13	1144.029	14	630	35.65071	
7	YP 20% - B1	30/4/2019	21/5/2019	300	150	12.40	1169.494	21	640	36.21659	35.08482
8	YP 20% - B2	30/4/2019	21/5/2019	300	150	12.18	1148.745	21	550	31.12363	
9	YP 20% - B3	30/4/2019	21/5/2019	300	150	12.33	1162.892	21	670	37.91424	
10	YP 20% - A1	30/4/2019	28/5/2019	300	150	12.65	1193.073	28	670	37.91424	36.78248
11	YP 20% - A2	30/4/2019	28/5/2019	300	150	12.78	1205.333	28	620	35.08482	
12	YP 20% - A3	30/4/2019	28/5/2019	300	150	12.12	1143.086	28	660	37.34836	



REPORT OF ANALYSIS

KURVA GRANULOMETRI

Sample : **SILICA SAND**
 Principal : **PT. PAM LIONNAISE JAYA**
 Order Number : **35.2502**
 Code : -

ANALISA UKURAN BUTIR

Saringan No.	Diameter [mm]	Berat tertahan [gram]	%Tertahan	% Lolos Kumulatif
8	2.360	0.00	0.00	100.00
10	2.000	0.00	0.00	100.00
14	1.410	0.00	0.00	100.00
16	1.180	18.50	18.50	81.50
18	1.000	58.30	58.30	23.20
20	0.850	17.20	17.20	6.00
25	0.710	5.20	5.20	0.80
30	0.590	0.80	0.80	0.00
50	0.297	0.00	0.00	0.00
		100.00	100.00	

