

COMPRESSIVE STRENGTH AND MODULUS OF ELASTICITY OF GEOPOLYMER CONCRETE WITH METAKAOLIN AND SILICA FUME

Final Project Report

as one of requirement to obtain S1 degree from

Universitas Atma Jaya Yogyakarta

By:

GARUDEA MARTHA HANDYANINGTYAS

NPM: 111313777



INTERNATIONAL S1 PROGRAM

DEPARTMENT OF CIVIL ENGINEERING

FACULTY OF ENGINEERING

UNIVERSITAS ATMA JAYA YOGYAKARTA

YOGYAKARTA

2015

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GEOPOLYMER CONCRETE WITH METAKAOLIN AND SILICA FUME**

By:


Garudea Martha Handyaningtyas

111313777

Has been approved

Yogyakarta, *April 17, 2015*

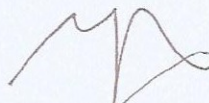
Advisor,



(Dr. Ir. A.M. Ade Lisantono., M.Eng)

Approved by:

Head of Civil Engineering Department,



(J. Januar Sudjati, ST., MT)

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Final Project

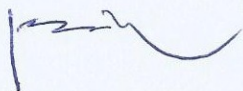

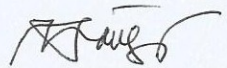
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By:

GARUDEA MARTHA HANDYANINGTYAS

111313777

Has been examined and approved by the examination committee

	Name	Signature	Date
Chairperson	: Dr. Ir. A.M. Ade Lisantono., M.Eng		17/04/2015
Member	: Prof. Ir. Yoyong Arfiadi, M.Eng., Ph.D		17/04/2015
Member	: Ir. Pranawa Widagdo, MT		17/04 2015

*There is surely a future hope for you,
And your hope will not be cut off....*

(Proverbs 23:18)

*Truly I tell you, if you have faith as small as a mustard seed, you can
say to this mountain, 'Move from here to there,' and it will move.*

Nothing will be impossible for you.

(Matthew 17:20)

I dedicated this Final Project to my Lord and my Family

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I realize, this report may be flawed. Therefore I accept any form of suggestion for further improvement. Thank you

Yogyakarta, March 2015

Author

Garudea Martha Handyaningtyas
(111313777)



TABLE OF CONTENT

Title	i
Statement.....	ii
Approval.....	iii
Motto.....	v
Acknowledgement.....	vi
Table of Content.....	viii
List of Table.....	xi
List of Figures.....	xii
List of Equation.....	xiv
Abstract.....	xv

CHAPTER I INTRODUCTION

1.1. General Background.....	1
1.2. Problem Statement.....	4
1.3. Problem Limitation.....	4
1.4. Objectives.....	5
1.5. Final Project Originality.....	6

CHAPTER II LITERATURE REVIEW

2.1. Theories.....	7
2.2. Another Research to Compare.....	8
2.2.1 Thesis Research.....	10

CHAPTER III BASIC THEORY

3.1. Geopolymer Concrete.....	11
3.2. Metakaolin.....	13
3.2.1 Advantages of Metakaolin.....	14
3.2.2 Use of Metakaolin.....	15
3.3. Silica Fume.....	15
3.4. Alkali Activator.....	16
3.5. Aggregate.....	17
3.6. Distilled Water.....	19
3.7. Compressive Strength.....	19
3.8. Modulus of Elasticity.....	21
3.9. Slump Value.....	21
3.10. Workability.....	21
3.11. The Age of Concrete.....	23

CHAPTER IV RESEARCH METHODOLOGY

4.1. Research Methodology.....	24
4.2. Specification of Specimen.....	25
4.3. Research of Framework.....	25
4.4. Materials.....	26
4.5. Tools.....	31
4.6. Material Testing.....	44

4.6.1 Fine Aggregate.....	44
4.6.2 Coarse Aggregate.....	48
4.7. Specimen Testing.....	50
4.8. Slump Test.....	53
4.9. Curing Process.....	54
4.10. Compressive Strength and Modulus of Elasticity Tests.....	54
4.11. Schedule of the Final Project.....	54
CHAPTER V DISCUSSION	
5.1. Result and Discussion of Material Investigation.....	56
5.1.1 Investigate the Fine Aggregate to Obtain the Results.....	56
5.1.2 Investigate the Coarse Aggregate to Obtain the Results.....	59
5.2. Slump Test.....	61
5.3. Weight Density of Concrete.....	62
5.4. Compressive Strength of Concrete.....	65
5.5. Modulus Elasticity of Concrete.....	69
CHAPTER VI CONCLUSION AND SUGGESTION	
6.1. Conclusion.....	72
6.2. Suggestion.....	73
REREFENCES.....	75
APPENDIX.....	77

LIST OF TABLES

Table 4.1.The Amount of Specimens	51
Table 4.2.Schedule of the Research	55
Table 5.1. Relationship Between the Color of the Solution and Organic Mater Content	56
Table 5.2.Investigation of Mud in the Sand	57
Table 5.3.Result of the Density and Observation Test of Fine Aggregate	58
Table 5.4. Investigation of Mud in the Coarse Aggregate	59
Table 5.5.Result of the Density and Observation Test of Coarse Aggregate	60
Table 5.6.The Result of Slump Test at 14 days and 28 days	62
Table 5.7.Specification of Weight Density Concrete	62
Table 5.8.Average Weight Density in 14 Days	63
Table 5.9.Average Weight Density in 28 Days	64
Table 5.10.Compression Strength Test	65
Table 5.11.Composition of the Contents	67
Table 5.12.Compressive Strength of Lisantono and Hatmoko Research	68
Table 5.13.Compressive Strength of the Test	68
Table 5.14.Modulus of Elasticity Test	70
Table 5.15.Average of Modulus of Elasticity Test	70

LIST OF FIGURES

Fig.3.1. Cylinder Sample	20
Fig.4.1. Flowchart of Research Framework	26
Fig.4.2. Fine Aggregate	26
Fig.4.3. Coarse Aggregate	27
Fig.4.4. Metakaolin	27
Fig.4.5. Silica Fume	28
Fig.4.6. NaOH	28
Fig.4.7. Na_2SiO_3	29
Fig.4.8. Distilled Water	29
Fig.4.9. Sulfur	30
Fig.4.10. Oil	30
Fig.4.11. Caliper	31
Fig.4.12. Digital Scale	31
Fig.4.13. Measuring Cup	32
Fig.4.14. Gardener Standard Colors	32
Fig.4.15. Erlenmeyer Flask	33
Fig.4.16. Sieve and Sieve Machine	33
Fig.4.17. Beaker Glass	34
Fig.4.18. Sticky Plastic	34
Fig.4.19. Abrams Cone	35
Fig.4.20. Mortar	35
Fig.4.21. Cylinder Mold	36
Fig.4.22. Oven	36
Fig.4.23. Universal Testing Machine	37

Fig.4.24. Brush	37
Fig.4.25. Capping	38
Fig.4.26. Plastic Bucket	38
Fig.4.27. Pan	39
Fig.4.28. Plate	39
Fig.4.29. Ruler	40
Fig.4.30. Wagon	40
Fig.4.31. Shovel	41
Fig.4.32. Hammer	41
Fig.4.33. Iron to Pound the Mixture	42
Fig.4.34. Plastic Bag	42
Fig.4.35. Stationer	43
Fig.5.1. Weight Density in 14 Days Chart	63
Fig.5.2. Weight Density in 14 Days Chart	64
Fig.5.3. Compressive Strength Column Chart	66
Fig.5.4. Compressive Strength Line Chart	66
Fig.5.6. Modulus of Elasticity Chart	69

LIST OF EQUATION

2-1. Poly-condensation Process	9
3-1. Area of Cylinder	19
3-2. Magnitude of the Compressive Strength	20
4-1. The Amount of Mud of Sand	45
4-2. Water Content of Fine Aggregate	47
4-3. The Amount of Mud of Coarse Aggregate	48
4-5. Water Content of Coarse Aggregate	50
5-1. Calculation of the Amount of Mud in Sand	57
5-2. Calculation of the Amount of Mud in Coarse Aggregate	59

ABSTRACT

COMPRESSIVE STRENGTH AND MODULUS OF ELASTICITY OF GEOPOLYMER CONCRETE WITH METAKAOLIN AND SILICA FUME,
Garudea Martha Handyningtyas, Student Number 111313777, year of 2015,
Structural engineering, Civil Engineering International Program, Faculty of
Engineering, Universitas Atma Jaya Yogyakarta.

Geopolymer concrete is concrete which uses different materials and are environmental friendly during the production process. There are several advantages of geopolymer concrete; such as anti-fire, used as a cover material for the exterior of mechanical equipment, durable and environment friendly. Geopolymer also produced by the chemical reaction of alumina-silicate oxides (Si_2O_5 , Al_2O_2) with alkali Poly-silicate yielding polymeric Si–O–Al bonds. Geopolymer concrete is concrete without cement as a bond but, geopolymer concrete uses alkali activator as a bond of the concrete.

This research studies about compressive strength and modulus of elasticity of geopolymer concrete with metakaolin and silica fume as solid materials. The proportions of solid material are 25%, 50% and 75% for the metakaolin, while the proportion of silica fume is 5%. The alkali activators in this research are NaOH and Na_2SiO_3 . The proportions of NaOH and Na_2SiO_3 is 2:1. The aggregates in this research are coarse aggregate (split) and fine aggregate (sand) with the proportion of 2:1. The samples in this research are 18 samples. 9 samples cylinder with the size are 70mm x 140mm and the other 9 samples cylinder with the size are 150mm x 300mm. Compressive strength test is done at the age of 14 days and 28 days. The compressive strength test is using Universal Testing Machine (UTM).

Based on the compression strength test that has been done, the value of the average compressive strength at 28 days with comparative precursor (metakaolin:silica fume) 25:5, 50:5, 75:5 are 1.149 MPa, 0.641 MPa and 0.178 MPa, respectively. Based on modulus of elasticity test that has been done, the value of the average modulus of elasticity at 28 days with comparative precursor (metakaolin:silica fume) 25:5, 50:5, 75:5 are 2.866 MPa, 2.371 MPa and 1.143 MPa, respectively.

Key Words: Geopolymer Concrete, Metakaolin, Silica Fume