COMPRESSIVE STRENGTH AND SHEAR BOND STRENGTH OF OIL WELL CEMENT WITH CALCIUM CARBONATE AND SILICA FUME

Final Project Report

By:

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Student ID Number: 121314243

INTERNATIONAL CIVIL ENGINEERING PROGRAM

DEPARTMENT OF CIVIL ENGINEERING

FACULTY OF ENGINEERING

UNIVERSITAS ATMA JAYA YOGYAKARTA

YOGYAKARTA

2016

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as a requirement to obtain Bachelor degree from
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STATEMENT

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Final Project

COMPRESSIVE STRENGTH AND SHEAR BOND STRENGTH OF OIL WELL CEMENT WITH CALCIUM CARBONATE AND SILICA FUME

By:

Arnoldus Meidio Adi Prasetyo

Student ID Number: 121314243

Has been approved

Yogyakarta, July 25, 2016

Advisor,

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

Approved by:

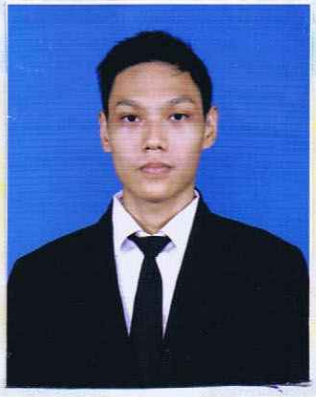
Head of Civil Engineering Department,

(J. Januar Sudjati, ST., MT)

APPROVAL

Final Project

COMPRESSIVE STRENGTH AND SHEAR BOND STRENGTH OF OIL WELL CEMENT WITH CALCIUM CARBONATE AND SILICA FUME



ARNOLDUS MEIDIO ADI PRASETYO

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Has been examined and approved by the examination committee

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Chairman	:	Dr. Ir. A.M. Ade Lisantono, M.Eng		July 25, 2016
Secretary	:	Anggun Tri Atmajayanti, S.T., M.Eng.		25/7/16
Member	:	Prof. Ir. Yoyong Arfiadi, M.Eng., Ph.D.		25/7/2016

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4. All the lecturers in the civil engineering program, especially the International program.
5. My friends, seniors and juniors in the international civil engineering program

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

Yogyakarta, June 2016

The Author

Arnoldus Meidio Adi Prasetyo

121314243

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

NOTATIONS

A = Specimen cross section area, cm^2

API = American Petroleum Institute

BWOC = By weight of cement

D = Specimen diameter, cm

f'_c = Compressive strength, kgf/cm^2

h = Specimen height, cm

OWC = Oil well cement

P = Maximum load, kgf

SBS = Shear bond strength, kgf/cm^2

ABSTRACT

COMPRESSIVE STRENGTH AND SHEAR BOND STRENGTH OF OIL WELL CEMENT WITH CALCIUM CARBONATE AND SILICA FUME, Arnoldus Meidio Adi Prasetyo, Student Number 12.13.14243, year of 2016, Structural Engineering, Civil Engineering International Program, Faculty of Engineering, Universitas Atma Jaya Yogyakarta.

One of the critical factor of cementing operation is designing the cement slurry. For that reason, slurry properties which have been classified by American Petroleum Institute (API) should be changed so it will match the requirements of reservoir condition. Changing the slurry properties is done by adding the additives into the cement slurry. This research objective is to test the effect of calcium carbonate and silica fume to the oil well cement. The result of this research are the data of oil well cement physical properties, compressive strength and shear bond strength. The data are collected by making cylinder sample with 75 mm x 150 mm for the compressive strength specimen and cylinder with 1 inch x 2 inch (25.4 mm x 50.8 mm) for the shear bond strength specimen that will be tested on Shimadzu Universal Testing Machine, which is then the result of the test will be compared to the API standard and result from other researches. The specimen will have 5 variants percentage of silica fume and calcium carbonate (0% calcium carbonate (CC) + 0% silica fume (SF), 5% CC + 5% SF, 10% CC + 10% SF, 15% CC + 15% SF, and 20% CC + 20% SF) and 3 variants of cement age (7, 14, and 28 days). From the performance of cement with calcium carbonate and silica fume in the laboratory test, it can be concluded that by adding calcium carbonate with 5% or more into the cement slurry will reduce both compressive strength (22.253 MPa (0% CC + 0% SF), 19.803 MPa (5% CC + 5% SF), 12.963 MPa (10% CC + 10% SF), 10.264 MPa (15% CC + 15% SF), 9.526 MPa (20% CC + 20% SF)) and shear bond strength (3.139 MPa (0% CC + 0% SF), 6.849 MPa (5% CC + 5% SF), 3.695 MPa (10% CC + 10% SF), 3.065 MPa (15% CC + 15% SF), 2.596 MPa (20% CC + 20% SF)). The usage of silica fume is to reduce the loss of compressive strength caused by calcium carbonate, it can be seen in the comparison between the result of this research (19.803 MPa (5% CC + 5% SF)) and Paramatatya's (2014) research (19.36 MPa (2.285% CC)) where the compressive strength of the specimen with 5% of calcium carbonate and 5% of silica fume has higher compressive strength compare to paramatatya's sample with 2.285% of calcium carbonate.

Key Words: Additive, Calcium Carbonate, Silica Fume, Oil Well Cement