

**COMPRESSIVE STRENGTH CHARACTERISTICS
OF CONCRETE BASED ON SITE PRODUCTION
PRACTICES**

BY

OMUH Ignatius Owoicho

Matriculation Number: CUGP09221

FEBRUARY, 2016

COMPRESSIVE STRENGTH CHARACTERISTICS OF CONCRETE BASED ON SITE PRODUCTION PRACTICES

A PhD Thesis

BY

OMUH Ignatius Owoicho

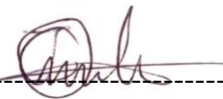
MATRICULATION NUMBER: CUGP09221

SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, IN PARTIAL
FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF
DOCTOR OF PHILOSOPHY (Ph.D) IN BUILDING TECHNOLOGY (BUILDING
STRUCTURES), COVENANT UNIVERSITY, OGUN STATE, NIGERIA

FEBRUARY, 2016

DECLARATION

I, OmuH, Ignatius Owoicho declare that the work referred to in this thesis was carried out entirely by me under the supervision of Prof. Timothy O. Mosaku (Main Supervisor) and Dr. Kolapo O. Olusola (Co-Supervisor) of the Department of Building Technology, Covenant University, Canaan- Land, and Department of Building, Obafemi Awolowo University, Ile-Ife. Therefore, no portion of the thesis has been submitted in support of an application for another degree or qualification of this or any other University or other institution of learning. All sources of scholarly information referred to in this thesis were properly acknowledged.



OmuH Ignatius Owoicho

CERTIFICATION


This thesis entitled COMPRESSIVE STRENGTH CHARACTERISTICS OF CONCRETE BASED ON SITE PRODUCTION PRACTICES carried out by OMUH Ignatius Owoicho under my supervision meets the regulations governing the award of the degree of Doctor of Philosophy (Ph.D.) in Building Structures of the Covenant University, Ota, Ogun State, Nigeria. I certify that it has not been submitted in part or full for the award of the degree of Ph.D. or any other degree in this or any other University and is approved for its contribution to knowledge and literary presentation.

Prof. Timothy O. Mosaku
Main Supervisor



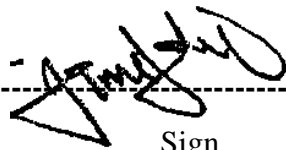
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Dr. James D. Owolabi
Head of Department



Sign

DEDICATION

This work is dedicated to God Almighty, the Alpha and Omega, creator of all things who made this possible and who said "...apart from me you can do nothing" and my parents, Mr and Mrs Nicholas O. Omuh.

ACKNOWLEDGEMENT

It would be impossible to adequately mention the names of everyone who has supported and encouraged me on this journey. I'm afraid this will not do justice

First I want to appreciate my supervisors in the persons of Professor Timothy O. Mosaku and Dr. Kolapo O. Olusola for their unrelenting guidance and support. The seeds were sown by them and their wisdom and efforts are very well cherished

I sincerely appreciate the entire staff of Building Technology department in the persons of, Professor Olabosipo Fagbenle, Dr. Owolabi, Dr. Lekan M. Amusan, Dr, John O. Ameh, Dr. Ayodeji O. Ogunde, Dr. (Mrs) Tunji-Olayeni, Mr. Opeyemi Joshua, Mr. Raphael Ojelabi, Mr. Adedeji Afolabi, Mr. Benjamin Babalola, Mr. Fatai Ogunbayo, Mr. Adekule. Ajao, Mr. Ogundipe, Mr David. You all have given me invaluable support. Thank you for your kind criticisms, timely directions and assistance during my lab and field work.

I am particularly grateful to The Chancellor for his vision that has birthed this great institution. I wish to acknowledge the management and staff of Covenant University for providing me with a platform to carry out this research.

My sincere appreciation also goes to family who have been very helpful and on this journey - My Parents, Mr and Mrs Nicholas O. Omuh, My siblings; Veronica, Oche, Helen, Uncle Toyin and Rebecca, Uncle Yomi, Justina, Olekwu. I am also grateful to my friends; the Kukoyis, Peter and Ene Obande, Yemi and Joyce Joshua, Andrew Obande, Matthew Obande (in loving memory) you were all wonderful pillars of support.

Finally, I sincerely appreciate my loving wife, Linda and wonderful children, Gabby, Ehi, Owi, and Jesse for always being there for me and making home worth returning to. God bless you all.

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ABSTRACT

Concrete is the most common construction material in the world today. It is used as a material in structural elements of most buildings of the world and most building failures including collapse are associated with failure of concrete either as produced or as assembled. The variations in strength of concrete is as a result of several factors that could be the varying quality of materials, the variation in the mix proportion and the varying production processes that include batching, mixing, compaction, and curing. This study was aimed at appraising the characteristic strength of concrete from some selected construction sites in Lagos Metropolis and Ota with a view to ascertaining its conformance with specified standards and also to assess the concrete production practices employed on these sites. The research sought to know if the applied concrete margins were adequate for the concrete practices in Nigeria or if they need to be modified for design strength. This was accomplished through assessment of concrete production practices on some selected sites, identifying the possible strength deviations of concrete produced on site in relation to the expected design strength. The study also evaluated the effects of mix proportioning, methods of batching, mixing, compaction, and curing on the concrete compressive strength, identified the most appropriate production methods and materials combinations that can be employed for acceptable strength performance in structural concreting work. A model was developed to predict the compressive strength of concrete made with different combinations of mix proportioning, batching, mixing, and compaction investigated. A total of 15 sites were visited with 300 concrete cube samples collected. Compressive strength test was performed on the collected samples. Using three mix ratios of 1:2:4, 1:3:6, 1:1¹/₂:3, 288 concrete cube specimen were produced simulating the different site conditions under a controlled environment in order to determine the effects of batching, mixing and compaction, and curing on the final compressive strength of the concrete specimen. The results showed that there was variation between the compressive strength obtained from the respective site and the design strength. It was observed that the production methods of mix ratio, batching, mixing, compaction, and curing had a significant effect on the compressive strength and the interaction of all the different production processes had a combined effect on the compressive strength. The result showed that though some of the sites appeared to have attained the specified strength, the expected margin was not attained. It was recommended that the mix ratio, the methods of batching, mixing, compacting, and curing the concrete should be specified by the engineer. Batching by volume, which is common practice on Nigerian construction sites, should be replaced with absolute volume which will consume less materials and produce proportions of aggregates that are close to proportions measured out by weight batching.

Keywords:

Characteristic strength, batching, mixing, compaction, curing, site practices