

**LABORATORY MANUAL DEVELOPMENT FOR CONSTRUCTION  
MATERIALS AND TESTING, 2<sup>ND</sup> EDITION**

**A Special Problem  
Presented to  
the Faculty of the School of Graduate Studies  
Central Philippine University  
Iloilo City**



**In Partial Fulfillment  
of the Requirement for the degree  
MASTER OF ENGINEERING**

**by**

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March 2005**

# CHAPTER I

## INTRODUCTION

### Background

Experimentation and testing plays an important role in the developing new materials and devices and in controlling the quality of materials for use in design and construction. In the educational process they also serve, through direct involvement of the student, to give substance to theoretical concepts and to provide a means of augmenting insight gained from analytical studies. For these reasons, students of engineering, architecture, and other fields associated with design activities or resource utilization can benefit from experiences in obtaining the first-hand information about materials and processes.

This manual has been prepared for the purpose of standardizing the department's sampling and testing procedures and to provide assurance that the materials and workmanship incorporated in each construction project are in reasonably close conformity with the requirements of plans and specifications. This is not designed as a field manual but is intended to be used in Construction Material and Testing laboratory and other offices for guidance, reference. This manual describes the test procedures that are currently use in Construction Material and Testing laboratory

The second edition of this manual has been reorganized. To achieve simplicity and straightforwardness without compromising content, each exercise incorporates a discussion of theory, principles and calculations in addition to detailed, step-by-step procedure. Tabulated worksheets and space for computations are also provided to simplify and facilitate data recording and analysis. A new ASTM, AASHTO and ACI

specification has been introduced to supersede the previous specifications of the same agencies.

Conceived, designed and developed for Central Philippine University civil engineering students, specifically those enrolled in the course Construction Material and Testing under the semestral system, this manual presents different exercises, each embodying a standard procedure for testing specific material. The laboratory testing has been arranged so that each test may be performed well within a three-hour period.

The use of fabricated equipment, substitutes, and innovations is strongly recommended in the Construction Materials and Testing laboratory. This recommendation is being made in order to meet the minimum standards recommended by the Technical Panel for Engineering, Technology and Architecture (TPETA) for Material Testing Laboratory. The use of fabricated equipment will also help reduce the total cost of obtaining the equipment.

In a similar manner of compliance, the material-testing procedures presented herein adhere to established international and local standards.

### **Objectives of the Study**

The objectives of this laboratory manual includes the following:

1. To familiarize students with the mechanical properties of engineering materials.
2. To develop skill in methods of observation.
3. To develop knowledge of basic and accepted method testing procedures.
4. To learn writing and communication skills, including Internet use.

5. To learn critically evaluate laboratory procedures in the resulting data, including data manipulation on computers.
6. To learn to work in teams.

### **Significance of the Study**

The purpose of this manual is to present a series of test on aggregates, Portland cement concrete, metals, wood, and plastics to be conducted in the laboratory periods of the Construction Materials and Testing course. These tests, in conjunction with the lectures given in Construction Materials and Testing course, will give the student a basic knowledge of the engineering properties of these common construction materials. This manual is not intended as a comprehensive material testing guide. However, it includes selection of tests which are commonly used by engineers to classify these materials and to control the quality of these materials.

### **Scope and Limitation of the Study**

The study included in this manual is the standard mechanical tests for the following materials: aggregates, cement, concrete, concrete hollow blocks, timber, steel bars, asphalt and non-destructive test. The study does not include the chemical test of constructional materials especially metals as related to acidity or alkalinity and resistance to corrosion or weathering. Also not included are the physico-chemical test, thermal test, electrical and magnetic test, and acoustical and optical test.