

Soil Testing & Compaction Techniques for Construction Projects

INTRODUCTION

As all know, almost all structures are either constructed on soil, supported by soil or both. This means that civil engineer in general and geotechnical engineer in particular must treat soil as construction material just as steel and concrete. The engineer and construction technologist must have the basic knowledge concerning soil behavior especially soil compaction in order to overcome many problems associated with soils placement throughout the construction period.

Soil compaction is conducted in almost all construction works. Since the soil contains inorganic mineral grains enclosing voids of varying sizes which are filled with air, water and organic materials, the soil must be compacted to reduce the amount none-soil materials. It is very important for the engineer to select the appropriate type of soil and to compact it in engineering procedures. The existing of voids, water and organic material in none-compacted soils will result in many engineering problems such as reduction in shear strength and increasing settlement and permeability. Reduction in shear strength and settlement are the main factors that cause most of the problems in any engineering structure. Dealing with this issue properly will save a lot of money, time and effort.

OBJECTIVES

The main objective of this course is to give the attendance the basic knowledge of how to compact and densify the soil in the field in different construction projects such as highways, roads, pavements, around buildings, parking constructions, landfill, retaining walls, etc..., in order to eliminate settlement and increase the shear strength of the soil to prevent cracks in buildings, pavements and highways. Also the attendance should know how to compact the soil under solid waste in landfill projects to prevent ground water pollution. In addition to that the attendance should know at the end of the course to select the appropriate type of soil and the method of compaction for the different engineering projects and predict the behavior of the soil for each project.

PRESENTER

Dr. Mousa Attom, Ph.D.

Dr. Attom has a Ph.D degree in civil engineering geotechnical area from Kansas State University, USA. He gained master degree from The university of Texas at Arlington , USA in 1987 and the B.Sc in civil engineering from Yarmouk University in Jordan in 1985. He has over twenty years of practical and teaching experience in both USA and in Jordan.

In the USA, he was the director of the research lab in the construction research center at The University of Texas at Arlington for two years. He worked as Laboratory manger and staff engineer at Staal Gardner and Dunne, Inc. consulting company in southern California for two years. Throughout his career, he attended six specialized seminars and involved in many challenging projects in Dallas and Los Angeles areas.

He has been a faculty member in civil engineering department at Jordan University of Science and Technology since 1991. Also, he is a consulting engineer for Ziad Al Hajaj Est. for building and Construction Company in Amman, Jordan since 1992. Throughout his career in Jordan, He conducted many workshops for army and air force engineers in soil compaction techniques and soil testing. He has over twenty five publications in soil behavior in international refereed journals and he shared in over ten international conferences throughout the world.

PROGRAM

DAY ONE

- **Definition of soil**
- **Introduction to soil classification**
 - Introduction to soil compaction
- The purpose of soil compaction
- The effect of compaction on shear strength, settlement, permeability and other soil properties

DAY TWO

- The effect of moisture content on the dry density of the soil
- Moisture- Density relationship and definition of the wet and the dry side of the moisture content-density curve
- soil behavior in both the wet side and the dry side of the optimum
- soil properties in both the wet side and the dry side of the optimum
- Laboratory preparation of soils for compaction test

DAY THREE

- **Methods of measuring soil density in the laboratory**
 - standard proctor density test
 - modified proctor density test (method A, B, C, D)
- The difference between standard and proctor density test
- Construction of compaction curve and Zero-Air line curve
- Determination of optimum moisture content and maximum dry density from compaction curve
- Compaction technique of the soil in the field

DAY FOUR

- **Tests methods for measuring field density**
 - Sand cone test
 - Water balloon method
 - Nuclear meter method
- **Definition of relative compaction**
- **The use of the above test result to find relative compaction**
- **The behavior of soils at low relative compaction**
- **Meaning of maximum dry density**
- **Methods of increasing maximum dry density of the soil**

DAY FIVE

- Selection of soils for different construction projects such as in pavement landfill, earth reinforcement, roads (base, sub-base and sub-grade), highways, retaining walls, etc....
- Introduction to different compacting equipments
- Methods of compacting the different types of soils in the field
- The effect of energy level on soil compaction in the field
- Shear strength and consolidation properties of compacted soil
- Compaction technique to prevent cracks, settlements, soil washing and decrease permeability of soil in different construction projects