

Determining water absorption of crushed sand

Master's project in Building Materials, for the Master Program Structural Engineering and Building Performance Design

Background

For concrete with respect to compressive strength and durability the water cement ratio (w/c) is a key parameter. When calculating the w/c -ratio only the effective water content is used and which is the difference between the total water present in the concrete and the water absorbed by aggregates. To be able to calculate the free water it is necessary to know the water absorption of the aggregates. For example, with a water absorption of 0.5%, for the fine aggregate (sand) approximately 10 litres of water per cubic meter can be added to compensate for the aggregate absorption.

Water absorption sand is determined according to SS-EN 1097-6 and for the fine aggregate it is determined by first water saturating the aggregate (for 24 hours) and then by drying the aggregate so that it becomes water saturated but surface dry. This condition is assessed visually by filling a cone, see figure below, which then is lifted and the slope of sand cone is assessed. This method is however not suitable or applicable to crushed sand. This is a big problem as crushed sand is becoming more frequently used as a replacement for natural sands due to environmental aspects and resource depletion. Hence, new test methods are needed for crushed sands.

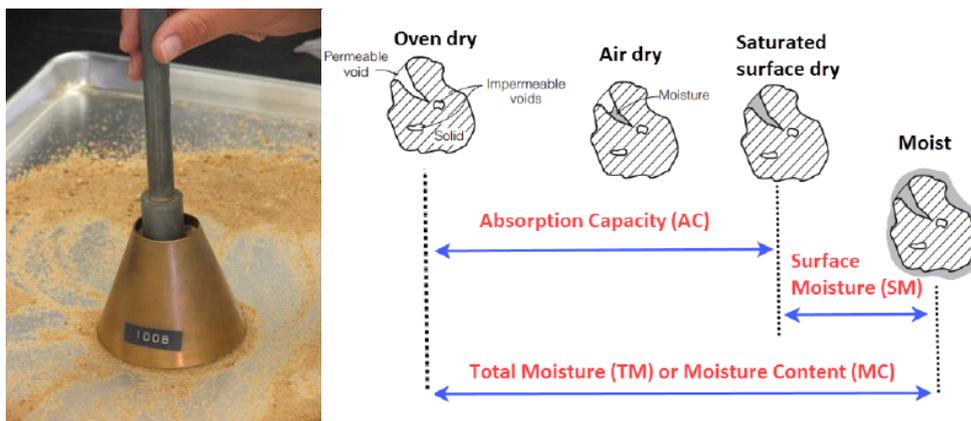


Figure 1. Determination of water absorption according to SS-EN 1097-6 and states of moisture content.

Purpose/Method

In this master thesis project different methods for determining water absorption will be evaluated. The work will start with a review of proposed and available methods (e.g. based on conditioning in RH-chamber, centrifugal removal, sorption isotherms, thermodynamic principle, IR-spectroscopy, electrical impedance spectroscopy, etc.). Different methods will be evaluated on different crushed sand materials to determine their applicability and reliability.

Thesis setup information

The master thesis will be carried at Chalmers University of Technology (building materials) and at Thomas Concrete Group. This Master Thesis work will be part of a project aiming at developing a new standard procedure and is suitable for students interested in experimental work and concrete technology.

Supervisors

PhD Oskar Esping, Oskar.Esping@thomasconcretegroup.com, Thomas Concrete Group
 Doc. Helén Jansson helen.jansson@chalmers.se, Chalmers University of Technology (examiner)