# **ICAR CONCRETE RHEOMETER**



Year of Purchase	:	2014
Cost	:	20.85 Lac

**Experiment** : To measuring fundamental flow (rheological) properties of fresh concrete.

# Descripitions

ICAR Plus Rheometer is a rugged, portable instrument for measuring fundamental flow (rheological) properties of fresh concrete.

The instrument was first developed at the International Center for Aggregate Research (ICAR) located at The University of Texas at Austin and then by Germann Instruments to fill the need for a method to characterize the true flow behavior of concrete mixtures. The traditional methods of measuring slump or slump flow are not capable of characterizing the fundamental rheological properties of concrete that exist during the processes of mixing, transporting, and placement. As a result, the true performance of innovative concrete mixtures cannot be measured with these traditional slump-based methods.

The ICAR Plus Rheometer provides, for the first time, a low-cost and simple to operate instrument that can be used for:

Research and development to characterize the influence of new materials on concrete rheology Optimizing mixture proportions so that the resulting concrete flows readily but is resistant to segregation (especially important for selfconsolidating concrete) On-site quality control

### Method of Operation :

Icar\_6The ICAR Plus Rheometer is composed of a container to hold the fresh concrete, a driver head that includes an electric motor and torque meter; a fourblade vane that is held by the chuck on the driver; a frame to attach the driver/vane assembly to the top of the container; and a laptop computer to operate the driver, record the torque during the test, and calculate the flow curve parameters. The container contains a series of vertical rods around the perimeter to prevent slipping of the concrete along the container wall during the test. The size of the container and length of the vane shaft are selected based on the nominal maximum size of the aggregate. The vane diameter and height are both 127 mm.

### Two types of tests are performed:

The first type is a stress growth test in which the vane is rotated at a constant slow speed of 0.025 rev/s. The initial increase of torque is measured as a function of time. The maximum torque measured during this test is used to calculate the static yield stress. The other type of test is a flow curve test to determine the dynamic yield stress and the plastic viscosity. The flow curve test begins with a "breakdown" period in which the vane is rotated at maximum speed. This is done to breakdown any thixotropic structure that may exist and to provide a consistent shearing history before measuring the Bingham parameters. The vane speed is then decreased in a specified number of steps, which is selected by the user but at least six steps are recommended. During each step, the vane speed is held constant and the average speed and torque are recorded. The plot of torque versus speed of vane rotation defines the flow curve from which the Bingham parameters are calculated.

#### The ICAR Plus Rheometer software performs all the necessary functions:

operates the driver, records the torque, computes test results, and stores data. The entire testing is controlled from a single screen as shown below. The user defines the test geometry and provides the test parameters to run the flow curve test. A simple press of the "Start" button initiates the stress growth test and flow curve test is started by pressing the second "Start" button. Both tests are completed within 1 minute.