

Testing of Fresh Properties

- Mini Sump Test
- Flow Table Test
- Slump Flow Test
- Marsh Cone Test
- Pressure Bleed/Filter Test
- Vane Shear Test
- Viscosity Test
- Rheology Test
- Green Strength Study
- Mixing and vibration equipment
- SCC equipment
- Foam generator
- Puntke Test



Mini Slump Test

Working Principle

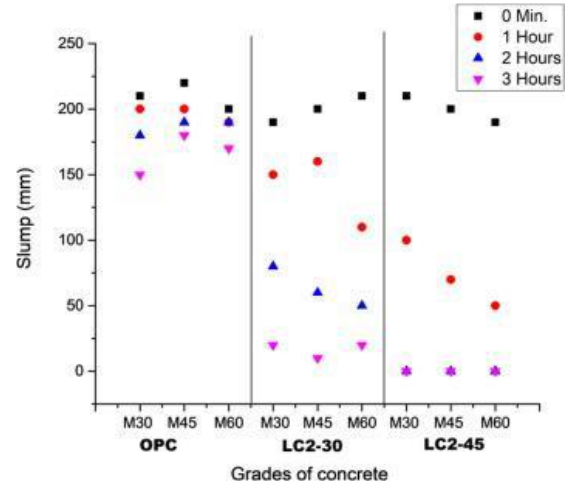
The cement flows under gravity, the spread is also measured to correlate with rheological properties.

Application

To determine early stiffening and consistency of cement, compatibility of different plasticizers and super plasticizers.



Mini slump



Compatibility test of PCE based HRWRA

Flow Table Test

Working Principle

To measure the spread due to repeated drops of 12.5 mm for 25 times in 15 seconds.

Application

To determine consistency, cohesiveness and probability of segregation of concrete and mortar.



Flow table test



Spread measurement

Slump Flow Test

Working Principle

The effect of gravity on the behaviour of compacted concrete.

Application

To measure consistency and workability of concrete. To determine effect of admixtures on workability over time by slump retention test.



Slump Cone

Marsh Cone Test

Working Principle

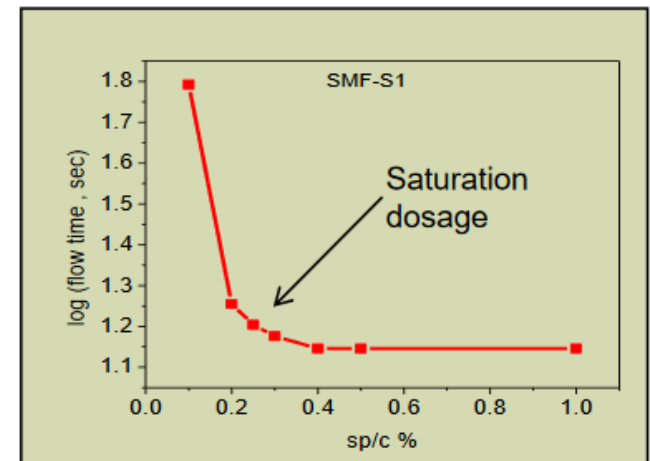
Flow of cement pastes and grouts under gravity through the orifice.



Marsh cone Test

Application

To determine fluidity, optimum dosage of plasticizer and super plasticizer, rheological parameters like yield stress and viscosity.



Determination of SP Dosage

Pressure Bleed/ Filter Test

Working Principle

The segregation of water (bleeding) in paste/mortar/concrete under a static pressure.

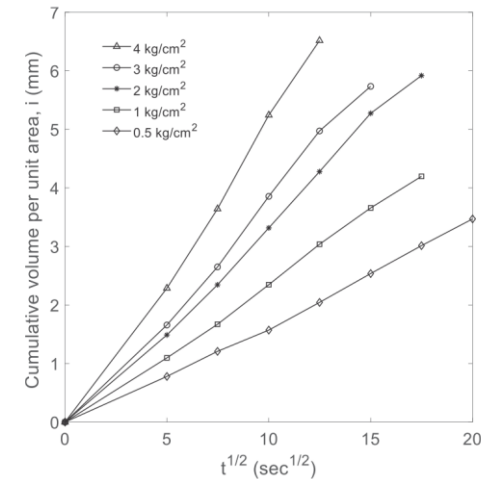
Application

To determine stability of grouts, segregation potential under pumping pressure, extrudability of 3D printable concrete.

The test results can be used to determine the flow properties of fresh concretes.



Bleed Apparatus



Bleed value under different static pressure

Rheology – Vane Shear Test

Working Principle

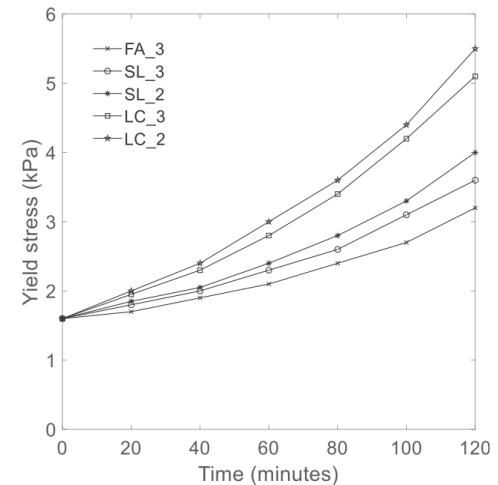
The cement paste / mortar is a yield stress thixotropic material. In Vane shear test, a constant rotation is provided until the failure of specimen and static shear yield stress is determined.

Application

To determine minimum pumping and extrusion pressure required for different mixes, and effect of set admixtures on flow properties of mortars.



Vane shear apparatus



Yield stress evolution

Rheology – Brookfield Viscometer

Working Principle

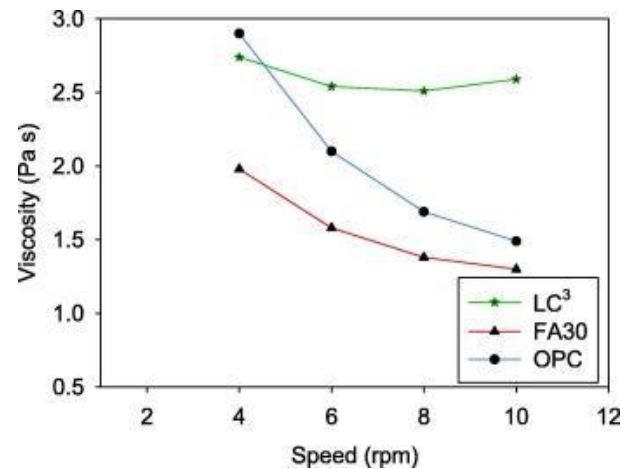
This test is based on principle of rotational viscometry. The viscosity is indicated by the torque required to rotate the spindle.



Brookfield viscometer

Application

To compare the flow behavior of different binder systems.



Viscosity for different binders

Rheometer

Working Principle

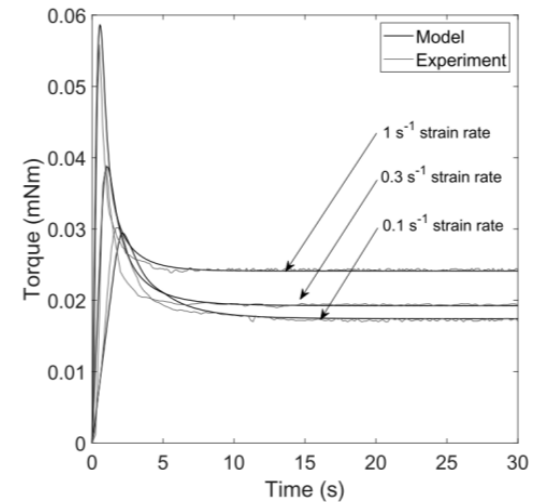
A spindle (parallel plate, co-axial, vane) is rotated under different rpm to determine the parameters like static shear yield stress, dynamic shear yield stress, thixotropy and viscosity governs the flow of concrete.

Application

To determine basic flow parameters for cement and concrete mortar.



Rheometer



Torque for different strain rate

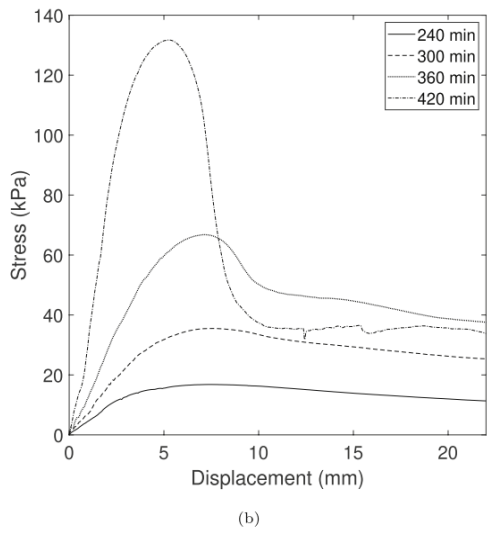
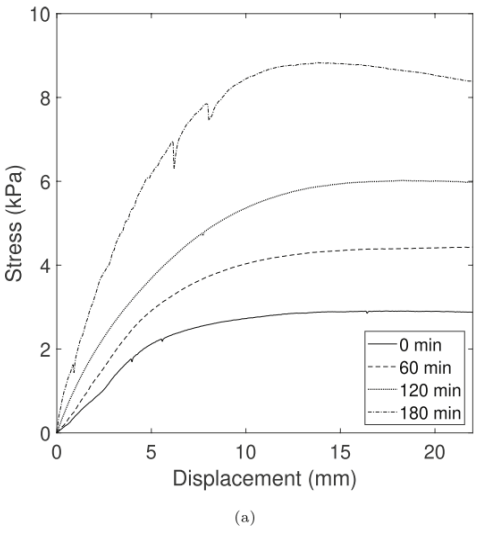
Green Strength Study

Working Principle

The uniaxial compressive strength and Young's modulus evolution of concrete at early ages (0 hour to 24 hours).



Zwick UTS



Stress-strain curve from 0 – 420 minutes



(a)



(b)

Failure modes at 0 and 420 minutes

Mixing and Vibration Equipment



SCC testing equipment

Working Principles

The rheological parameters such as yield strength and viscosity of self compacting/consolidating concrete are tested using a series of empirical tests.



V- funnel test

Testing Equipment

L-Box test (passing ability), J-ring test (filling ability, passing ability), V-Funnel test (filling ability, comparison of mix in terms of viscosity), Orimet test (flow time and plastic viscosity)



J-ring test

Foam generator

Working Principle

Foam is generated from foaming solution by passing compressed air through sintered disc of certain pore size. Foam characteristics are analyzed based on the change in foam column height and bubble size.

Applications

Different foaming solution preparation for foam concrete, fire extinguisher, to set the proportion of ingredients.

Lightweight concrete – foam concrete.



Foam generator



Puntke Test

Working Principle

The excess water after completely filling the voids appears at surface of the mix. This indicates the saturation limit.

Application

Optimization of powder composition regarding particle packing.

Determination of optimum configuration of particles to enhance flow of SCC and 3D printable concrete.



Apparatus



Mix before and after saturation