



# Testing of Transport Properties

- Carbonation Test
  - Rapid Chloride Permeability Test
  - Accelerated Chloride Migration Test
    - Chloride Conductivity Test
    - Oxygen Permeability Test
    - Water Penetration Test

# Carbonation of Concrete

## Working Principle

Concrete undergoes carbonation when exposed to atmospheric  $\text{CO}_2$ . Carbonation results in reduction in pH of concrete. The depth of carbonation can be measured using a phenolphthalein indicator.



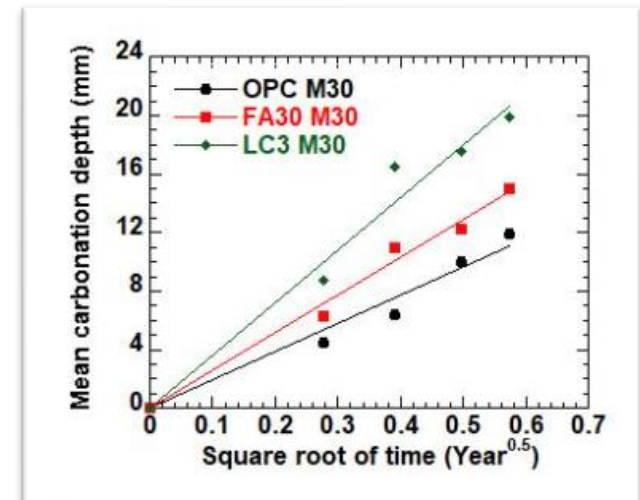
Carbonation chamber



Carbonation depth measurement

## Application

The depth of carbonation can be used as a parameter to assess carbonation resistance of different cementitious binders.

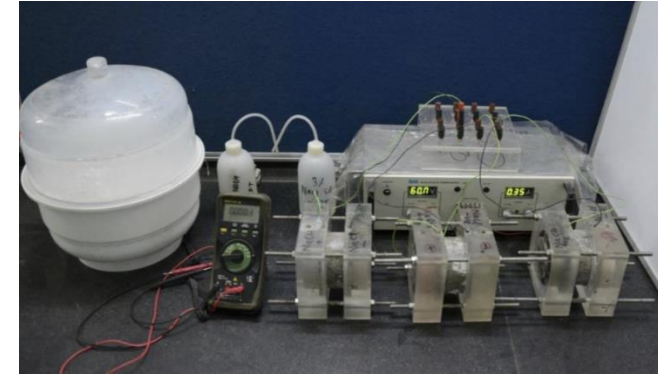


Evolution of carbonation depth

# Rapid Chloride Permeability

## Working Principle

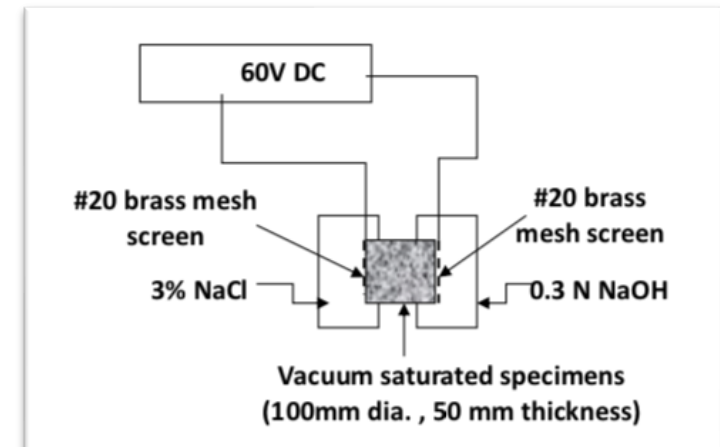
Permeability indicates the ease with which a fluid under pressure can flow through a solid. The charge passed through a concrete specimen under an applied potential is used to evaluate the resistance of concrete to the penetration of chloride ions.



Test setup

## Application

The charge passed can be used for qualitative comparison of the durability characteristics of different concretes.



Schematic of test setup

# Accelerated Chloride Migration

## Working Principle

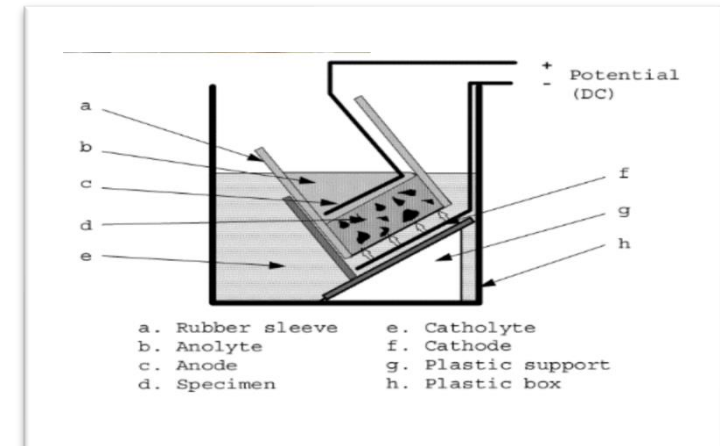
Electric field is applied to facilitate the flow of chlorides through concrete. The depth of chloride penetration is used to calculate the non-steady state migration coefficient.



Test setup

## Application

The migration coefficient can be used to compare the resistance to chloride penetration in concrete systems.



Schematic of test setup

# Chloride Conductivity

## Working Principle

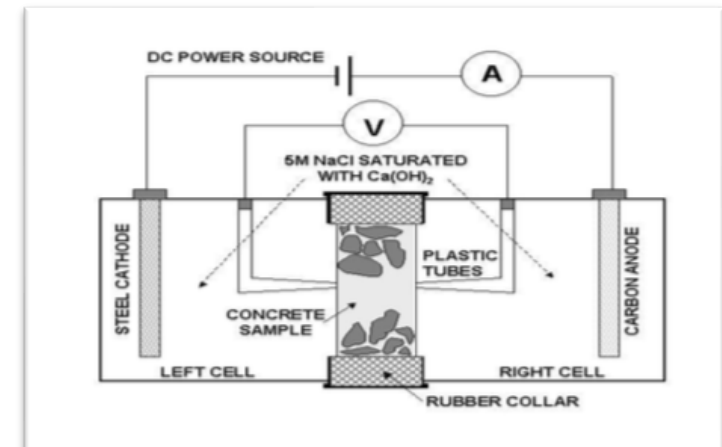
The current flowing through a concrete specimen under the application of a potential difference is used to determine the chloride conductivity.



Test setup

## Application

The chloride conductivity indicates the resistance offered by the concrete system against ingress of chlorides.



Schematic of test setup

# Oxygen Permeability

## Working Principle

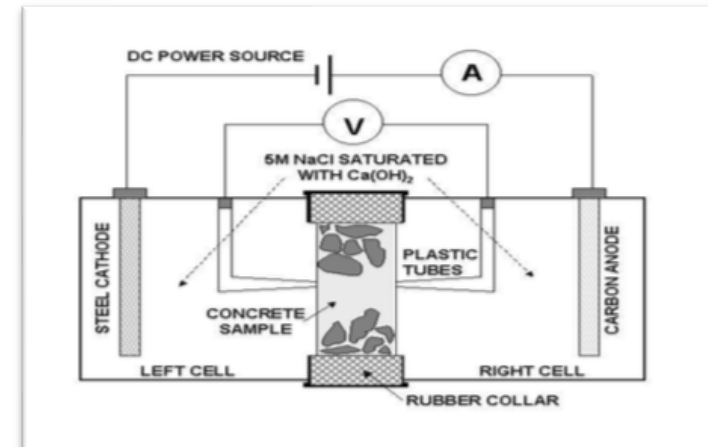
The resistance offered by the cementitious system against the permeation of oxygen gas under pressure is measured. The rate of drop in pressure is used to find the oxygen permeability Index (OPI).



Test setup

## Application

- Evaluation of resistance against  $\text{CO}_2$  permeation
- OPI value is used for determining the cover depth of concrete for a given service life
- OPI is an input for Service Life Model (SLM) for carbonation



Schematic of test setup

# Water Penetration

## Working Principle

The resistance offered by the cementitious system against the penetration of water under pressure is measured.

## Application

- Evaluation of resistance to water penetration.
- The depth of penetration of water is used as an indicator of the durability of concrete.



Schematic of test setup