



Rapid Chloride Penetration Testing (RCPT) (ASTM C 1202)

Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration

What is Rapid Chloride Penetration Testing (RCPT)?

RCPT is used to measure the electrical conductance of concrete samples to provide a rapid indication of their resistance to chloride ion penetration. In most cases, for a given set of concreting materials, the total charge passed through the sample, measured in coulombs, have shown good correlation with chloride-ponding tests, such as AASHTO T 259, on companion slabs cast from the same concrete mixtures.

How is the RCPT performed?

The perimeter of a 2-inch (50-mm) cylinder is coated with epoxy, then vacuum saturated and placed into a test cell sandwiched between two chambers: one filled with 3% NaCl and the other with a 0.3N NaOH solution. A 60-volt potential is applied across the cell and the resulting current measured at regular intervals over a period of 6 hours. The total charge passed through the sample, represented by the area under the current versus time plot of the data, is then calculated and reported in units of coulombs.

What are the concerns about Chloride Ingress on durability and serviceability?

Ingress of a sufficient quantity of chloride ions will destroy the protective, passivating oxide layer on the surface of embedded steel reinforcement, causing corrosion. The consequences of steel corrosion are cracking, spalling, or delamination of concrete due to the increased volume of the corrosion product, and a reduction in the cross-sectional area of the steel, thus reducing the load-carrying capacity of the reinforcement concrete element.

Where should I be concerned about Chloride Ion Penetration?

Chloride ion ingress is a concern in areas where deicing salts are used to melt snow and ice, in marine environments where concrete structures are subjected directly to seawater or airborne chlorides, or where reinforced concrete elements are exposed to brackish water. Parking garages, bridges, marine structures and other concrete structures with proximity to the marine environment, and concrete piles and footings in brackish water typically require some form of corrosion protection to meet the intended design service life. Corrosion-inhibiting admixtures and/or supplementary cementitious materials, in combination with a low water-cementitious materials ratio, are effective corrosion protection measures.

How is this standard used in the industry?

This test method was previously used to provide documentation and assurance that a given concrete mixture will meet a specified coulomb level and, thus, provide the intended durability with respect to chloride-induced corrosion. However, because the RCPT does not actually measure chloride ingress its use has been curtailed with the development of ASTM C1556, Standard Test Method for Determining the Apparent Chloride Diffusion Coefficient of Cementitious Mixtures by Bulk Diffusion, which yields a parameter that can be used in software programs such as the industry-developed Life-365™ Service Life Prediction Model for reinforced concrete exposed to chlorides in service.

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