

Rapid Chloride Test RCT & RCTW-3000

Details

The RCT and RCTW systems are used to accurately and quickly determine the chloride ion content from powder samples of concrete obtained on-site or in the laboratory using the Profile Grinder or other means. The test results can be used for:



Establishing the chloride ion profile for service life estimation

Establishing the depth of removal of a chloride ion contaminated surface layer

Diagnosing a structure for corrosion activity, in combination with other test systems such as the Mini Great Dane, the GalvaPulse, and the Rainbow Indicator

Monitoring the chloride ion content during electrochemical removal of chlorides

Measuring the chloride ion content of fresh concrete or its constituents

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A powder sample of hardened concrete is obtained by drilling or grinding the cover concrete in the structure, or a sample is obtained from the fresh concrete. The sample is mixed with a specific amount of extraction liquid and shaken for five minutes. The extraction liquid is designed to remove disturbing ions, such as sulfide ions, and extracts the chloride ions in the sample.

A calibrated electrode is submerged into the solution to determine the amount of chloride ion, which is expressed as percentage of concrete mass.

Two extraction methods are used:

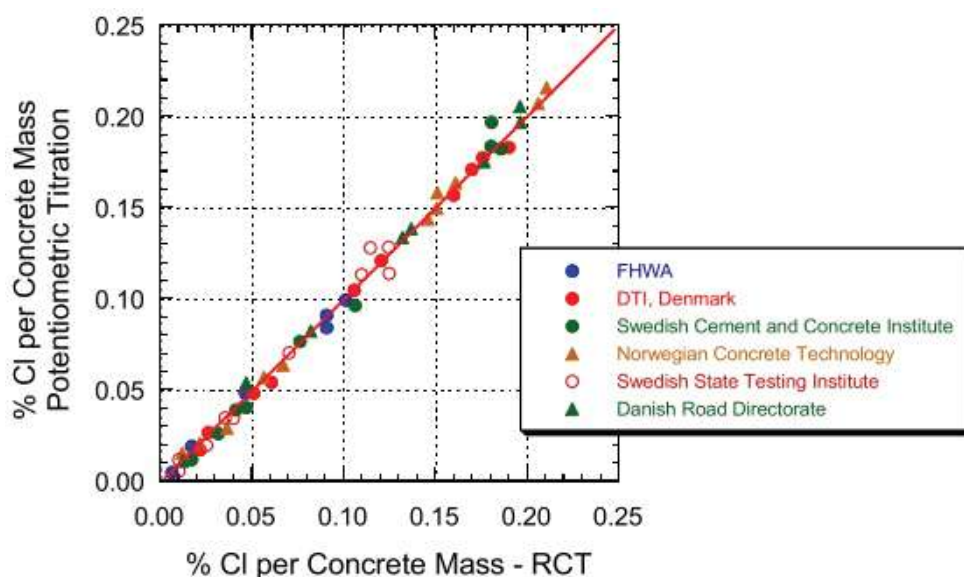
The RCT (Rapid Chloride Test) is used to determine the amount of acid-soluble chlorides

The RCTW (Rapid Chloride Test Water) is used to determine the amount of water-soluble chlorides

The two methods use different kinds of extraction liquids. The type of method to use will depend on the specification criteria for maximum allowable chloride ion content in either hardened or fresh concrete. Note that the acid extraction does not remove chemically bound chlorides.

Technical Specification

Numerous correlations have been made between RCT test results and chloride ion content determined by standard laboratory potentiometric titration methods such as AASHTO T 260, ASTM C114, DS 423.28 or NS 3671. The following graph shows the results of such correlations made by various laboratories in the Scandinavian countries and in the U.S.



In one comparison, the Swedish National Testing Institute produced concrete powders containing known amounts of chloride ion introduced into the concrete by diffusion. The concretes were made with different binders as illustrated in the table below. Parallel testing was done in accordance with, AASHTO T 260 and with the RCT system. The RCT readings were taken after the powder samples were kept in the extraction liquid overnight to obtain full extraction of acid-soluble chlorides. Alternatively, if the result is obtained after 5 minutes of shaking of the vial, a correction factor can be applied to the measured chloride ion content.

	% Cl ⁻ per Mass of Concrete		
	Known Amount	AASHTO T 260	RCT
Portland Cement (CEM I)	0.023	0.024	0.022
	0.071	0.070	0.072
	0.328	0.314	0.321
Fly Ash Cement (CEM II/B-V)	0.020	0.019	0.019
	0.057	0.052	0.061
	0.244	0.229	0.238
Slag Cement (CEM III/B)	0.020	0.019	0.019
	0.056	0.052	0.059
	0.244	0.231	0.238

The accuracy of the RCT results compared with the known amount of chlorides is as good as with the AASHTO T 260 potentiometric titration method. The average deviation of the RCT results from the known amount of chlorides is within $\pm 4\%$.

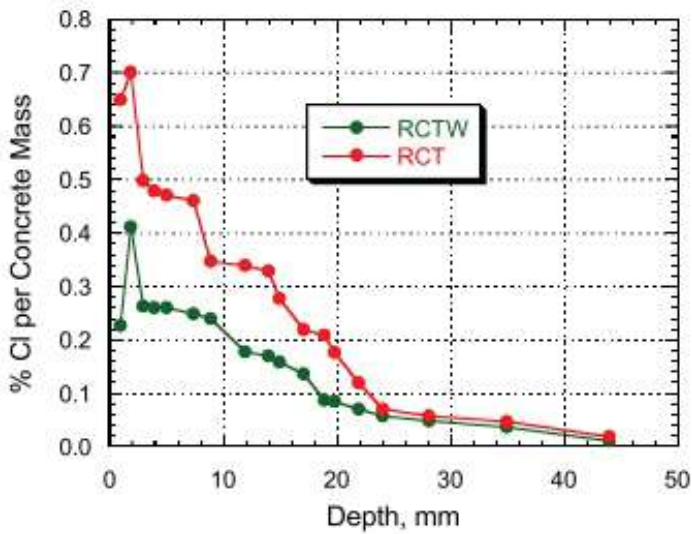
For repeated testing with the RCT on the same concrete powder, the coefficient of variation of test results is on average 5%.

The precision and accuracy of the RCTW test for water-soluble chlorides is similar to RCT results.

Testing Examples

An example of a chloride ion profile measured with the RCT is illustrated.

RCT_2 The graph to the right shows two other profiles that were obtained from on-site profile grinding on a highway bridge column exposed to deicing salts for 4 years. Concrete powder samples were obtained at depth increments of 1 to 2 mm and were analyzed for acid-soluble chlorides with the RCT and for water-soluble chlorides with the RCTW. The depth of carbonation was measured to be 2 mm using the Rainbow Indicator, corresponding to the initial peaks of the chloride ion profiles obtained.



RCT-1000-1 electrode wetting agent



Extra Parts

RCT-1030 set of calibration liquids



RCT-1032 mixing container and cup



Consumables



RCT-1023 vials, set of 25, for testing hardened concrete



RCT-1031 vials, set of 4, for testing fresh concrete



RCTW-1023-1 vials, set of 25, RCTW-1023-2 buffer vials, set of 25, for testing hardened concrete



RCTW-1031-1 vials, set of 4, RCTW-1031-2 buffer vials, set of 4, for testing fresh concrete

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