PEM TEST FOR TRANSPORT: RESISTIVITY

Why do we need this test?

Experience has shown that most premature failures in concrete pavements are due to durability-related factors and that historical approaches to specifications based on strength have proven to be insufficient.

All durability-related distresses in concrete involve the movement of moisture (transport); therefore, a fundamental part of extending pavement life is to reduce the permeability of the concrete matrix.

The ability to specify and deliver concrete with low permeability significantly reduces the cost of ownership over time. The resistivity test has been shown to be faster, less expensive, and more reliable than approaches used in the past.

What does the test tell us?

The resistivity test provides a nondestructive means to assess whether a given mixture has low permeability as an indicator that the concrete has the potential to survive exposure to the environment.

How does the test work?

The ability of a concrete system to resist movement of fluids depends on how large the pores are and how many pores are connected. The principle behind this test is that it is easier to transmit electrical current through a pore solution than through a solid.

Results can be affected by the chemistry of the pore solution and whether all the pores are filled (saturated). This makes standardized sample preparation an important part of producing meaningful data.

What do the numbers mean?

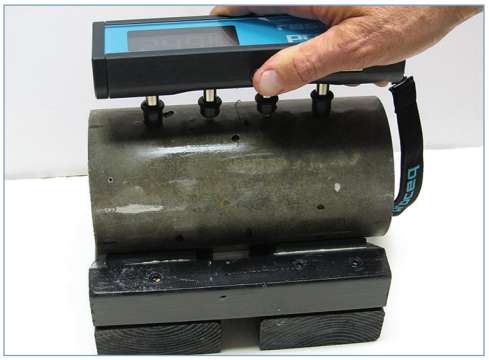
A higher resistivity indicates a less permeable, better quality concrete.

Comparison of rapid chloride penetrability test (AASHTO T 277) and resistivity

Chloride Ion Penetrability	Charge Passed @ 6 hours (coulombs)	Resistivity (kΩ·cm)
High	>4,000	<5
Moderate	2,000 to 4,000	5 to 10
Low	1,000 to 2,000	10 to 20
Very Low	100 to 1,000	20 to 200
Negligible	<100	>200

What do I need?

Surface resistivity is run using a 4-pin resistivity meter on the surface of a cylinder, while the same device can be adapted to collect bulk resistivity data through the length of a sample. Both tests provide the same information when a correction factor is applied to take into account the shape and size of the sample. Tests should be conducted on cylinders that have been stored in a salt solution as described in the test method.



Cylinder sample testing with surface resistivity meter

Bulk resistivity

More information?

AASHTO has published two methods to assess resistivity: TP 119, Standard Method of Test for Electrical Resistivity of a Concrete Cylinder Tested in a Uniaxial Resistance Test, and T 358, Standard Method of Test for Surface Resistivity Indication of Concrete's Ability to Resist Chloride Ion Penetration. Guidance on their use is available at https://cptechcenter.org/performance-engineered-mixtures-pem/pem-test-methods/.

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