PERMEABILITY: Rapid Chloride Permeability Test

• Chloride permeability of concrete is determined indirectly by measuring the electrical conductance (in Coulombs or Amp-sec) of concrete subjected to accelerated chloride diffusion under applied electric field.

• The test is known as “rapid chloride permeability test” on concrete, conducted in accordance with ASTM C 1202 or AASHTO T-277.

• For this test, a 75 mm diameter and 50 mm thick cylindrical disk specimen is used.

• The curved surface of the disk is epoxy-coated to avoid evaporation of moisture during testing.

• The disk specimen is saturated with water under vacuum and kept saturated for about 24 hours.

• The specimen is clamped between the two halves of a chloride permeability cell, as shown below:

![Image of chloride permeability cell with NaOH and NaCl reservoirs]

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PERMEABILITY:
Rapid Chloride Permeability Test----continued

- Using the set up shown below, the charges are passed through the specimen for a period of 6 hours and the resulting current is recorded with time using a data logger.

Set-up for rapid chloride permeability of concrete
PERMEABILITY:
Rapid Chloride Permeability Test------continued

• Current versus time data are plotted, as shown below:

• The area under the curve gives the total charge passed in Coulombs (Ampere-seconds).

• Higher values of the total charge passed indicate increased diffusion of chloride ions.

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PERMEABILITY:
Rapid Chloride Permeability Test------continued

Assessment of Chloride Permeability based on Charge Passed

<table>
<thead>
<tr>
<th>Charge Passed (Coulombs)</th>
<th>Chloride Permeability</th>
<th>Typical of</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 4,000</td>
<td>High</td>
<td>High water-cement ratio, (&gt; 0.6) PCC</td>
</tr>
<tr>
<td>2,000-4,000</td>
<td>Moderate</td>
<td>Moderate water-cement ration, (0.4-0.5)</td>
</tr>
<tr>
<td>1,000-2,000</td>
<td>Low</td>
<td>Low water-cement ratio, with admixtures (&lt; 0.4)</td>
</tr>
<tr>
<td>100-1,000</td>
<td>Very low</td>
<td>Very dense concrete, sealed concrete</td>
</tr>
<tr>
<td>&lt; 100</td>
<td>Negligible</td>
<td>Polymer concrete</td>
</tr>
</tbody>
</table>