



Concrete Protector & Restorer

Concrete Sample—Water/Cement (W/C) Ratio

The Problem

The ratio of water to cement is directly related to concrete strength.

Concrete that has a high w/c ratio contains more water in the concrete mix and produces hardened concrete that is weaker than concrete that has a low w/c ratio which has less water in the concrete mix and produces hardened concrete that is stronger.

The quantity of water needed for concrete to harden (hydrate) is thought to be a w/c ratio of 0.25. In the field concrete can have w/c ratio from 0.35 to 0.65

The excess water, which is the difference between the actual w/c ratio and 0.25, is not needed for hydration and eventually evaporates from the concrete leaving tiny pores and capillaries.

Pores and capillaries are potential channels that water can use to penetrate concrete. Water and destructive chlorides carried with water into these pores and capillaries can cause scaling, freeze/thaw damage and other more advanced deterioration.

The greater the quantity of water (the higher the w/c ratio) in the concrete mix, the more porous the hardened concrete will be and the greater its susceptibility to deterioration mechanisms. The lower the quantity of water (the lower the w/c ratio), the less porous (denser) the hardened concrete will be.

3M Concrete Protector & Restorer (CP&R) Solution

Because CP&R has very low viscosity it can penetrate into the very tiny pores and capillaries of concrete. CP&R fills and seals them, making the concrete surface water repellent.

The depth of penetration depends on several factors, including density of the concrete (affected by the w/c ratio) and quantity of CP&R applied. CP&R will penetrate deeper into more porous concrete (high w/c ratio) than dense concrete (low w/c ratio).

Concrete porosity also affects the coverage rate or quantity of CP&R that will be required to adequately treat an entire surface. Porous concrete will use more CP&R than dense concrete and some porous concretes may require two applications to adequately fill the concrete pores and capillaries.

Treating porous concrete can help prolong the concrete life by helping protect it from deterioration. Also, high w/c ratio concrete is not as strong and may have a greater susceptibility to other deterioration, such as cracking, delaminations, scaling etc. So, treating high w/c ratio concrete can help improve the hardened concrete material properties.

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