



## Freeze/Thaw Mitigation of Exterior Concrete with Low Entrained Air

Spray-Lock Concrete Protection (SCP) technologies close capillary void space in concrete within the interaction zone, significantly reducing permeability to liquids. Because of this action, the ability of liquid water to enter the concrete to then subsequently freeze and cause freezing/thawing damage is mitigated. This generally translates to longer service life of concrete in freeze/thaw exposure conditions when SCP is used as a remediation measure when existing concrete air entrainment values are lower than specified or when the concrete's air void system is not conducive to freeze/thaw resistance, or both.

When specifying SCP products as freeze/thaw remediation measures, consideration should be given to the potential routes of water ingress. SCP products should be applied to any surface of the concrete where water may potentially enter and cause subsequent freeze/thaw damage. To evaluate whether SCP products are the correct product to specify for freeze/thaw mitigation, the following test results from water permeability and freeze/thaw testing are provided for evaluation by design professionals.

### Water Permeability Testing under Hydrostatic Pressure (EN 12390-8)

SCP technologies, when applied to new or existing concrete correctly, greatly reduce the ability of liquid water to penetrate the matrix. The following test results represent testing in accordance with EN 12390-8, a European norm that introduces water under 5 bar (72 psi) hydrostatic pressure to concrete for 72 hours and is used to indicate permeability reduction of concrete.

**Table 1:SCP Products Reduction of Water Penetration Under Hydrostatic Pressure**

Product	Depth of Water Penetration, in. (mm) Untreated Control	Depth of Water Penetration, in. (mm) Treated	Reduction % (U-T)/U
SCP 578	4.53 (115)	0.67 (17)	85
SCP 743	3.86 (98)	0.20 (5)	95

## Freeze/Thaw Durability Testing (ASTM C666-15, EVS 814:2003)

The most recent freeze/thaw durability testing results are presented below. Note: these laboratory samples were treated with SCP products within the first 24 hours of casting.

**Table 2: SCP Products Mitigation of Freeze/Thaw Damage**

Product	Number of Cycles	Mass Loss, lbs. (g) Untreated Control	Mass Loss, lbs. (g) Treated	Reduction % (U-T)/U
SCP 578	300	1.91 (867)	1.32 (600)	31
SCP 743	300	1.66 (754)	0.66 (298)	60
SCP 743	56	1.63 (740)	0.37 (170)	77

### Conclusion/Discussion

Damage from freezing and thawing is mitigated by reducing concrete's permeability or the use of an appropriate air void system. By reducing water permeability, SCP products may sufficiently mitigate the potential for freeze/thaw damage of existing concrete. When specifying SCP as a freeze/thaw mitigation measure for existing concrete, SCP recommends that pre- and post- treatment cores should be extracted and subjected to water permeability testing to verify that the treatment meets the design professional's requirements for low permeability concrete for freeze/thaw mitigation.