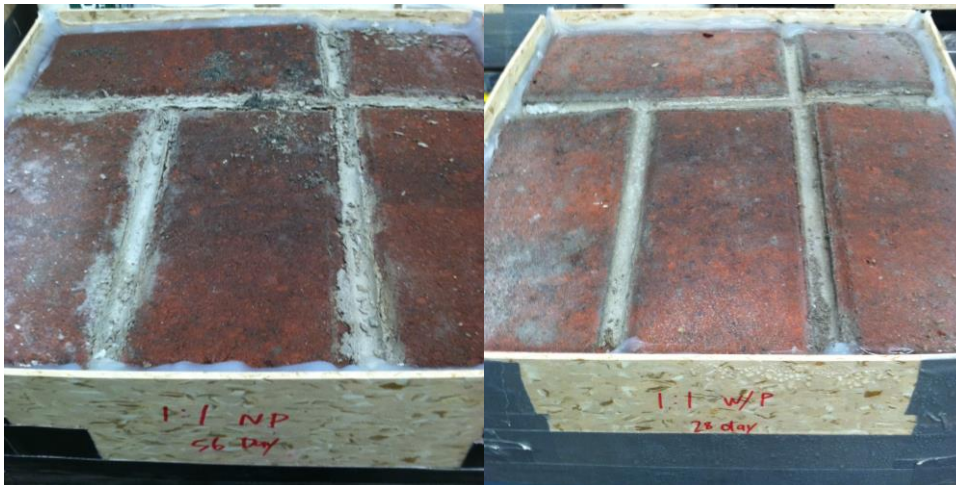


ICE MINUS 9 (RL-9)

Freeze-Thaw Resistance Amendment

ICE MINUS 9 (RL-9) is a reactive proprietary polymeric admixture that imparts superior freeze-thaw and salt-scaling resistance to mortars, plasters and concretes. In addition, it improves bond strength and flexibility while reducing shrinkage. Provided in ready-to-use concentration, it is simply used in place of mixing water to produce workable mixtures.

ICE MINUS 9 (RL-9) can be used with a wide variety of hydraulic materials, including portland cement, portland cement-lime blends, masonry cement, mortar cement, natural cement and natural hydraulic limes. It may be used with air-entrained or non-air-entrained mixtures. It also reduces the required time for moist-curing or misting of many of these materials to achieve proper cure.



Photos: Pavement mortar cured for 56 days before freezing (far left) displays significant scaling after just 3 cycles of freeze-thaw in the presence of deicing salts (ASTM C672 modified).

Identical mortar modified with ICE -9 and cured just 28 days before freezing (near left) exhibits minimal damage after 50 freeze-thaw cycles with the same salt exposure.

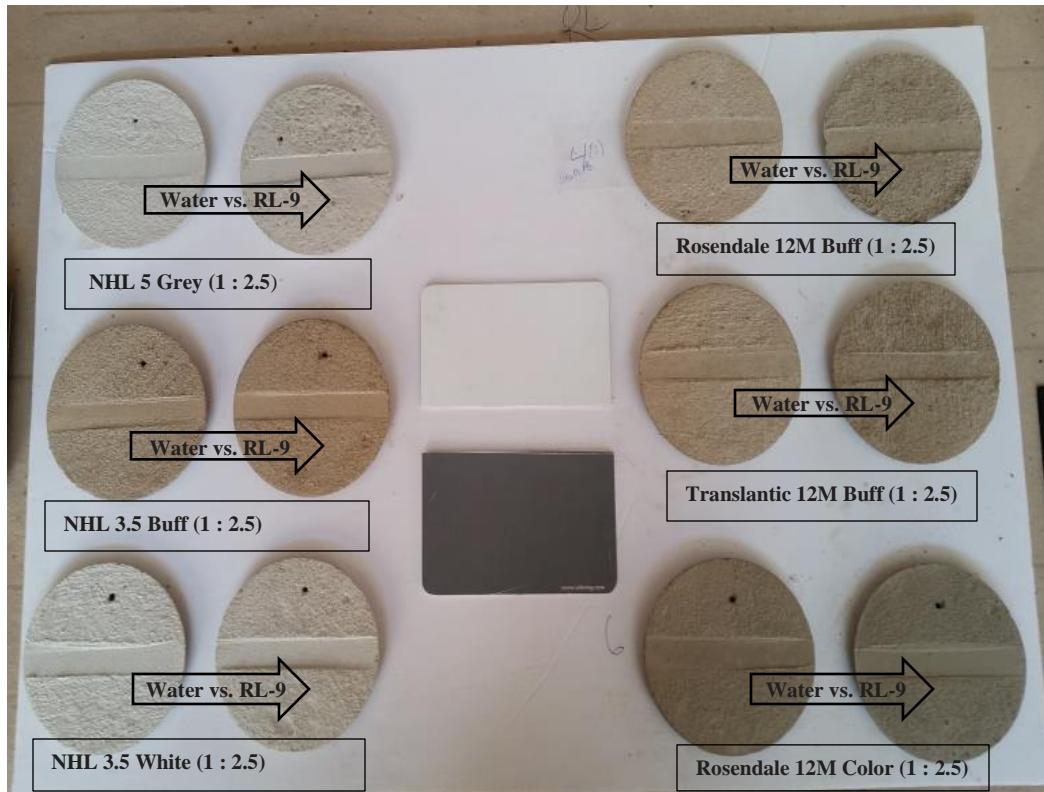
HOW IT WORKS:

ICE MINUS 9 (RL-9) alters the way hydraulic binders interact with aggregates and substrates, and alters the pore/void geometry of cementitious matrices:

- Microscopic particles of the active modifier in ICE MINUS 9 (RL-9) adhere to the surfaces of hydraulic cement particles, rendering them more "sticky".
- This increased bond potential results in both higher bond strength to the substrate and higher internal cohesion.
- Because the active modifier is a relatively soft material, it creates a more flexible bond, reducing the brittleness of hydraulic matrices, reducing Modulus of Elasticity and improving stress-relief.

- Used with appropriately selected binders and properly graded and proportioned aggregates, **ICE MINUS 9 (RL-9)** creates a water-resistant pore structure, with low Saturation Coefficient, resulting in greatly improved freeze-thaw and salt-scaling resistance.
- Mixtures modified with **ICE MINUS 9 (RL-9)** retain approximately 80% of their moisture vapor permeability while reducing cold water (initial) absorption by a similar proportion. Compressive strength is not significantly changed compared with unmodified mixes.

Performance:



Addition of ICE MINUS 9 (RL-9) to different mortars has a minimal effect on color. Different mortars were mixed with water (left) and RL-9 (right) and the color change was minimal.

Typical Performance Properties vs. Un-Modified Mortars	
Compressive Strength (ASTM C109)	Approx. 12% Increase
Water Vapor Transmission (ASTM E96)	75% Permeability Retained
Water Absorption (ASTM C67)	80% Reduction in Absorption

Where to Use:

ICE MINUS 9 (RL-9) is recommended for use in severe exposures and demanding applications, including:

- Pavement Joints
- Pavement Bedding Mortars
- Water Table Mortars
- Coping Mortars

- Stairway Joints
- Coastal Exposures
- Mortars for Hard Stone, Glazed Masonry and other Low Bond Potential Substrates
- Pools, Fountains and other Frequently or Continuously Wet Exposures
- Surfaces Subject to Salt Exposure



Belvedere Castle, New York City Central Park: Skyward facing mortar joints on coping stones were restored using E-NHL 50M and ICE MINUS 9 (RL-9) from 2018-2019.

Compatible Products:

Spec Joint 46 Types M, S, N, O & K: Portland cement-lime mortars, where the convenience and economy of a dry mortar mix are desired.

Rosendale & Translantic 12M: Natural cement mortars.

E-NHL 20M, 35M and 50M: Hydraulic lime mortars, where positive hydraulic setting characteristics and earlier resistance to rain and frost are desired. Based on NHL 2, 3.5 and 5 natural hydraulic lime, respectively.

Cemplast 54: Portland cement-lime stucco.

Rosendale & Translantic 14S: Natural cement stucco.

APPLICATION:

Preparation

For Masonry Construction: Protect work from harsh direct sunlight, wind and rain, and freezing temperatures. Protect sills, ledges, windows, doors, and projections from droppings and splatters. Do not use tape or adhesives on any masonry surface. Prevent mortar from staining the face of the masonry and or other surfaces to be left exposed.

For Masonry Repointing: Remove all existing deteriorated mortar. Rake to the depth required to reach sound mortar, leaving a clean square face at the back of the joint, to which ever depth is greatest (1 inch, 1 ½ times the width of the mortar joints, or until cohesive existing mortar is encountered). Care should be taken not to damage adjacent masonry surfaces and masonry joints should not be widened. Debris should be removed by brushing, vacuuming, and/or pressurized air. If there is evidence of moisture retention or rising damp, it may be necessary to allow the structure to “dry out” before repointing. If this is not done, lime leeching may occur, causing failure of the placed mortar and staining of the masonry. Pre-dampen porous masonry to reduce suction.

For Stucco & Plaster Applications: Control substrate absorption by wetting masonry units or surfaces prior to application. Surfaces and/or units should be cool and damp (but not glistening wet or “holding water”) to prevent premature drying of plaster. On highly porous substrates, dampening should begin on the day prior to application. Control absorption by thoroughly dampening substrate by fine mist spray (depending on conditions this may entail dampening for additional time). Ensure there is no standing water or over-saturation before application. If, prior to dampening, the substrate is retaining moisture, it may be attributed to various conditions which would need to be corrected before work begins. Issues such as roofing, masonry detailing, gutters and drainage, etc. should be addressed prior to product application.

Mixing Directions *ICE MINUS 9 (RL-9)* is provided in **Ready-To-Use form and requires no dilution.** It is simply mixed with mortar or plaster to a workable consistency in complete replacement of gaging water.

Approximate Dosage: 1-2 gallons per cubic foot of mix

Minimum Application Temperature: 40 °F and rising

Application:

For Masonry Repointing: Joints greater than ¾” should be re-pointed with an initial lift to bring the joint depth to a uniform thickness. Pack mortar firmly against the previously placed, pre-dampened mortar by applying firm pressure to ensure close contact between the lifts. If pointing in lifts, roughen the surface to provide keying between applications and allow mortar to become thumbprint hard prior to reapplication. NOTE: *Rosendale & Translantic 12M* Natural Cement mortars can be built out continuously without waiting to achieve thumbprint hardness. When finishing mortar joints, it is often preferable to match the original joint profile.

For Plaster/Stucco Application: Scrub a thin mixture of *ICE MINUS 9 (RL-9)* and plaster mix into the pre-dampened surfaces to improve bond and follow immediately with application of a first lift of stiffer material. Lifts should not exceed 1/2”. Maintain the plaster in a damp condition for 24 hours to avoid plastic shrinkage and cracking. Apply subsequent lifts as required once the prior lift has achieved final set.

Reworking: Do NOT re-temper materials which have begun to set. Discard materials which have become crusty or have lost plasticity. In warm, dry or windy conditions, keep material covered to avoid rapid loss of workability.

Curing Time: Mortar and plaster work should be protected from sun, wind, and rain for at least 24 hours. Some slower curing materials, such as hydraulic lime mortars, may require longer protection. All work should be protected from freezing temperatures for at least 3 days, but slower curing materials may require longer protection. In some cases mortar work may need to be protected from freezing temperatures for 28 days.

Clean Up:

Due to mixture tenacity, it is recommended to avoid drops and smears and to protect all vulnerable surfaces prior to start of work. Maintain clean surfaces on the face, sills, ledges, and projections of masonry on an ongoing basis, and immediately strike off minor dabs of adherent mortar from masonry faces. After mortar has achieved thumbprint hardness, lightly brush masonry to remove small mortar burrs from joints and masonry edges. If chemical cleaning is necessary, contact cleaning compound manufacturer for directions and test the treatment in small inconspicuous areas to determine effectiveness and to ensure no damage occurs. Tools should be kept clean throughout the day by rinsing with clean water. Protect any unused product from moisture and freezing.



8 years after repointing with ICE MINUS 9 (RL-9) modified mortar, this post office stairway in Ottawa remains unaffected by severe freeze-thaw and deicing salt exposures.

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