

PENTRA-SIL™ (244+)



Pentra-Sil™ (244+) Salt Protection & Dust Proofer - Hardener, Sealer, Densifier

PRODUCT DESCRIPTION

Pentra-Sil (244+)™ Salt Protection & Dust Proofer - Hardener, Sealer, Densifier is a clear, odourless V.O.C. compliant, water-based, environmentally safe to use salt protectant and dust proofer that hardens, seals, and densifies concrete and masonry surfaces. Pentra-Sil 244+ reacts chemically with siliceous materials to provide a permanent hydrophobic surface that protects and preserves concrete surfaces and a variety of masonry substrates without altering the natural appearance and texture.

Pentra-Sil 244+ is in a class of its own. It provides all the protection of a high-end penetrating water repellent sealer and offers all the benefits of a surface hardener, sealer, densifier.

Pentra-Sil 244+ Salt Protectant, Hardener, and Sealer is a patented surface treatment that both penetrates and seals by reacting chemically with the concrete surface, forming a clear, dense, and durable inorganic topical surface layer that is breathable, abrasion-resistant, and hydrophobic.

Pentra-Sil 244+ forms an effective chloride ion screen providing superior protection against water and water-carried salts that cause erosion, deterioration and corrosion. Pentra-Sil seals micro-channels making concrete harder, stronger, more abrasion resistant, dustproof, and easier to maintain. Substrates become resistant to staining, spalling, weathering, efflorescence, water intrusion, fungi and mildew, deterioration, freeze-thaw scaling and reinforcing steel corrosion. Pentra-Sil 244+ will also harden the surface and is extremely abrasion resistant, providing the ability to maintain a salt ion screen and water repellent characteristics even through regular maintenance, pressure washing, pedestrian and traffic wear. The permanent bond lasts longer than silanes, reduces maintenance costs, and looks better over time.

Pentra-Sil 244+ can be used as an interior or exterior treatment for both horizontal and vertical concrete and masonry. It is perfect for parking garages, bridge decks, exterior concrete, integrally coloured concrete and acid stained concrete.

KEY BENEFITS

Chloride-Ion Protection: Pentra-Sil 244+ meets industry standards (NCHRP 244) for protecting concrete against chloride intrusion. (90%+ effectiveness)

Sealing: As Pentra-Sil 244+ penetrates the micro-channels in concrete, it reacts to form insoluble silicate structures that seal the concrete. This helps protect the concrete from water penetration and makes it more resistant to many types of chemicals.



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Hardening and Dust Proofing: Pentra-Sil 244+ hardens the concrete making it stronger and more abrasion resistant. It also dust proofs the concrete, so particles of concrete will not circulate within a building creating a health and maintenance problem.

Environmentally Safe: Pentra-Sil 244+ contains no carcinogens and minimal VOC's. The application is fast and the floor is ready to use within hours.

Economical: Pentra-Sil 244+ incorporates the hardening of a densifier with the chloride protection of a silane, all in a single, permanent application. Epoxies, urethanes, and acrylics all need to be regularly stripped and re-applied.

ASR Protection: Alkali-Silica Reaction (ASR) is a worldwide problem that occurs when the alkali in the large and fine aggregates reacts with the silica in the cement and with water to form an expansive gel, which can break concrete apart. Other chemical hardeners use potassium or sodium compounds, which can raise alkalinity and contribute to ASR. Pentra-Sil 244+ uses exclusive lithium technology that does not contribute to the alkalinity and can even help prevent surface ASR.

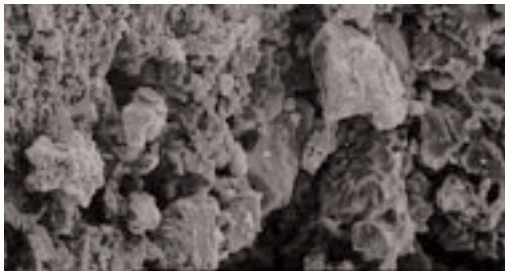
OTHER USES

Top protective surface guard for polished floors that provides superior stain resistance, chemical resistance, water repellency and enhanced surface sheen. When polished, surfaces treated with Pentra-Sil 244+ become brilliantly glossy, and durable, extending the life of concrete floors.

Used as a protective surface treatment, Pentra-Sil 244+ provides maximum performance on floors that have already been treated with Pentra-Sil Nano Lithium (NL) Concrete Hardener, Sealer, and Densifier.

Excellent colour enhancer and sealer for acid stained or integrally coloured concrete, pavers, block and roof tiles.

TABLE 1.



Magnification 200X Untreated



Magnification 200X Treated

UNIQUE CHEMISTRY See Table 1.

(For visual descriptions of magnified views.)

Pentra-Sil 244+ formulation is a colourless Nano Lithium silicate that is crosslinked with a proprietary silane technology that allows it to chemically react with siliceous materials and free-lime, forming extremely strong tri-calcium silicate compounds. Its unique penetrating chemistry forms an insoluble, permanent bond creating a hydrophobic, abrasion and chemically resistant surface for architectural concrete and masonry substrates.

Pentra-Sil's 244+ technology's unique atomic structure (Particle Size) and lower viscosity to conventional treatments provide superior penetration within the capillary channels providing a more consistent and uniform cure. The Advanced Nano Lithium (NL) will not absorb water or affect alkalinity and is suitable for both interior and exterior applications on new or existing concrete.

Because both the Nano Lithium and the Silane molecules are very small, Pentra-Sil 244+ is able to penetrate deeply into the concrete pores where it forms a barrier against water and water-borne salts that can cause reinforcing steel corrosion. It also helps substantially reduce efflorescence by preventing the large salt particulates from leaching and migrating to the

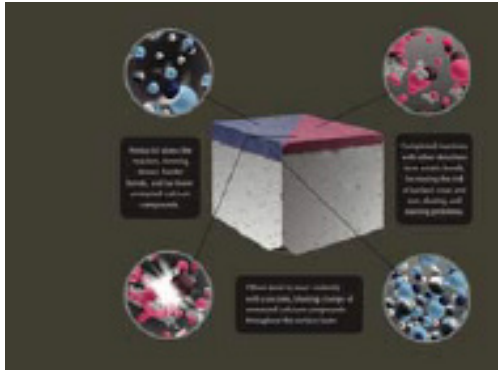


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TABLE 1.

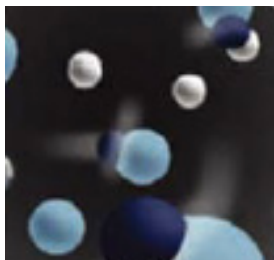


surface with wet/dry cycles. By further reducing moisture permeation and water in the wall system, there is less likelihood of soluble salts in the concrete of being dissolved and brought to the surface. Reducing the moisture penetration also lessens the possibility of fungi and mildew in or on the wall or floor.

The Most Significant Advance in Chemical Concrete Sealer and Hardening Technology in Fifty Years.

Pentra-Sil™ Nano Lithium (NL)™ is a patented Lithium Silicate compound that cures at room-temperature into an inorganic, clear, glass-like compound that is insoluble and extremely hard. The technology is unsurpassed by alternative technologies and is the superior surface treatment for concrete floors. **See Table 2.**

TABLE 3a.



Pentra-Sil penetrates deeper than sodium or potassium- based sealers, but more importantly, Pentra-Sil penetrates more evenly throughout the surface matrix of the concrete, with substantially better particle distribution during absorption. **See Table 3a.**

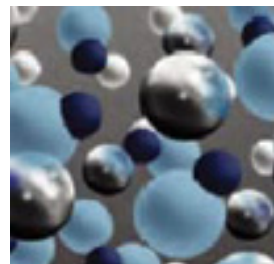
By nature, sodium and potassium react violently in concrete. These rapid reactions create uneven clumps of untreated calcium throughout the surface layer. These clumps form weak, erratic bonds that can allow water to enter the substrate over time contributing to reduced life cycle from potential surface wear and tear, dusting, staining, chemical deterioration or environmental erosion. Furthermore, the sodium and potassium bonds are soluble, and actually, attract moisture and expand, which can lead to surface crazing (among other causes). **See Table 3b.**

TABLE 3a.



The Nano-Lithium chemistry engineered into Pentra-Sil buffers these reactions, allowing the Nano Lithium to react more entirely with the calcium compounds -creating denser, harder bonds and leaving far fewer untreated calcium molecules protecting against mechanical wear and chemical attack. The Nano Lithium bond is insoluble, so it will not attract and absorb moisture, leaving the surface more stable and less likely to craze. **See Table 3c.**

TABLE 3c.



PENTRA-SIL™ (244+)



- Provides Maximum water repellency combined with hardening, densifying and sealing characteristics to provide long-term protection against staining and deterioration
- Surfaces treated with Pentra-Sil will maintain their natural appearance, vapor permeability, slip resistance and other surface characteristics.
- Seals micro-channels in concrete against water and chemical attack that cause corrosion and deterioration.
- Helps reduce damaging ASR alkali-silica reactions in the surface layer of concrete substrates.
- Testing demonstrates that Pentra-Sil provides unsurpassed water repellency from salt and water intrusion.
- Creates a stronger, more impenetrable, and better-looking finish that is dust-proof and resistant to staining and deterioration.
- Penetrates deep inside the concrete capillaries (3-5 mm in densely finished concrete) chemically reacting with the free-lime, forming a permanent insoluble bond within the concrete.
- Forms a protective surface layer that is breathable, dense and abrasion resistant.
- Protection from acid rain, waterborne chemicals and freeze-thaw damage.
- Protects coloured concrete from weathering and efflorescence.
- Reduces maintenance, cleaning costs and repairs.

PRIMARY INDUSTRIAL MARKETS SERVED SUBSTRATES

Salt and Moisture Exposed Areas	Uses
Adobe	Park Garages
Granite	Stadiums
Natural Stone	Buildings
Sandstone	Marinas
Clay Brick	Sea Walls
Mortars	Dams
Limestone	Bulkheads
Terracotta	Loading Docks
Architectural Concrete	Foundations
Cast-in-place Concrete	Bridge Decks
Concrete Masonry Units	Highway Sound Barriers
Exposed Aggregate Substrates	Brick
Portland Cement Stuccos	Stone Veneers
Precast Prestressed Concrete Products	Cast-in-place Concrete
Stamped/Coloured Concrete	Precast
Acid Stained Concrete	Overpass Tunnels
Terazzo	Pedestrian Walkways
	Driveways
	Pavement
	Monuments



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PACKAGING

5 Gal Plastic Pail	45.65 lbs	20.7 kgs
55 Gal Drum	502 lbs	228 kgs
275 GAL Tote (IBC)	2,511 lbs	1,139 kgs

USE & TECHNICAL SPECIFICATIONS

COVERAGE/TREATMENT YIELD*

Steel Troweled	400-550 ft ² per gallon (1 litre per 9.8 to 13.5m ²)
Broom Finished	250-350 ft ² per gallon (1 litre per 6 to 8.5m ²)

DRYING TIME

1-2 hours	
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TYPICAL COVERINGS ESTIMATED BETWEEN 200-400 ft² per gallon

Exposed Aggregate	Concrete Block
Porous Concrete	Rough Stone, Sandstone
Smooth Concrete, Precast	Smooth Stone, Polished Granite
Smooth Concrete, Steel Trowel Finish	Bridge decks and other surfaces subject to abrasion
Exterior Brick	Any material with a Portland cement binder
Stucco	

PHYSICAL PROPERTIES

Form:	Clear, pale light yellow, aqueous solution
Total Solids:	17%
Active Ingredients:	100% of total solids
Weight/Gal:	9.13 lbs/gal
Specific Gravity:	1.10
pH:	11.0
Flash Point:	N/A
V.O.C. Content	50<gms/L
Freeze Point:	32°F(0°)
Slip Resistance:	Does not change floor friction coefficient*
Depth of Surface Penetration	2-8mm on steel trowled concrete
Shelf Life:	1 year in factory sealed container



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COMPLIANCES

Recommended for use on concrete classes both new and existing surfaces as noted in ACI Standard 302. 1R-89. Safe for use in Food & Drug Processing Industries

TEST DATA

Pentra-Sil treatments exhibit properties and characteristics indicated in Table 1.

Flexural Strength: Results are expressed in pounds per square inch (psi) and carried out per ASTM C-78-94 "Standard Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)."

Untreated 430	Pentra-Sil 244+ 600
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Water Permeability: Performed in accordance with CRD-C 48-73 "Method of Test for Water Permeability of Concrete," shows Pentra-Sil 244+ reduces the permeability of concrete over the control.

Untreated 4.8E-10 (cm/sec)	Pentra-Sil 244+ 6.9E-11
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Water Vapor Transmission: Performed in accordance with ASTM E-96-94, "Standard Test Methods for Water Vapor Transmission of Materials." These figures are reported in grains/hour per square foot and show reduced vapor transmission

Untreated 1.40	Pentra-Sil 244+ 1.20
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Stain Resistance: All samples were exposed to the listed materials then scrubbed with water, a non-abrasive cleaner, and an abrasive cleaner. Values listed are for abrasive cleaners only with 0 representing no change in stain and 10 indicating the stain is completely gone.

	Untreated	Treated with 244+
Tomato Paste	3	8
Gum	3	8
Coffee	8	10
Tea	8	8

Chloride Ingress: Wiss, Janney, Elstner Associates tested the ability of Pentra-Sil 244+ to resist chloride ingress. The test method is based upon techniques developed and used by WJE in a research project of the National Cooperative Highway Research Program as reported in NCHRP No. 244, "Concrete Sealers for Protection of Bridge Structures."

For a sealer to meet this standard, it must reduce chloride content by at least 75%.

Untreated	Pentra-Sil 244+ 0% reduction	91% reduction
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Hardness/Abrasion: Mohs Hardness testing was conducted by Arrow Testing Laboratories of Provo, Utah in January of 2001 using the Arrow protocol and apparatus. 3000-psi steel-troweled concrete that has been in place ten years was tested. The Mohs hardness scale is a comparative scale. The absolute scale of hardness equivalent is given in parentheses following the Mohs number.

Untreated 3.5 (9)	Pentra-Sil 244+ 6.5 (86)
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Water Penetration: In January of 2001, Arrow Testing Laboratories of Provo, Utah used a water cylinder, and 3000-psi steel-troweled concrete that has been in place for 10 years. The slab was tested through a 30-minute soak-in period. The cylinder is graduated in inches; the figures below represent column inches absorbed over the test period.

Untreated .7 (1.78cm)	Pentra-Sil 244+ .1 (.25cm)
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Abrasion Resistance	(ASTM C 779*)
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This series of tests were conducted according to ASTM C-1028-96 guidelines with a machine trowel finish



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RESULTS:

Dry untreated specimen = 0.710

Wet untreated specimen = 0.480

Pentra-Sil 244+ treated specimen

Dry=0.731

Wet=0.470

INTERPRETATION:

The dynamics of friction on concrete are very complex. This testing can only be interpreted to mean that Pentra-Sil products do not significantly alter the friction qualities of the surface they are applied to. All standard methods for accident prevention must be used in situations where slip and fall or traction concerns exist.

CHEMICAL RESISTANCE:

Pentra-Sil treatments provide enhanced chemical resistance on the following, but not limited to:

Table I ACI Standard 302.1R-89 Chemical hardeners can be used to increase concrete resistance to chemicals Including, but not limited to the following:

Aluminum sulfate	Lead refining solutions, 10%	Potassium dichromate
Ammonium chloride	Lignite oils	Potassium persulfate
Barium hydroxide	Machine oils	Potassium sulfate
Beef fat	Magnesium chloride	Rapeseed oil
Calcium hydroxide	Magnesium sulfate	Sea water
Calcium nitrate	Manganese sulfate	Silage
Carbon dioxide	Manure	Sodium bromide
Carbonic acid	Mash, fermenting	Sodium carbonate
Castor oil	Mercuric chloride	Sodium chloride
Coal-tar oils	Mercurous chloride	Sodium dichromate
Cottonseed oil	Mine water, waste	Sodium nitrite
Creosote	Mineral oil	Sodium sulfate, 10%
Cresol	Molasses	Sodium sulfite, 10%
Distillers slop	Mustard oil	Sodium thiosulfate
Ethylene glycol	Nickel sulfate	Soybean oil
Ferric chloride	Oleic acid, 100%	Sugar
Ferric sulfate	Olive oil	Sulfite liquor
Ferrous chloride	Paraffin	Tallow and tallow oil
Ferrous sulfate	Phenol, 25%	Tannic acid
Fish oil	Phosphoric acid, 85%	Tanning liquor, 10%
Fruit juices	Pickling brine, 10%	Tobacco
Glucose	Poppy seed oil	Walnut oil
Glycerine	Potassium aluminum sulfate, 10%	Zinc chloride
Hydrogen sulfide	Potassium carbonate	Zinc sulfate
Iodine	Potassium chloride	Zinc nitrate
Lactic acid, 25%		Zinc sulfate

This information contained herein, is to the best of our knowledge and belief, accurate and is to be used as a guide to product selection. However, since the conditions of handling, installation and use are beyond our control, we make no guarantee of results. When in doubt, please test first.



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LIMITATIONS

Pentra-Sil 244+ is designed to react with acidic or alkaline siliceous substrates. The active ingredients in the sealer treatment may not chemically react with neutral pH or acidic substrates.

Not suitable for asphalt surfaces

Do not apply to glazed brick or tiles

Pentra-Sil will not bridge water intrusion of visible cracks of 10 mils (.25 mm) or larger and is not designed for use on surfaces experiencing hydrostatic pressure.

The sealer is not intended to serve as a waterproofing material

Do not use below grade or for extension below grade

APPLICATION PROCEDURES & INSTRUCTIONS

(Always test each concrete surface for suitability and desired results. Let surface dry before inspection and approval of the desired application.)

Mix well before using. Application by spray, roller or brush to new or old concrete. Surfaces to receive Pentra-Sil 244+ should be clean and free of all foreign materials such as bond breakers, curing agents, form release oils, grease, dust, construction laitance, drywall residue etc. We don't recommend citrus cleaners for concrete, but if a d-Limonene (citrus) based cleaner is used, the surface must be neutralised using a high pH detergent (i.e. TSP, Tide, Cascade etc.) before applying Pentra-Sil 244+. All standing water should be removed before application.

Horizontal Application: Use an airless, or HVLP sprayer to apply Pentra-Sil 244+ to form an even, glistening sheen. Apply enough Pentra Sil 244+™ to keep the surface wet for 20 minutes. If areas dry out before that, apply more product. Apply when surface and air temperatures are 40°F to 100°F (4°C to 38°C).

Vertical Application: Apply from the bottom up using a low pressure, 10 – 25 psi (68.9 – 172 kPa) sprayer with a fan-type nozzle. Flood surface until excess runs down 6" to 8" (152 – 203 mm) below spray pattern nozzle or sponge surfaces sufficiently to create a uniform wet-look. Proper quantity on horizontal surfaces is indicated when the solution stands for a few seconds before completely penetrating. For maximum penetration and desired coverage rates, a wet-on-wet application is recommended; retreat within three to five minutes after initial application. A brush or roller can be used. When a brush or roller is used, repeated applications should be made until the surface retains moisture for a minute or so before solution disappears. Distribute any pools of material with a broom.

Because the porosity of substrates and application conditions can vary greatly, Convergent Concrete is not responsible for any shortfalls or excess consumption based on the estimated yield and coverage rates noted above. For precise rates of consumption, a pre-application field test should be performed.

Make certain the most current version of the Pentra-Sil Product Datasheet and MSDS are being used.

Please read this information prior to use; call Customer Service (1-866-375-2280) to verify the most current versions or visit our website: www.convergentconcrete.com/pentrasil_244.



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Proper application is the responsibility of the user. Field visits by Convergent Concrete personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the job site.

OTHER USES:

Protective colour guard treatment for acid stained concrete and integrally coloured concrete or a surface enhancer on polished concrete floors.

Pentra-Sil may be applied to new or existing acid stained floors, integrally coloured concrete or polished concrete surfaces of any age to create a more durable, lasting shine as well as enhanced stain resistance. All surfaces must be clean and sound. We recommend thoroughly cleaning existing surfaces with black scrubbing pad (light abrasion) and a neutral pH detergent. For polished concrete applications Pentra-Sil 244+ is applied at (400 square feet per gallon) after 120 grit surface grind. Then buff with a 2000 – 3000 grit to create a durable, extremely hard glossy shine.

Treated surfaces will exhibit a glossy satin sheen. Maximum strength and resistance will develop over seven days. The surface will increase its hardness and durability and its sheen over time - taking on a polished look with general maintenance.

We recommend a re-application of the Pentra-Sil 244+ every 1-2 years to preserve the maximum integrity of the floor surface. This is cost-effective maintenance that will keep your floor looking like new, both aesthetically and mechanically substantially reducing costly maintenance and repairs.

FINAL RESULTS

Typical drying time is 1-2 hours for both vertical and horizontal surfaces.

Floors are ready for traffic and use when dry. Sanding or polishing will only wear down the protective surface and is not recommended for industrial applications unless it is being used as a surface enhancer for polished concrete acting as polishing agent.

A light lithium residue may form on the surface after the surface is dry. This is excess Pentra-Sil 244+ that was not absorbed and can be removed with a stiff broom, power sweeper or floor machine (if required).

Water repellency and hardness continue to develop for up to seven days following the application; however, significant results should be visible within 24 hours.

On smooth concrete, for an immediate shine, allow the Pentra-Sil 244+ to dry overnight and then polish with a high-speed propane buffer equipped with black pad, followed by a red pad. Or run an auto-scrubber over the surface with nylo-grit or strato-grit brushes and vacuum going (but no water). Buffing with a black pad followed by a red pad will make smooth surfaces shine more quickly.

Second applications are rarely needed; however, if concrete is very porous or if a quicker sheen is desired, you may apply a second, very light application. Lightly mist the surface with Pentra-Sil 244+, spread evenly with a lamb's wool applicator or soft broom, and let dry.

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CLEAN UP

Use water to clean tools and equipment. Pentra-Sil treatments are environmentally friendly and require no special or hazardous disposal methods.

MAINTENANCE

Routine sweeping, mopping, washing and mechanical scrubbing of floors with neutral pH cleaners/water is recommended.

DO NOT USE acidic or citrus cleaners to maintain the floor. Although Pentra-Sil is chemically resistant and helps reduce staining, acidic and citrus cleaners may etch the surface causing a residual stain. Regular maintenance will improve surface shine. This will prolong the life of the floor surface and over time will increase the sheen. Wipe up any chemical spills as soon as possible. Wait 6-12 hours after application before painting, line- stripping, or applying resilient tile, and conduct an adhesion test. For line-stripes, we recommend lithium Transil® Traffic Marking and Safety Paint™. Use a stiff broom or power sweeper to remove dirt and dust from the surface. Please consult the manufacturer to inquire about surface preparation and recommendations. Always test adhesion and performance for suitability and desired results before application.



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