

Ministry of Land, Infrastructure, Transport and Tourism NETIS
New Technology Information System
NETIS number: KT-160095-VR
New technology name: Hydrofit method
(impregnation composite injection method)

For Professional use

HYDROSKY®

HydroSky is a registered trademark and company name.

HydroSky Manual

Penetrating water absorption inhibitor : SKY-SP•SKY-HX•SKY-GT
Silicate-based surface impregnation agent: SKY-SP
Silane-based surface impregnation water repellent agent: SKY-GT
Silicone-based surface impregnation agent: SKY-GS, SKY-MX, SKY-MW
Special silane-based surface impregnation agent: SKY-PLS
Special silicone water repellent agent: SKY-Fiver, SKY-Modern
Two-layer waterproofing agent: SKY-HX, SKY-CVL
Asbestos solidification treatment agent: SKY-Protevor
Exterior wall asbestos-containing paint remover: SKY-Pe PLS
Flame retardant treatment agent: SKY-FEU SKY-FLARE
Flame-proofing treatment agent: SKY-QON SKY-CRD
Global warming countermeasures: SKY-Apollo MX, Apollo Silver
Hydrofit method: SKY-SP, SKY-CSP+SKY-G1

HYDROSKY

*The Hydrofit method completes construction accurately, quickly, and safely, truly prioritizing the environment and achieving the **SDGs**.*

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HydroSky Co., Ltd.
Everything starts here Vol.9

Conditions for alkali-aggregate reaction Causes of alkali-aggregate reaction and countermeasures and repair methods □

Alkali-aggregate reactions can be caused by the manufacturing process of concrete structures or by external sources over time. During manufacturing, concrete is inherently highly alkaline, and the use of cement or sea sand that contains a lot of alkali increases the alkali concentration abnormally, causing a chemical reaction with aggregates and crude aggregates. When the reaction product absorbs water as alkaline silica gel, it expands the concrete, causing cracks and an abnormal decrease in strength and elastic modulus, resulting in deterioration. From the outside, it can be the so-called chloride penetration of antifreeze or seawater splashes, and it can also be caused by the supply of moisture to concrete.

Deterioration of concrete structures due to alkali-aggregate reaction

As deterioration due to alkali-aggregate reaction progresses, concrete structures may exhibit the following external changes: 1. Cracks 2. Pop-out 3. Contamination of the concrete surface due to deposits 4. Blockage of joints, damage, and displacement due to partial expansion. Pop-out occurs when aggregate particles near the concrete surface expand, causing the concrete on the surface to pop out. Expansion of concrete due to alkali-aggregate reaction generates tensile stresses that were not anticipated in the design of reinforcing bars and PC tension agents, which can sometimes cause the reinforcing bars to break and reduce the strength of the structure.

Measures to prevent alkali-aggregate reaction

- A. Avoiding the use of alkali-reactive aggregates,
- B. The amount of alkali in concrete exceeds the limit,
- C. Supply of water to concrete.

If any of these conditions are not met, the alkali-aggregate reaction will not occur.

Avoiding condition A. is possible due to the domestic aggregate situation and distribution process, and there is no way to determine whether an aggregate is alkali-reactive at the site, and C. Cutting off the water supply is also considered difficult in civil engineering structures, so B. is a method to limit the total amount of alkali in the concrete.

Even if the total amount of alkali is set at 3kg/m², there is also no way to stop the alkali-aggregate reaction.

Calcium admixture or injection

When calcium is added, calcium ions (positive ions) act as an adhesive, forming aggregates of particles inside the concrete. At this time, the remaining hydroxide ions (negative ions) fix heavy metals while inducing a pozzolanic reaction. Strength is due to the formation of crystalline minerals in the pozzolanic reaction, and is developed over the long term. The crystalline minerals in the pozzolanic reaction form a gel in the gaps in the concrete, and crystallize as they combine with the surrounding moisture, so they have high water holding capacity and little gas phase (void).

Therefore, the more crystalline mineralization progresses, the greater the strength and the lower the hydraulic conductivity. This effect can also occur underwater, as the pozzolanic reaction progresses, resulting in the development of strength.

Features of the Hydrofit Method

The binding components of inorganic materials continue to react permanently. Iron does not rust easily, concrete maintains its strength, and rocks are prevented from weathering. Inorganic materials are harmless and do not have a negative impact on the environment. The basic construction is the same regardless of whether the ground is soft, there is an underground water vein, or the construction area is large or small. Concrete plays an extremely important role in the development of social capital, and to date a large number of concrete structures have been supplied, supporting the foundations of human prosperity. On the other hand, early deterioration problems caused by salt damage and alkali-silica reactions have become evident in various places, completely changing the way we think about the lifespan of concrete structures.

Effects and features of the Hydrofit method

A chemical reaction occurs within the concrete structure to restore and stabilize its strength.

- Water-stopping: Repairs leaks in concrete structures and bricks, etc.
- Neutralization: Prevents and restores neutralization
- Strength: The strength of the repaired area is greater than that of the existing part
- Ease of construction: Construction can be carried out even if the structure is wet. Visualization of process management
- Safety: Contains no harmful or flammable substances, allowing safe construction
- Environmental: Along with safety, no harmful substances are released and waste disposal is easy
- Sustainability: Structures protected from neutralization maintain their effectiveness continuously
- Versatility: If the working environment is suitable, construction can be carried out underwater. Therefore, it is ideal for protecting cultural properties

For details, please refer to the product manual.

Main product overview

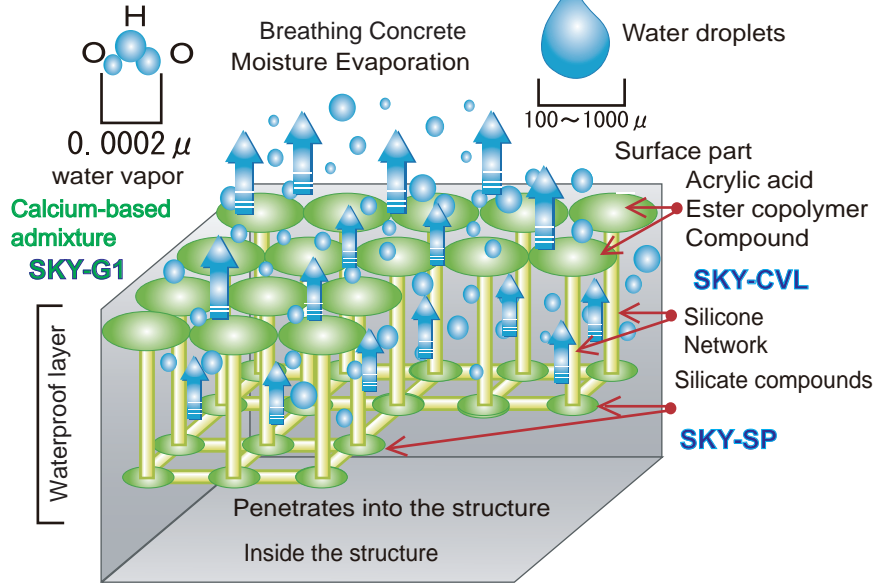
<p>SKY-SP Neutralization inhibitor</p>	<p>Silicate-based anti-deterioration agent It is effective for restoring alkalinity of concrete, preventing efflorescence, treating laitance, and also for preventing rust from internal rebar explosion by inhibiting and restoring carbonation.</p>
<p>SKY-GT Water repellent enhancer</p>	<p>Silane-based protective and water-repellent agents Surface water repellent enhancer. Does not change the texture of the surface, such as for anti-mold treatment of plaster.</p>
<p>SKY-HX Water stop, water repellent</p>	<p>Silicate, silane-based protective agent hybrid type It has the performance of the above two systems. It is used for water leakage from hair cracks, etc.</p>
<p>SKY-G1 Admixture strengthening agent</p>	<p>Calcium-based admixture Mainly used for injection work and concrete mixing. When used in combination with SKY-SP, it can be used for various repair work.</p>
<p>SKY-GS Protective waterproofing agent</p>	<p>Silicone-based protective waterproofing agent Made from modified silicone and polymer compounds. While impregnating, it forms a dense seal on the surface. Protects and waterproofs concrete foundations and backfilled areas.</p>
<p>SKY-MX Protective waterproofing agent</p>	<p>Silicone-based protective waterproofing agent Unlike silane-based products, SKY-MX has high elasticity due to its siloxy acid bond, and prevents deterioration due to frost damage. A waterproofing agent that protects soft materials such as stone from weathering.</p>
<p>SKY-MXC Made to order Colored waterproofing agent</p>	<p>Acrylic, silicone-based coloring protective waterproofing agent Acrylic paint has been added to the functions of SKY-MX, and the purpose is to provide protective waterproofing for colored finishes. By using SKY-MXC and SKY-SP together, a finish like new construction can be achieved.</p>
<p>SKY-CVL Two- or three-layer waterproofing agent Silicate and silicone protective agents</p>	<p>Developed primarily as a civil engineering modifier. A hybrid of silicate and silicone. Prioritizes functionality over finish. Effective for repair and improvement work when used in combination. Expands the possibilities for impregnation coating waterproofing when used in combination with SKY-G1. Applications include waterproofing slopes and floors. Preventing water leakage from park ponds. Water leakage from railway decks, etc. In addition, the addition of silica-blended SKY-CSP cement system provides great reliability, especially for injection water-stopping work.</p>
<p>Hydrofit method SKY-SP SKY-CSP SKY-G1 Blast furnace slag cement containing fine silica powder SKY-CSP</p>	<p>The basic material combination is to apply SKY-SP for surface treatment or pre-injection. To mix the injection paste, mix 1 kg of SKY-CSP with about 700 g of SKY-G1 in a mixer. The amount should be the amount that can be injected in one go (the amount that matches the injection tool). Injecting slag paste into cracks is not suitable for water leakage from the back side, so it is injected.</p> <p>This powder is made from silica stone and is mostly composed of silicon (SiO₂). Of all substances, silicon is the least corroded by acids or chemicals, and has high physical strength. It is highly resistant to alkali, acid, heat, fire, weather, water, and abrasion, making it a highly physical material.</p>
<p>SKY-SP · Gmax Silicate-based + calcium-based quick-setting admixture</p>	<p>Two-component underwater rapid gelling waterproofing agent The reaction between the two liquids causes a sudden gelation (jelly-like) and then gradually crystallizes into glass, forming a water-stopping base. Unlike water glass, it does not dissolve again and is a highly versatile material that is miscible with the two liquids.</p>
<p>Special silicone protective agent Texture-oriented protective water repellent SKY-PLS SKY Heritage</p>	<p>By adding a special silane, SKY-PLS, to Sky Heritage, we have achieved super water repellency with quick drying. Whether or not it penetrates into the applied base, it provides water repellency, expanding the range of application applications.</p> <p>Returning to the starting point of Sky Heritage, we will pursue further functionality. We will challenge the possibilities of bringing changes to the base material, such as expressing the wet color of stone.</p>
<p>SKY Fiver Ideal for cloth, paper, leather products, etc. SKY Modern Ideal for glass and stainless steel Flame retardants</p>	<p>Even without adding fluorine, the applied substrate achieves super water repellency whether it penetrates or not. This expands the range of uses. Fabrics achieve super water repellency without any change in texture, and paper, including cardboard, is also water repellent. This expands the range of applications for wood and leather products.</p>
<p>SKY-FEU Strong acidity, not waterproof SKY-FLARE Strongly alkaline, not waterproof SKY QON Weakly alkaline and waterproof SKY-CRD Strongly alkaline and waterproof</p>	<p>It is an environmentally friendly material. The effectiveness of the flame retardants SKY-FEU and SKY-FLARE is obvious. SKY-QON Waterproofing and fire retardant for wood SKY-CRD is a flame retardant and waterproofing agent for releasing PC formwork made of wood and cardboard.</p>
<p>SKY Apollo MX Apollo Silver</p>	<p>MX Color is mixed with ceramic insulating beads to give the waterproof paint insulating properties, and it is also effective as a base coat for Sky Apollo Silver.</p> <p>Highly reflective, waterproof, heat-insulating paint for roofs and rooftops. Effective for heat island countermeasures and energy conservation.</p>
<p>SKY PROTECTOR Sky Protector PE Plus Asbestos removal solidification agent</p>	<p>It is already prohibited to use asbestos-containing products and equipment. In demolition work, it is becoming necessary to remove exterior wall paint before demolition. It is difficult to solidify asbestos-containing components with conventional stripping agents, and problems remain with the disposal of needle-like fibers after removing the paint. Sky Protector PE Plus makes it possible to dispose of needle-like fibers by solidifying them into glass, eliminating their floating properties, and can also remove sprayed asbestos and ceiling materials in a gel state. In particular, the enclosure method is a hidden method, and no treatment is given to the inside, so it is thought that the asbestos is scattered from the gaps in the boards and panels.</p>

mechanism

Concrete
Deterioration prevention, protection,
waterproofing image

HYDROSKY®

Moisture <molecule>



Partial injection **SKY-CSP+SKY-G1**

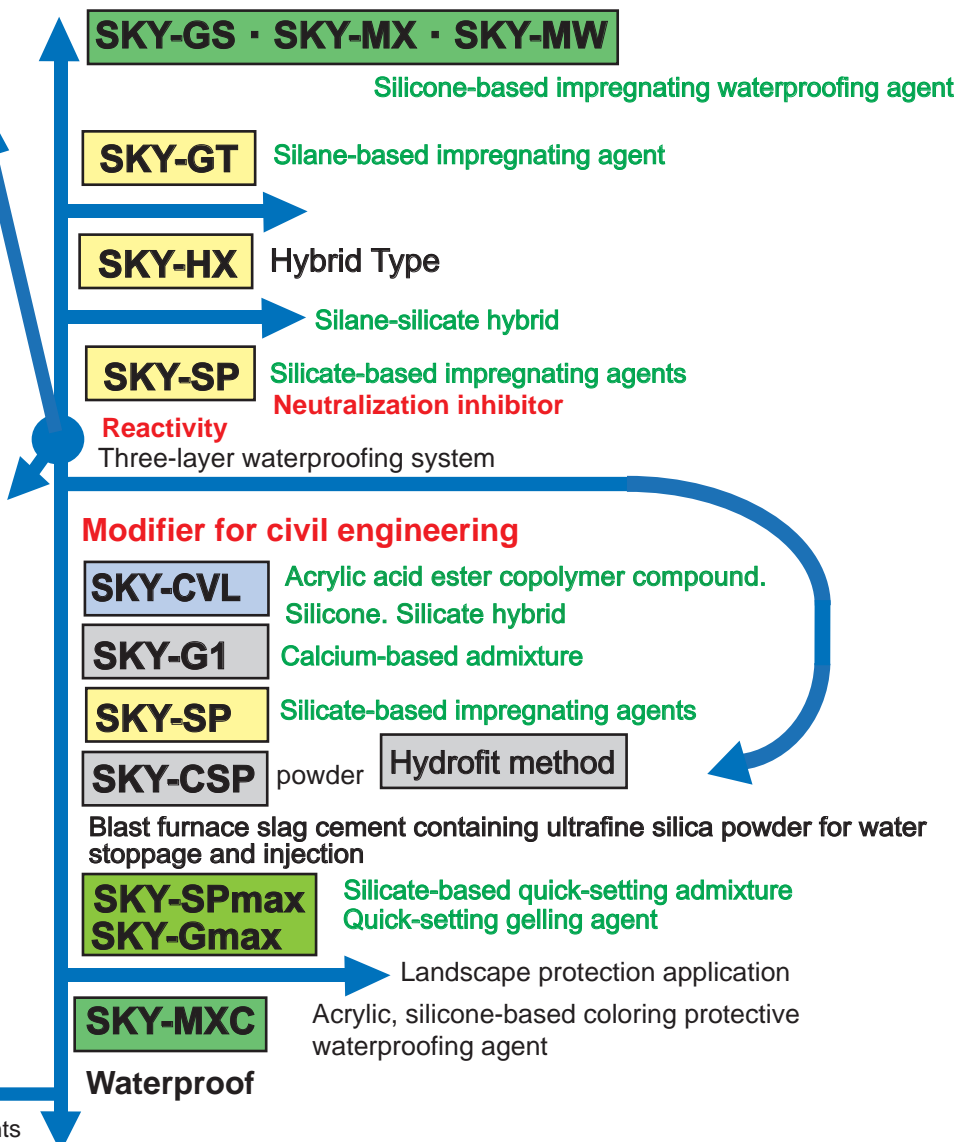
The multi-layer protective function of the surface layer can be achieved by using the above-mentioned acrylate copolymer compounds, as well as silicone oligomers, resins, and acrylic resin paints.

The left figure shows how impregnation prevents deterioration and stops water from entering the concrete. In nature, concrete structures will always endure coexistence with water. Deterioration will progress from the damaged area due to some factor. A significant decrease in strength will occur. As a countermeasure, the surface is protected with organic solvents, but this will decompose organically in a few years due to ultraviolet rays, etc. Recently, the Ministry of Land, Infrastructure, Transport and Tourism has begun to consider repairs using silicate-based impregnation agents. SKY-SP's silicate-based impregnation agent replaces the moisture inside and gradually crystallizes and solidifies. A second coat of SKY-G1 is then applied to fix SKY-SP inside the cracks and gaps. The injected paste is then integrated and assimilated with the concrete. In addition, to maintain the waterproofing effect, acrylic ester copolymer compounds such as SKY-GS, SKY-MX, and SKY-CVL are used to cover the concrete, preventing water from entering. Another effect is the expression method of coloring SKY-MXC. It is possible to provide protection equivalent to that of a new building for a long period of time.

Does not change the texture or feel
Highly functional super water repellent



Water repency



Measures to combat heat islands

Heat-insulating, heat-shielding, waterproof base treatment agent

Sky Apollo MX
Sky Apollo Silver

Waterproof and flame retardant for wood and cardboard

- SKY-FEU** • OH flame retardant PH1
- SKY-FLARE** • OH flame retardant PH14
- SKY-QON** • OH type flame retardant waterproofing agent PH10
- SKY-CRD** • OH type flame retardant waterproofing agent PH10

SKY PROTECTOR

Asbestos solidification treatment agent

Skyprotector SKY-H

Asbestos-containing exterior paint remover

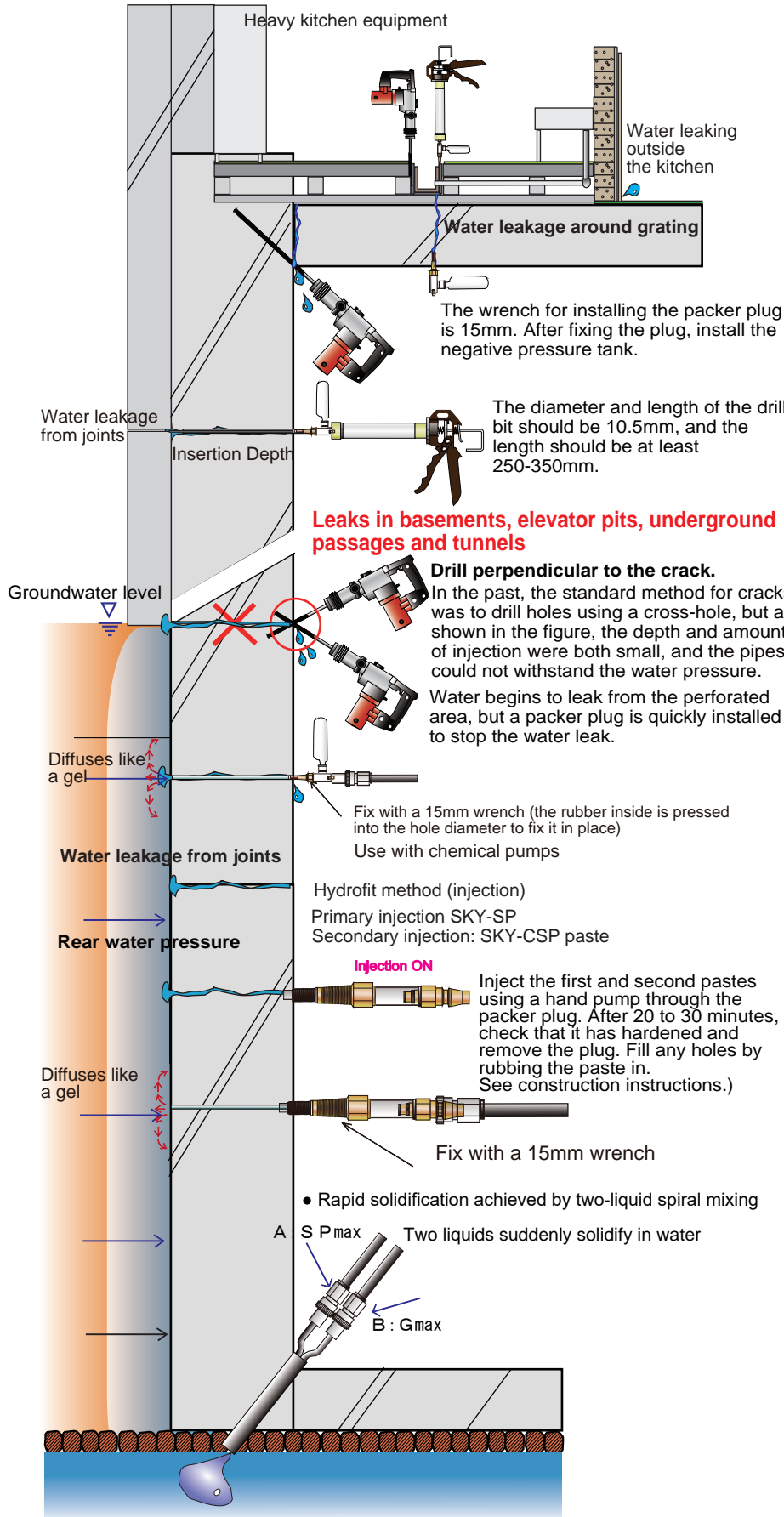
Skyprotector SKY-PE+

Leakage image and repair method

★ The Hydrofit method is an innovative water-stopping method.

The number of plugs will be increased depending on the location and size of the leak, but the same construction method can be used regardless of the size of the leak.

Water leaking from the kitchen to the floor below requires urgent attention!
(The same work is done on the roof of the building.)



Features of the Hydrofit Method

- ◇ Environmentally friendly blast furnace slag cement containing finely powdered silica
- ◇ Excellent durability
- ◇ Excellent resistance to alkali, heat, fire, weather, water, and abrasion, and increases physical strength
- ◇ Can be injected even if there is water in the crack
- ◇ Can be injected into fine cracks (0.05mm wide)
- ◇ Can prevent rust on steel frames and suppress alkali-aggregate reactions
- ◇ These combinations can also stop seawater leaks, leaks from organic waste treatment facilities, and leaks from polluted material treatment facilities
- ◇ Combined with other Hydro-Skys for expanded use

Applications

- Main crack repair targets
- ◇ Dams, tunnels, river embankments
 - ◇ Box culverts
 - ◇ Breakwaters, retaining walls
 - ◇ Underground passages, subways, highways, bridge piers
 - ◇ Buildings, apartment buildings, etc.
 - ◇ Concrete structures in general
- Leaking due to breakage of surface finishing material FRP/urethane paint
 - Leaking due to deterioration and breakage of expansion joints
 - Leaking due to breakage of holding concrete
 - Leaking due to deterioration and breakage of asphalt waterproofing
 - Leaking due to breakage of concrete slab

Water leakage problems

- ◇ The cause of the water leak is unknown
- ◇ We can't close for construction
- ◇ We handle food, so we can't use ingredients that emit odors
- ◇ We can't move kitchen equipment
- ◇ We only have a limited time between closing and preparing for business

Construction features!

- ◇ It is an impregnating agent (penetrating), so it penetrates into cracks
- ◇ Unlike organic materials, it can be applied in wet areas
- ◇ Water-based, solvent-free, and odorless
- ◇ It penetrates even when heavy kitchen equipment is present
- ◇ By dividing the application area, it does not affect business operations
- ◇ Additional repairs are possible because it is a physical and chemical water stopper
 - ◇ Tools, equipment, and materials
 - Hammer drill, drill bit 10.5mmφ length 250-350mm (800-1000mm or more depending on the structure and leakage conditions)
 - ◇ Sprayer, trowel stand, plastering trowel, bucket for mixing cement paste
 - ◇ Injection equipment
 - RTP-A packer type plug (recommended product) Low pressure injection pump: Hand pump for SKY-SP, paste pump
 - ◇ Materials
 - Hydrosky SKY-SP, SKY-G1, SKY-CSP
 - Repair cement



Achievements of the Hydrofit Method



Blast furnace slag cement containing fine silica powder

The feature of blast furnace slag cement with fine silica powder is that it is a powder made from silica stone, the majority of which is composed of silicon (SiO₂). Of all substances, silicon is the least corroded by acids and chemicals, has high physical strength, and is extremely resistant to alkali, acid, heat, fire, weather, water, and abrasion. By utilizing this characteristic, physical strength can be increased. By utilizing auxiliary materials, it can also be expected to be effective as a stabilizing material during ground improvement work. In addition, because it has low oil absorption and high whiteness, it is not only suitable for injection work, but also for surface finishing, and its expressiveness can be expanded by combining it with various Hydrosky products.

This is a revolutionary injection method, the Hydrofit method.

This method can be used above or below ground. It can also handle water leakage from walls, ceilings, and floors. Construction The same construction is possible regardless of the size of the site, without any impact on the surrounding environment. The newly developed blast furnace slag cement with fine silica powder is characterized by its resistance to both acids and alkalis, excellent resistance to harmful chemicals, and becomes stronger than normal concrete by releasing moisture. This effect can also be expected as a stabilizer for ground improvement and a measure to prevent liquefaction. By carefully planning the construction, it is a safe and economical hydrofit method.



As a material that contributes to extending the lifespan of buildings

SKY-CSP (blast furnace slag cement mixed with finely powdered silica) is listed as a material that contributes to the longevity of buildings. It can be used to repair water leakage and lack of strength due to weakening of concrete. When injecting cement paste, if the W/C exceeds 30%, the cement particles will sink to the bottom and form a weak layer such as bleeding water or laitance. In the hydrofit method, SKY-CSP and SKY-G1 are mixed at 50-70%. It has excellent workability and its strength increases from the initial stage. The components of SKY-G1 in this slag paste bring back the strong alkalinity to the same level as normal cement and stabilize it. It saturates gaps that cannot be filled with normal crystals, has high water retention and little gas phase. The more the crystal minerals progress, the stronger the strength increases and the lower the coefficient of permeability decreases. This allows effective repair of deteriorated concrete and hollow areas. Furthermore, by impregnating the surface layer with SKY-MX or SKY-CVL, long-term waterproofing becomes possible, making it a finishing, waterproofing and repair material that contributes to extending the lifespan of buildings.



When collecting a paste specimen of SKY-G1/SKY-CSP60% (W/C). With normal cement, bleeding occurs immediately after collection and the cement paste settles.



SKY-G1/SKY-CSP60% (W/C) paste specimen after 1 day. It has solidified without bleeding or expansion/contraction.

Hydro-Sky SKY-SP crystallizes while maintaining its strong alkalinity, preventing efflorescence caused by the movement of water in concrete structures and maintaining their beauty. The water voids and voids that increase and expand due to the loss of aggregate caused by neutralization become water-insoluble inorganic compounds. The reinforcing steel in concrete is filled with inorganic compounds with a high pH value to prevent rusting, but if the pH falls below 10, the steel will gradually rust and begin to crack. SKY-SP can also prevent cracking caused by rusting in areas where the reinforcing steel covering thickness is insufficient, and can restore the alkalinity. Scientifically speaking, SKY-SP is permanent because it continues its chemical reaction. SKY-SP is a highly reliable material that can be used as the "base" for all inorganic building materials. It can also be combined with a wide variety of products to protect civil engineering structures in new construction and renovation work, and to preserve cultural properties without changing the scenery. Taking advantage of these functionalities, we are developing environmentally friendly and improved materials, as well as stain-resistant coating agents that utilize water repellency.

Packaging
20kg



(SKY-MX Color)



Proposal for Hydrofit Construction Method **HYDROSKY®**

Silicate-based surface impregnation method and composite method

Concrete plays an extremely important role in the development of social capital, and to date, a large number of concrete structures have been supplied, supporting the prosperity of humanity from the ground up. On the other hand, the problem of early deterioration due to salt damage and alkali-silica reactions, which became evident in various places from the late 1970s to the early 1980s, completely changed the way we think about the lifespan of concrete structures. Silicate-based surface impregnating agents are materials that improve the quality of concrete by reacting with calcium hydroxide in the concrete to densify the surface of the concrete. In other words, it became clear that the durability of concrete structures varies greatly depending on the environment and the materials used, and that appropriate maintenance and management must be planned in design and construction. The Hydrofit method restores and stabilizes the strength of concrete by causing a chemical reaction within the concrete structure. The restoration work after March 11, 2011 and the emergency repair work for the highway tunnel collapse accident were also caused by concrete deterioration. The further evolved Hydrofit method is a composite method of a chemically acting impregnating agent and cement-based powder. After impregnating the base material with Hydro Sky, a silica-mixed blast furnace slag paste is injected to saturate the cracked or hollowed areas, restoring the concrete to sound condition. In addition, by applying vibration for a certain period of time when injecting this silica-mixed blast furnace slag paste into weakened slopes, roadbeds, and foundations, a densified concrete layer is formed and stabilized. These permeate the concrete structure, and react with calcium hydroxide to form a gel, filling and densifying the voids that have formed due to the alkali-silica reaction, thereby compensating for the lack of strength.

The Hydrofit method reacts with water and crystallizes to solidify. It is possible to stop water in just a few seconds, or to adjust the gel time by applying vibration to find a method that suits the site.

If the water stop is removed, groundwater will overflow



More than 20 liters of water is leaking from this area every minute.



Salt damage prevention work

Landscap protection and deterioration prevention works

Before construction

Measuring the true strength of cement paste is an extremely difficult test

In mixes with a W/C below 30%, this is not a big problem, but as the W/C increases, separation occurs inside the specimen, causing the cement particles to settle and the water to rise. As a result, although there are differences depending on whether or not admixtures are used, the lower part of the specimen becomes a cement-rich, dense paste hardened body due to the settling and consolidation of cement particles, while the upper part of the specimen becomes a cement-rich, dense paste hardened body due to the settling of cement particles and the rise of water, and the actual W/C increases the higher it goes. In mixes with a W/C of over 60%, the surface of the specimen often forms a brittle layer like bleeding water or laitance that is 30% or more thick than the height of the specimen. In addition, the paste layer below this bleeding or laitance layer also has a W/C that is significantly higher than the initial value due to the rise in water and the settling of cement, so the paste strength inside the specimen is not uniform, being strongest at the bottom and decreasing the further it goes up. The W/C ratio increases even more rapidly at the surface, forming a weak layer with extremely low strength. Therefore, when performing a compressive strength test, the results will vary greatly depending on how much of this weak layer and the areas with a large W/C are treated before the test. Also, since separation will vary greatly depending on the launch height, it is natural that the separation process will be more pronounced in the latter case than in the case of a $\phi 50\text{mm} \times 100\text{mm}$ specimen, and the process of strength reduction is likely to be greater. Settling of cement particles is less likely to occur on the sides of the specimen due to the constraint of the formwork sides, and is most likely to occur in the center of the specimen, where the constraint is the smallest, so the strength distribution will also differ horizontally.



After construction



For this reason, the specimen will not break in a kinematic or hourglass shape like fractures that occur when stress is uniformly distributed, but will be more likely to develop vertical cracks like those that occur when uneven loading or partial loading occurs. In contrast, even in the case of concrete with the same W/C, segregation can occur, but the rising of water and the settling of cement are prevented by the fine and coarse aggregate surfaces adjacent to the paste, so there is not as extreme a difference in W/C or structure between the top and bottom of the specimen as there is in the case of paste, and a large decrease in strength is unlikely to occur.

Cultural Heritage Protection

SKY Heritage

When I was invited to Beijing, China, I was able to undergo exposure testing as a protective agent for the renovation of the historical building "Palace Museum" (Forbidden City).

This is where Sky Heritage was born. The word "Heritage" comes from "World Heritage." It is said that 80% of World Heritage sites are made of stone. Heritage is the most effective way to protect and waterproof stone structures. Most of these World Heritage sites are in environments with high temperatures and humidity, or extreme temperature differences. Sky Heritage penetrates deep into the base material, from soft stone to hard stone, and provides ultra-long-term waterproof protection. One of the features of Sky Heritage is that if concrete or stone is damaged or cracked after construction, hydrolysis slowly progresses when the fractured surface comes into contact with air and moisture, and hydrophobicity increases, protecting the fractured surface. The work environment is also designed to be harsh, and construction is possible even below freezing. This is an ideal protectant that provides long-term protection without causing any change in texture.

SKY Heritage SKY-PLS

Sky Heritage has a high penetration power, and gradually forms a waterproof layer by replacing the moisture inside the structure. The water remover used in car gas tanks has the effect of breaking down the water inside the tank, and has been applied to Sky Heritage. Furthermore, this alcohol has a disinfectant effect and has a deterrent effect on moss and mold. Since Sky Heritage is alcohol-based, it can be applied even below freezing. Furthermore, this alcohol has a disinfectant effect and has a deterrent effect on moss and mold. Since Sky Heritage is alcohol-based, it can be applied even below freezing. SKY-PLS is a liquid that dries quickly and immediately shows strong water repellency. It gives super water repellency to concrete, stone, tiles, etc.

Experiments on tuff coated with SKY-PLS



After application, dry thoroughly.

Dropping water on a split stone

After 10 days, the entire surface became water repellent.

After applying SKY-PLS to tuff and allowing it to penetrate, it is split as shown in the diagram above, but the inside absorbs water. SKY-PLS begins to waterproof the cut surface that comes into contact with carbon dioxide and moisture in the air over time, and after 7 to 20 days, the entire surface is waterproofed. This is because the reactive catalyst hydrolyzes and the hydrophobic groups multiply. Even if building materials that have been pre-coated with water-repellent fireproof boards at the construction site are cut and processed, the cut surface will be waterproofed by the time construction is completed. Even if any parts crack after construction, the cracked surfaces will also be waterproofed after a certain period of time (7 to 20 days), and the effect will last a long time.

The difference in water absorption between the left and right sides of granite that has been soaked in water for a long time is clearly visible. As an application of this, it is possible to remove water or water stains that have penetrated over time through hydrolysis and replacement. This is the same effect as the water remover that is put in the gas tank of a car.



Osaka Waterworks Memorial Hall exterior wall brick protection work



Nikka Whisky Sendai Factory exterior brick repair and protection work



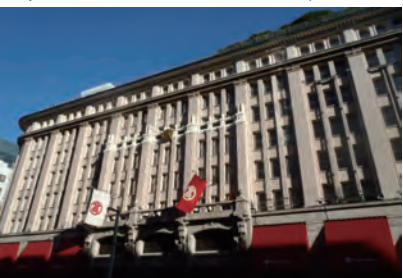
Repair and protection of exterior wall tiles



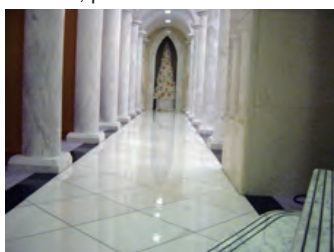
Important Cultural Property Takashimaya Tokyo Store Preservation and Repair Work



Elevator Hall



Marble floor, protection work



Developed from Sky Heritage (SKY-PLS)

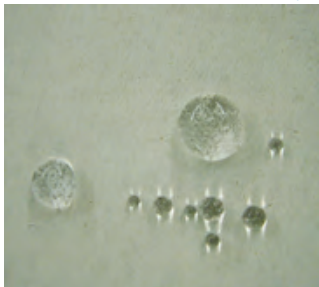
SKY-Fiver Amazing super water repellency

Functional super water repellent

We have created a super water-repellent waterproofing agent that dries quickly. It can be used for any purpose. Cloth, paper (cardboard), leather products. As shown in the photo below, water droplets turn into a spherical shape on the surface, confirming the super water-repellent effect. Even without using fluorine, the water-repellent effect will last for a long time after the disinfectant IPA (alcohol) has dried. When used on clothing, the effect will last even after 20 to 30 washes. By using the product according to the purpose, you can easily make your own water-repellent waterproofing.

Simple waterproofing of scarves

Expanded water repellency



For short periods of time, you can use a large piece of cloth such as a scarf to scoop up or carry water. If you wring it out, the water will pass through the cloth, and if you wring it out completely, it will become water-repellent again. It can also be used as an umbrella in case of sudden rain, and you can waterproof newspapers or cardboard by lightly spraying it with a hand sprayer.



Uses:

Paper, newspapers, magazines, cardboard, shoji paper, etc. In particular, if you apply Sky Fiber to washi paper after thoroughly drying it after ink painting or calligraphy, it will repel moisture and protect the work.

This effect extends to everything from wood to leather products, and does not change the texture of the material at all, with a natural finish that lasts for a long time, and you can expect even greater effects. In addition, by combining it with other Hydrosky products, the range of expression can be expanded.

SKY-Modern

Super water-repellent effect on glass, metal, etc.!



Modern was developed to protect surfaces such as glass. Special silane provides strong protection for the surface. Its super water-repellent properties prevent scale build-up caused by water adhesion. Modern is a moisture exchanger, so it reacts with moisture and carbon dioxide in the air, forming a hydrophobic gas after hydrolysis. When water is sprayed on glass, metal, or the body of a car to which Modern has been applied, it quickly becomes water-repellent. If this action is repeated, the special silane in the ingredients accumulates, and the super water-repellent properties continue.

Suitable for car wax

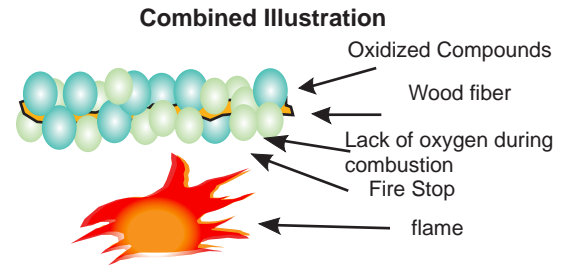


After applying Modern, hand grime and other dirt on automatic doors, display cases, etc. can be easily cleaned by wiping them off with a damp cloth. Other places that people touch, such as ATMs, can also be cleaned in the same way. By coming up with various ways to use it, the range of uses can be expanded even further.



SKY QON & SKY-FEU

SKY-FEU is characterized by its water-based inorganic nature. It penetrates deep into the wood, gradually losing its water solubility, causing no changes to the surface, while releasing the moisture inside. When a fire breaks out, it blocks the air needed for combustion, carbonizes the wood, and prevents the fire from spreading. When a fire breaks out, it can buy time for evacuation and rescue, and it is thought that the spread of fire to other areas can be minimized. SKY-FEU does not contain any organic solvents or harmful substances, is odorless, and does not emit toxic gases in the event of a fire.



Fire experiment using cardboard

The flame-retardant waterproofing agent SKY-CRD was applied to cardboard for use with plywood and then dried. Left: Flame-retardant waterproofing treated cardboard for use in releasing plywood, right: A hut was made with untreated cardboard. The paper caught fire. The untreated cardboard caught fire in a few minutes. The treated cardboard caught fire as the paper inside burned.

SKY-CRD



Flame-retardant waterproof material developed for cardboard

★Another feature: Use in disaster-stricken areas

In disaster-stricken areas, cardboard is mostly only used indoors in gymnasiums and other facilities.

If unprocessed cardboard is treated to be flame-retardant and waterproof, it can withstand outdoor use.

Using cardboard as a formwork, pour concrete into it



Inside, concrete fragments used in the experiment, expired cement, and dry mortar were mixed with 60% SKY-G1 and left overnight.

The cross section of the cardboard is clearly visible.



After the formwork was removed overnight, there was not much concrete left and it was easy to clean with water.

Heat-insulating and waterproof paint for roofs and exterior walls

SKY Apollo Silver

By combining Heritage with machined aluminum powder, we have created a revolutionary protective material that achieves heat shielding and insulation with a highly reflective waterproof finish. By combining it with Hydrosky products, you can achieve heat shielding and insulation while repairing roof and exterior wall leaks. By simply applying heat shielding and insulation, indoor temperature changes can be reduced by about 30%, and electricity bills can be significantly reduced by setting the air conditioning temperature comfortably.

Effective for roofs of factories, gymnasiums, warehouses, as well as exterior walls and siding of buildings.

Renovation of slate roofs and galvanized roofs. Sky Apollo MX's hollow ceramic beads enhance the insulating effect. After drying, Sky Apollo Silver provides heat insulation protection. Apollo Silver is liquid aluminum that protects against rust caused by salt damage and maintains beauty. It also contains asbestos, which is a concern, and does not scatter. Unlike regular paints, it is covered with aluminum, so the protective effect lasts for a long time. The rust prevention function is also used to protect screws and bolts in factories and equipment in coastal areas. We are proud that a series of roofs and exterior walls coated with Apollo Silver can reflect direct heat and prevent the heat island effect, contributing to environmental improvement.

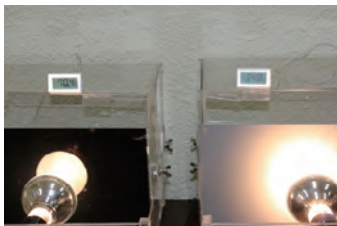
Overview of in-house experiment

Irradiation temperature measurement using a 100W reflector bulb

Untreated plate: Temperature on the back of the irradiation test plate

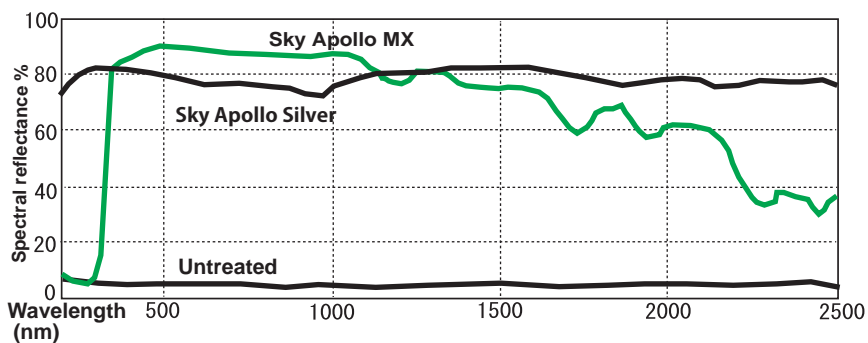
Irradiation test plate back temperature

This in-house experiment was carried out by sealing a transparent acrylic plate, 5mm thick, 150mm high, 200mm wide and 200mm deep, so that it would not be affected by room temperature, and installing a temperature sensor on the back of the irradiation test specimen. As shown in the above photo, a 100W reflector bulb was irradiated onto a 5mm thick slate roofing material. A heat shielding effect of over 30°C was confirmed in about 30 minutes.

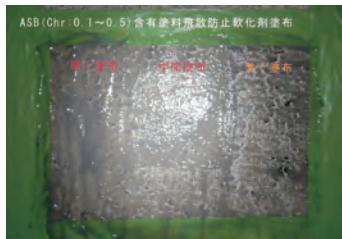


Similar results were also obtained with a 5mm thick aluminum plate and a 3mm thick galvalume steel plate.

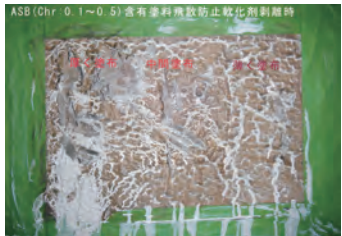
These test results confirm Sky Apollo's high reflectivity. It effectively blocks external solar radiation and does not store heat inside. While regular insulation materials often require thick sheets or thick coatings of mortar, Sky Apollo Silver is extremely easy to apply. Since metal powder is applied to Sky Apollo Silver, there is no need to worry about color fading, and it has excellent waterproofing and rust prevention effects due to its strong water repellency. It is a cost-effective material that has played a major role in improving the environment, and can be used for the roofs of gymnasiums, factories, and the roofs and exterior walls of logistics warehouses.



SKY PROTECTOR [Asbestos-containing paint stripper/spray treatment agent]



(24 hours after application)



- Sky Protector PE Plus does not contain any highly toxic substances (methylene chloride).
- It does not dissolve the old paint film but softens and peels off, so there is no splatter and it is easy to collect.
- It is biodegradable, and Sky Protector PE Plus in the wastewater is decomposed and rendered harmless by bacteria in the soil.
- It is completely safe as it is not a fish poison.
- Sky Protector PE Plus will not damage the surface of the structure.
- Even if high-pressure washing is used for removal, the paint after peeling will not dissolve in the water and the cleaning water and waste are separated, so it can be disposed of safely.

Handling Precautions

1. When using, wear protective gloves, protective glasses, aprons, etc. Polyethylene gloves and foot covers are effective.
2. Handle in accordance with the Organic Solvent Poisoning Prevention Regulations.
3. Ensure adequate ventilation while working, and warn people working below to be careful as the gas in the solvent is heavier than air.
4. Protect the work area and surrounding areas from splashes and contact with polyethylene film.
5. Do not store or leave Sky Protector PE Plus in direct sunlight or in high temperatures.
6. Use within six months under normal storage conditions, and do not return unused material to the original can.
7. The contents of this document may differ depending on the conditions of use at the site, etc.

Product Overview

pH: 9.8 Industrial Safety and Health Act: Not applicable Fire Service Act: Designated flammable material PRTR Act: Not applicable Appearance: Greenish-white viscous liquid Specific gravity: 1.08

1. Protection: Take measures (such as using polyethylene film) to prevent the stripping agent from scattering and paint dust from leaking outside the workplace.
2. Application: The amount to be applied varies depending on the condition of the paint film, so test it beforehand. Generally 0.3 to 1.0 (exterior thickness paint material) kg/m². Stir well before application.
3. Leave: Allow the agent to penetrate to the interface with the old paint film and leave until the paint film softens.
4. Removal: Remove the softened paint film with a scraper, ultrasonic i solator, etc.
5. Waste disposal: Dispose of the removed waste material in accordance with the Industrial Waste Act.



Ministry of Land, Infrastructure, Transport and Tourism NETIS
New Technology Information System
NETIS number: KT-160095-VR
New technology name: Hydrofit method
(impregnation composite injection method)

Each product in the Hydrosky series has a long-term protective function and has been used in many sites as the most suitable material for preventing deterioration of stone materials and protecting and repairing historical buildings under conditions that do not cause changes in texture. Further development has led to a new and enriched material group called Hydrosky.

The Hydrofit method has also been further evolved. It accurately identifies various causes of underground leakage, and instantly hardens and vitrifies large amounts of water leaking into structures that are heavily loaded by groundwater, especially in the flowing water area. After the reaction, it does not dissolve in water (seawater), making injection work easier and making it possible to stop water in a short time. It can be applied without problems as long as the environment is suitable for people to work. The applicability of this construction is also ideal for strengthening soft ground and slopes and retaining walls. Now that the Tohoku Pacific Ocean Earthquake has not yet cooled down, the range of use will be expanded again to collapsed bridges and roads, restoration work, and facility repair work in the Kumamoto earthquake. People also come to Japan from overseas, particularly Southeast Asian countries, who have high expectations for our renovation method, and we believe it to be an indispensable construction method for future infrastructure development projects.

● Characteristics and performance

① Improves moisture and water resistance ② Prevents and protects the surface from deterioration ③ Reduces the penetration of grease, oil, and acid ④ Prevents cracks caused by freezing ⑤ Prevents the growth of mold and algae ⑥ Hardens from the surface to the inside ⑦ Improves heat and cold resistance ⑧ Makes it easier to remove ice ⑨ Increases the elasticity of concrete ⑩ Provides waterproofing and surface protection for inorganic building materials in general ⑪ Various construction methods are possible by applying materials and equipment, such as composite construction methods.

● The use of this product does not impair the breathability of the structure surface, and the color and texture of the SKY type and Sky Heritage are not affected.

● By combining various products, HydroSky can achieve a wide range of effects and expression methods, making it suitable for a wide range of construction applications, not only in civil engineering and architecture but also for environmental improvement.

■ Amount used: Water-based type

4-8m² per 1kg, 0.12-0.25kg per 1m² (depending on material)

■ Amount used Alcohol type 6-12m² per liter, 0.05-0.20 liters

per 1m² (depending on material)

● Installation method

● Whether it is new construction or repairs, be sure to thoroughly clean the application surface. Remove paint, efflorescence, grease, etc. with a wire brush or scraper, or use a high-pressure washer. ● Fill any cracks, junk, or holes with mortar or mortar sealant.

● Hydrosky SKY-SP, HX adheres strongly to glass and aluminum, so adequate curing is required. Also, be careful not to let it adhere to plants, etc. ● When using water-based paints or finishing materials (top coats), avoid using anything other than SKY-SP.

● If the temperature of the application surface for SKY-SP and HX is 50°C or higher, spray with plenty of water and allow to cool before applying.

● Apply generously using a brush, roller or spray gun depending on the application conditions.

● When working, be sure to wear appropriate protective gear, use equipment and materials that will not generate sparks due to impact, static electricity, etc., and wear protective gloves, protective glasses, and respiratory protection to avoid direct contact.

Installation conditions: Temperature must be between 5°C and 35°C. Do not install in snowy or rainy weather.

● Depending on the material and base used, crystals may appear on the surface. Be sure to wipe them off thoroughly with a cloth dampened with water when the paint is half dry.

● For other functional materials or made-to-order materials, please refer to the product manual or contact us.

■ Notes

This product is not suitable for use as described in the attached installation instructions. If this product is swallowed or gets into your eyes, rinse with plenty of water and consult a doctor.

Manufacturer and distributor

Hydro Sky Co., Ltd.



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The contents of this document are based on the materials of our Technology Development Department. In addition, they may be subject to change without notice due to new product development, improvements, or discontinuation.