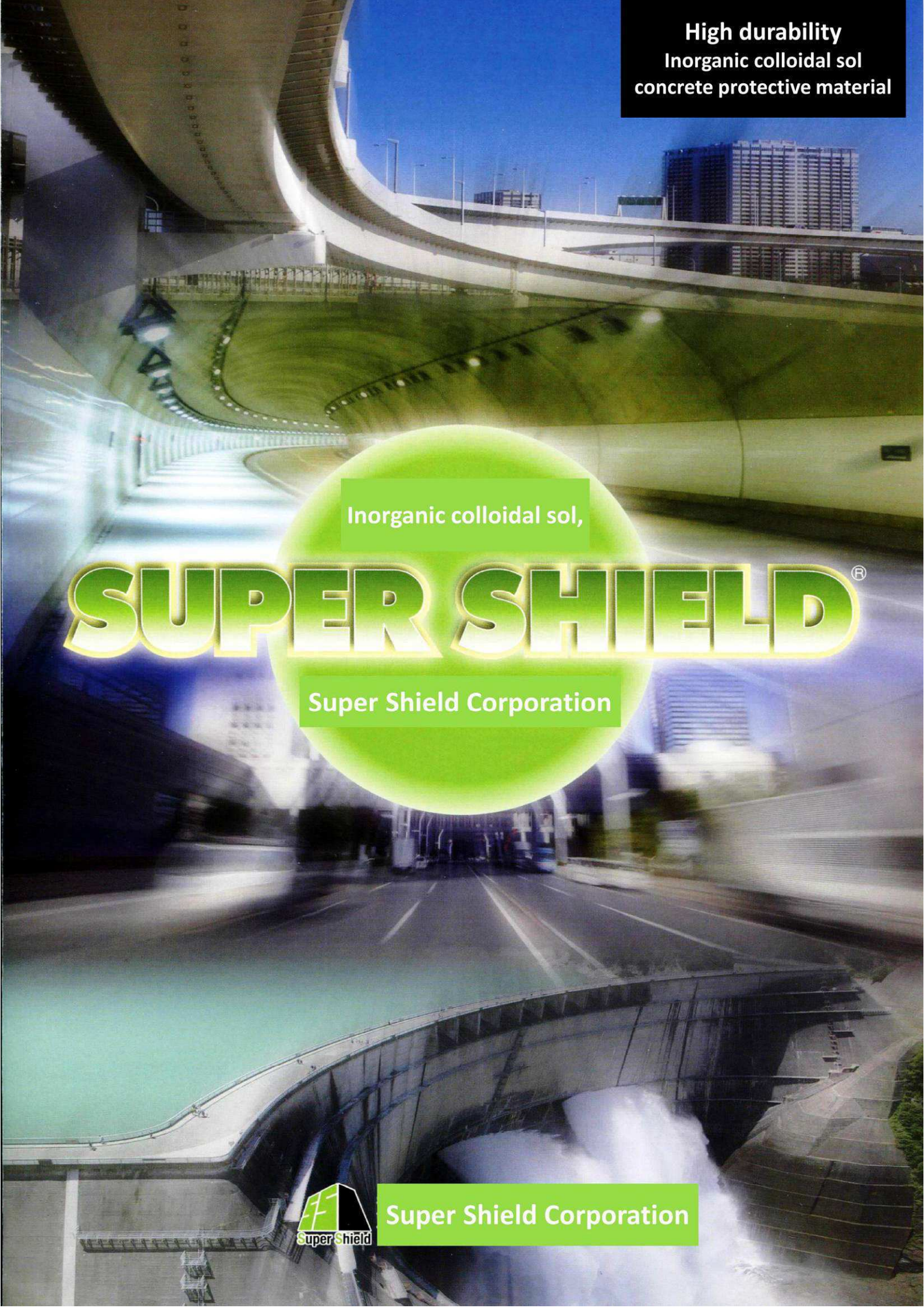

High durability
Inorganic colloidal sol
concrete protective material
Inorganic colloidal sol,
SUPER SHIELD®
Super Shield Corporation
Super Shield
Super Shield Corporation

Greetings

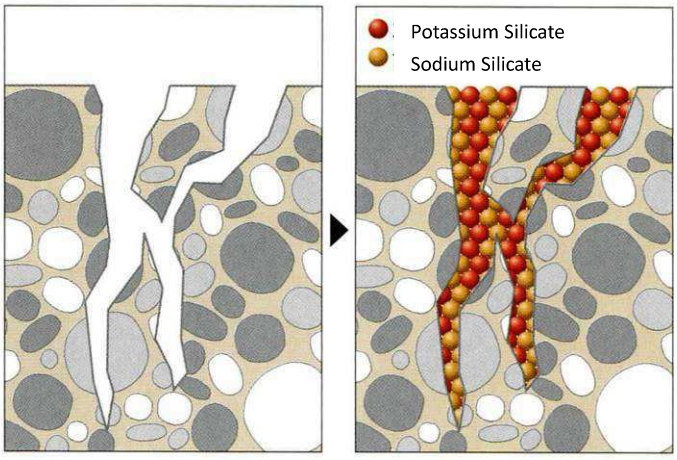
Concrete used to be the symbol of high durability. Nowadays, however, concrete loses durability quickly due to a variety of different deterioration-causing factors. Loss of durability has become a social issue. Public and private concrete structures built during Japan's rapid economic growth period need large-scale renovations. The construction industry is increasingly focused on something called Durability Improvement Technology because it protects and keeps concrete structures usable for a long period of time.

Super Shield(inorganic colloidal solution) is a next-generation and high-performance waterproof and protective agent for concrete based on the most advanced nanotechnology. The colloidal solution contains as its main ingredients sodium silicates and potassium silicates. Super Shield is an innovative new technology that protects the environment, reduces costs and improves the durability of concrete structures.

Super Shield keeps durability more effectively than conventional water-soluble or water-repellent protective agents. Super Shield makes concrete stronger and sturdier, and protects it from all deterioration-causing factors for a longer period of time because it has a highly effective self-repairing function that no conventional protective agent has ever had.

Characteristics of Super Shield

Super Shield colloidal solution contains insoluble and high-strength silicates (colloidal particles) whose first-stage diameter ranges from 1nm to 50nm. When applied, the silicates permeate into new and aged hardened concrete (hardened cement paste), combine with existing concrete elements and change their shapes actively from the first-stage diameter of 1nm-50nm to an aggregate diameter of 1nm to hundreds of nanometers. The combined particles are insoluble, and fill in harmful micropores and microcracks physically and effectively. They make concrete denser and significantly improve the durability of new and aged hardened concrete (hardened cement paste).



In addition to this, ions in the solution permeate deep into the concrete through the harmful micropores and microcracks and control carbonation caused by carbon dioxide gas and reinforcement corrosion caused by chlorides. Super Shield® is an innovative, high-performance and next-generation waterproof and protective agent for concrete with a self-repairing function.

Characteristics of Super Shield

Performance characteristics

・Carbonation control・Salt damage control・Frost damage control・Reinforcement corrosion control
・Alkali aggregate reaction control・Waterproof and water stop・Crack repair・Wear and abrasion resistance
・Antifouling and algae control

Application items

・Bridge (wheel guard, bridge deck)・Bridge pier, bridge abutment・dam・Tunnel (porous wall)
・Box culvert・Port facility and structures・River structures and bank protection
・Irrigation channel, sluice pipe・Water storage tank, underground pit・ deck・Concrete secondary products

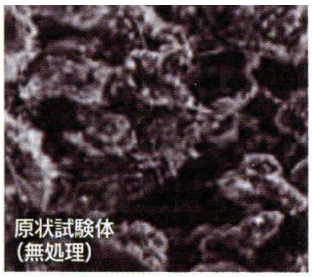
Permeation Process of Super Shield

When applied, Super Shield® permeates quickly down into concrete to about 20mm depth because of the microstructure of the solution and capillary phenomenon, and reaches to about 40mm depth in approximately 28 days (4 weeks).
As exposure continues, it further penetrates deeply into new and aged hardened concrete and protects reinforcing rods inside.

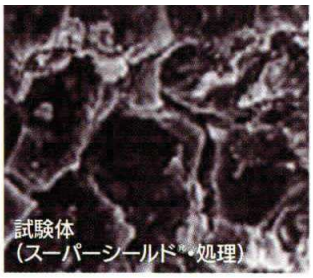
Permeation depth validation test
(reference test)

How far it goes as the test body dries is measured＝Applied plane: 44mm

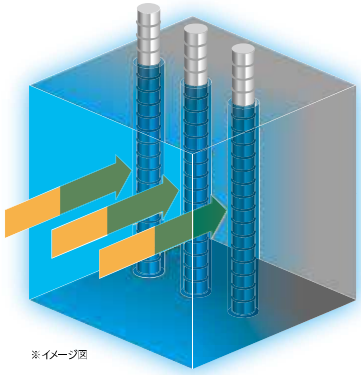
Observed by a scanning electron microscope (SEM)



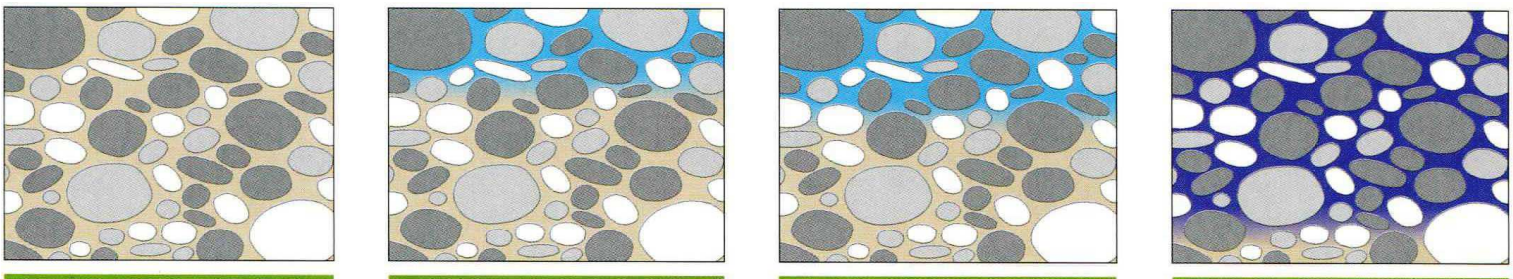
Test body in original state (untreated)



Test body (treated with Super Shield)



※Permeation depth of Super Shield® is defined as the depth of the interception layer against deterioration-causing factors, where condition differences is detected on the cleavage surfaces of Super Shield-treated and untreated test bodies.

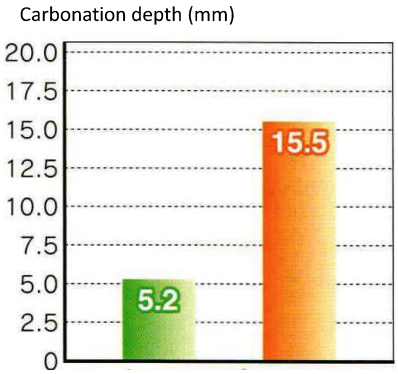


＊Super Shield fills in openings more deeply and densely as time elapses.

Carbonation

Super Shield protects new and aged hardened concrete (hardened cement paste) for a long period of time because it controls deterioration in two stages. First, it physically fills in micropores and openings in concrete, moatar, petrous media and other porous media to make them denser and keeps off deterioration-causing factors from the outside. Second, the solution has ionic permeability and protects concrete structures from within.

Carbonation Resistance Test Results



[Carbonation depth comparison: 33.55%]

[Control rate: 66.45%]

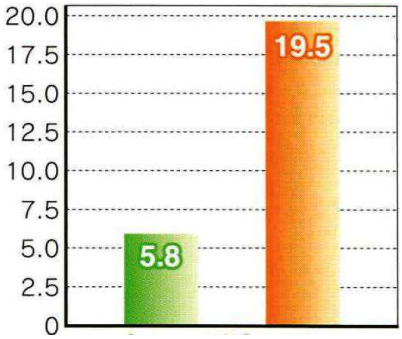
As the insoluble combined silicates (colloidal particles) go into the gaps and make the base material denser, deterioration-causing factors from outside (water, carbon dioxide gas, chlorides, etc.) cannot reach the inside. In this way, Super Shield prevents deterioration and makes new and aged hardened concrete (hardened cement paste) significantly more durable against carbonation.

Salt Damage

Chloride ions contained in salty sea breeze and snow melting agents (calcium chloride) get into hardened concrete and corrode the steel reinforcement inside.

Super Shield permeates new and aged hardened concrete (hardened cement paste) and increases the (OH-) inside. It reduces the corrosion limits of hardened concrete and controls steel reinforcement corrosion. It also controls the flowing out of calcium and stabilizes the alkalinity of hardened concrete. As a result, the passive film of the steel reinforcement inside stays sound and resists salt damage effectively.

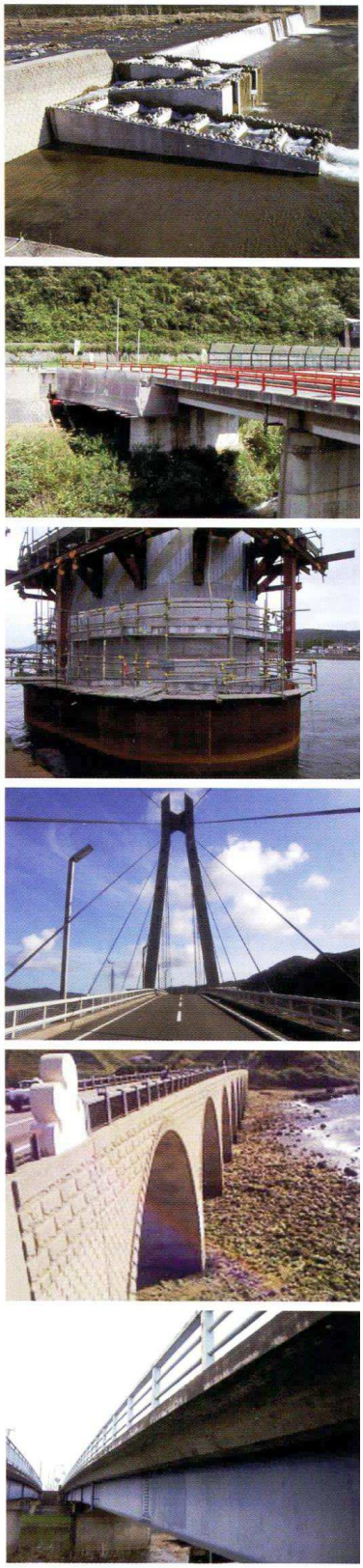
Chloride ion permeation resistance test



[Chloride ion permeation depth: 29.74%]

[Control rate: 70.26%]

Photographs of Tester Control and Use



Physical and chemical properties of Super Shield

＊Super Shield is an inorganic, colorless, nonpoisonous and non-combustible material.

○ Density: **1.08 (±0.3%)**/20℃(g/ml)

○ pH value: 12.20 (-1.0%)

○ Particle diameter: 1～50nm

Super Shield ingredients (compositional formula)

＊Main ingredients of Super Shield® are:

○ Main component: Na_2Sio_3 (sodium silicate)

○ Accessory component: K_2 Sio_3 (potassium silicate)

Pass Tester Surface Protection Method Application and Quality Control System

What is the Quality Control Tester?

The Quality Control Tester applies chemical test methods to measuring and recording of the colorless and transparent surface protection liquid

(for concrete durability improvement, crack repair). All that has to be done is to paste the Quality Control Tester on the surface of the concrete structure, follow the relevant standard application manual and apply the designated amount of the designated solution. The detection patches of the first and second applications will tell whether the work is done correctly (application control) and will store the record (quality control).

Usability of Quality Control Tester

① Application and quality control can be done in strict accordance to the manufacturer's operation standards. So, the benefits the manufacturer offers are assured.

② It can be combined with the on-site inspection of the contracting agency (supervisor). It offers an added value because it controls the application and quality of the work more effectively and uses a control method no conventional surface treatment method has ever had.

③ It offers an added value because it stores the data of application and quality control that can be used as evidence (data base) for post-audit (financial audit) and others.

④ It is precise. The color reaction range of the test patch is ＋0.001 to ＋0.002ml, and the detectable range is ＋4% to 14% (below the manufacturer's spraying loss limit of 15%) of standard application quantity.

⑤ Application speed and spraying quantity can be checked by visual inspection at every control point to minimize surface irregularity (shift from the "intuition-based" to "fact-based" approach).

⑥ Whether the manufacturer-designated application quantity has been applied can be checked (it can be customized to different surface protection methods).

Super Shield Operation Procedure

Cleaning/Rinsing
Use a high pressure washer or brush to remove dirt, if any.
＊Application is possible if the surface is slightly wet

↓

First Control Tester
One sheet/10m^2

↓

First Super Shield
applying 0.15 ℓ / m2

↓

Wet Curing
Let stand in a slightly sticky state. If it dries too quickly, sprinkle water as necessary.

↓

Second Control Tester
One sheet/10m^2

↓

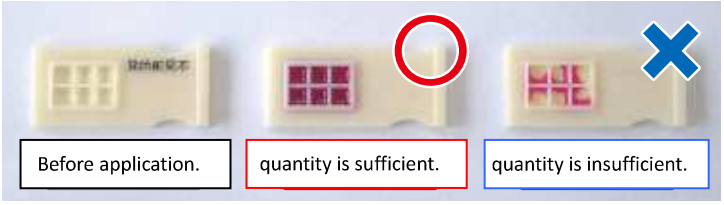
Second Super Shield
applying 0.10 ℓ / m2

↓

Wet Curing
Let stand in a slightly sticky state. If it dries too quickly, sprinkle water as necessary.

↓

Tidying up
Have the work checked by the supervisor or staff in charge.



Super Shield & Path Tester

After you read the instruction manual that came with your Path Tester and Super Shield always before installation, please use correctly and safely. Also, please note that it may change the specifications without notice.

■**For what is described in this standard construction specification, quotation, reprint without permission, replication, etc. is strictly prohibited.**

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