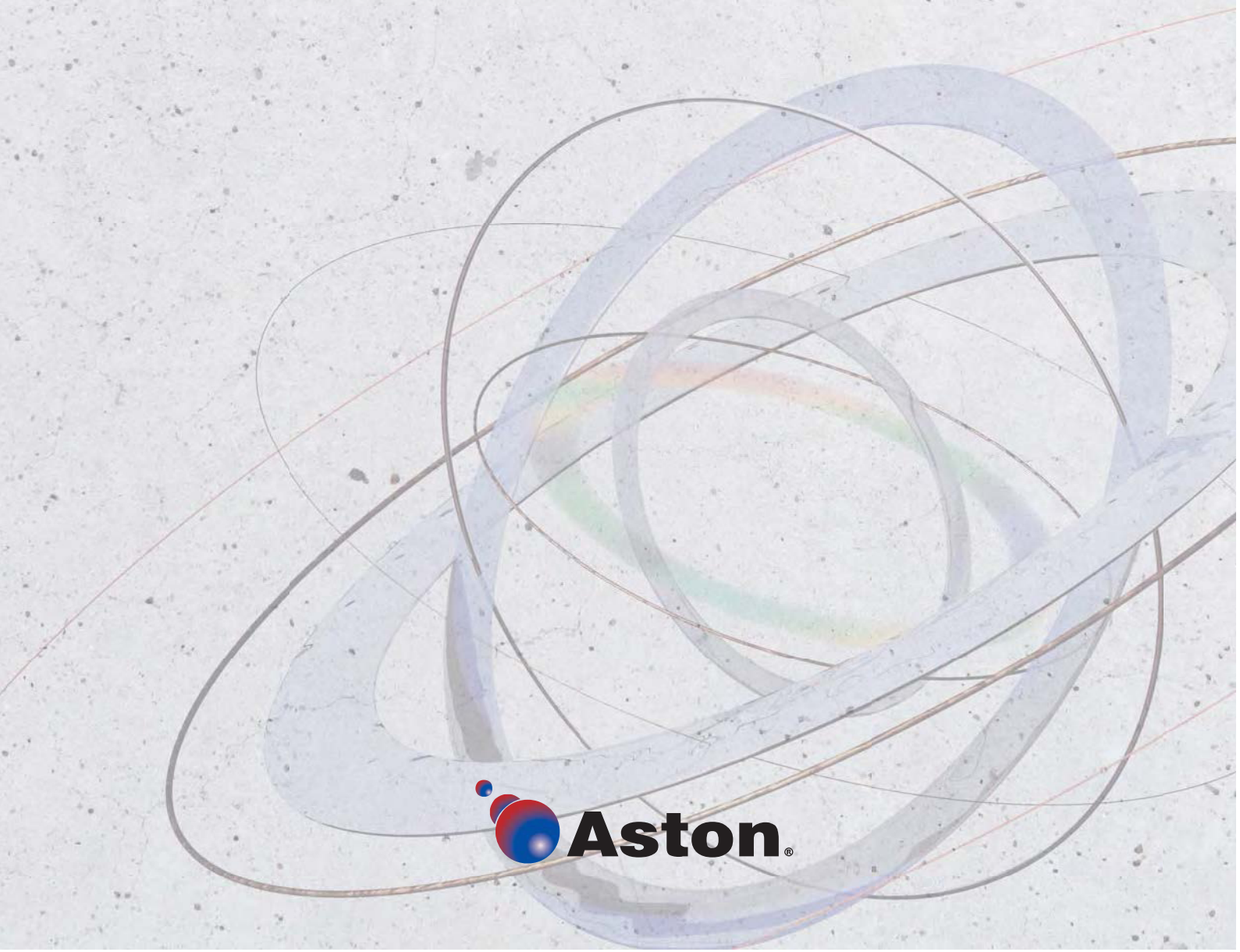
CS-21

CONCRETE RENOVATION

CS-21 Series Product Guide



Aston®

CS-21 Series Product Line
improves the durability of concrete structures and contributes to reduction of life cycle cost.

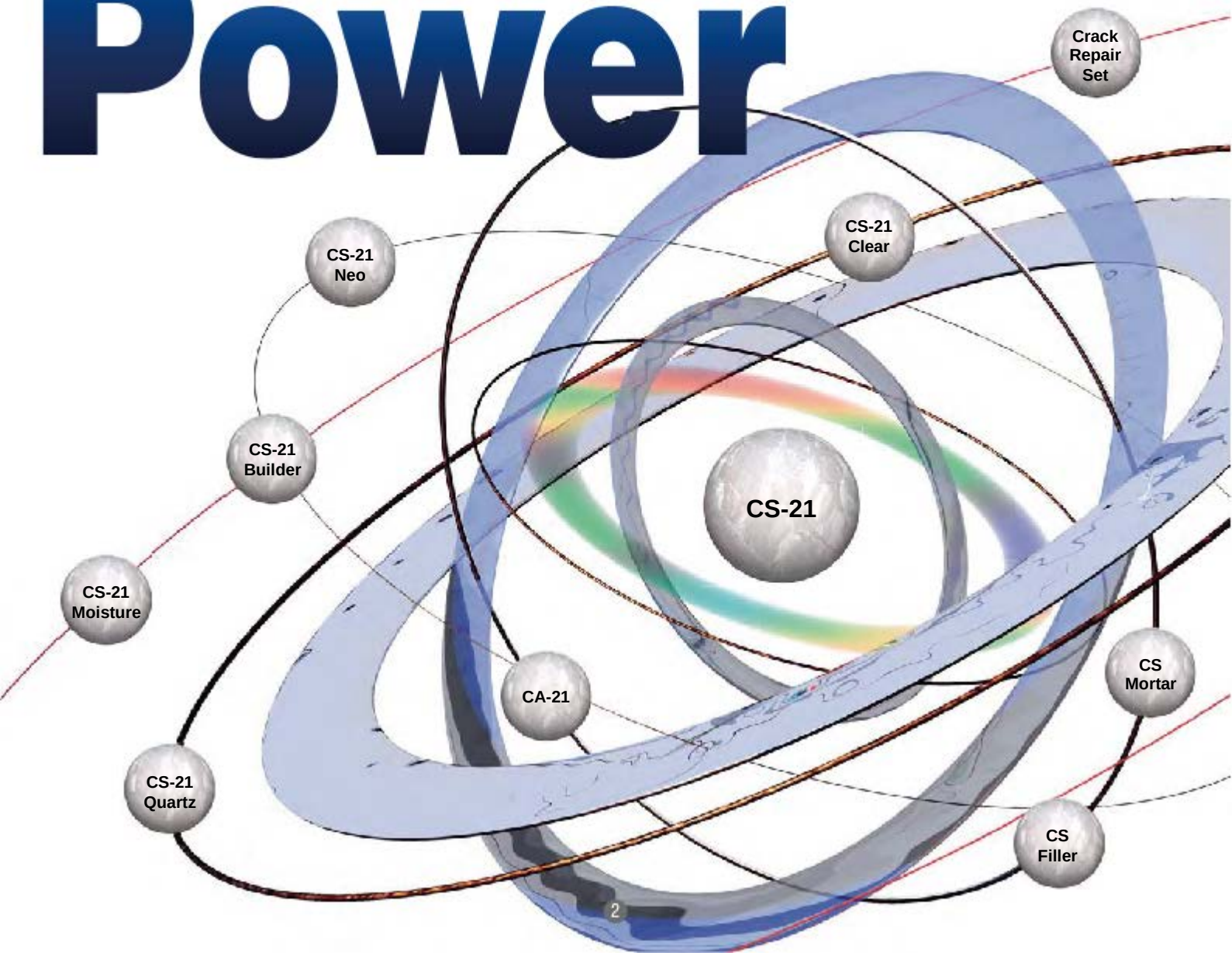
Concrete structures are indispensable for infrastructural development and economic growth. Developing the quality improvement technology has long been a challenge.
CS-21, which permeates the voids of concrete and densifies with products generated from reaction with cement component, was born from the on-site ingenuity to tackle the issue of stopping the water exuding from concrete.
Since then, it has been improved aiming to enhance the waterproof property and durability of concrete structures. Now, CS-21 Series product line is still being improved to meet various needs with the skills that can achieve desired outcomes.

CS-21 Series

● Intended Use	● Employed Product	● Application	● Method
Waterproofing of the concrete body	CS-21 (CSⅡMethod)	Waterproofing of parking lots, roofs, basements and water tanks	Coating or spraying
Protection of new surface	CS-21 Neo CS-21 (CS Ⅰ Method)	Measures for improving quality and durability	
Protection of existing surface	CS-21 Builder CS-21 (CSⅡMethod)	Preventive maintenance Long-life measures	
Protective decoration	CS-21 + CS Filler	Preventive maintenance, Long-life measures + decorative measures	
Crack repair	CS-21 CS-21 Crack Repair Set	Repair of minute cracks (When injection process is not necessary)	Coating or Filling
Leakage repair	CS-21 CS-21 Moisture CS-21 Quartz CS-21 + CA-21 (CS-21SP)	Water stop (In some cases, used with fine particle cement and/or auxiliary material)	Injection
Section repair	CS-21 Clear + CS Mortar	Reinforcing construction base of + Filling defective parts + Surface protection of filler	Coating and filling


コンクリート改質剤
CS-21
Neo
CS コンクリート改質剤 21
コンクリート補修材
CS-21
Builder
CS コンクリート改質剤 21
Moisture
CS-21Quartz
CA-21
コンクリート改質剤
CS-21
Clear

Power

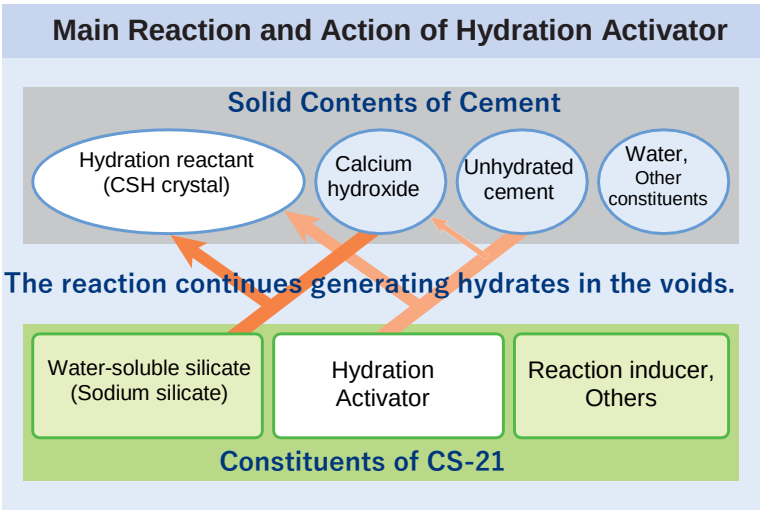

Crack Repair Set
CS-21 Clear
CS-21 Neo
CS-21 Builder
CS-21
CS-21 Moisture
CA-21
CS Mortar
CS-21 Quartz
CS Filler

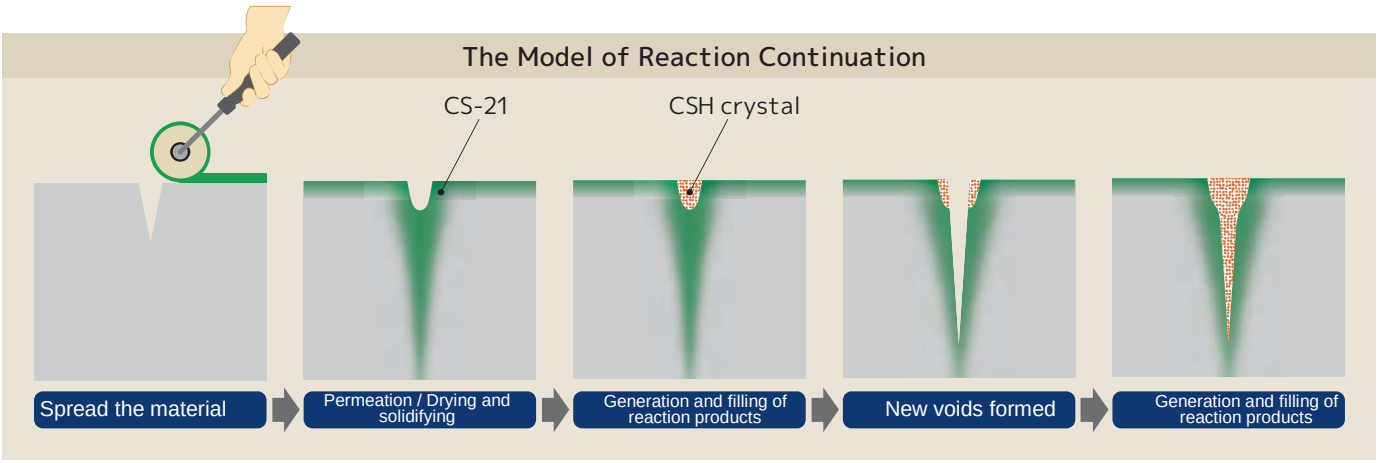
Background

The History and Evolution of Silicate-based Material

The silicate-based materials that densify concrete have been used in the countries in North Europe, North America and Australia since 1920's as waterproofing measures for concrete structures in civil engineering and construction.
In Japan, however, few people recognized the value, claiming that the effectiveness could not be verified just by the material or that the effectiveness would vary depending on the quality of the concrete body.
In 1993, Aston developed the Hydration Activator and established the unique construction technology that maximize its material performance, thus having built credibility and high performance not only in the field of concrete body waterproofing but also in the field of improving concrete structures.

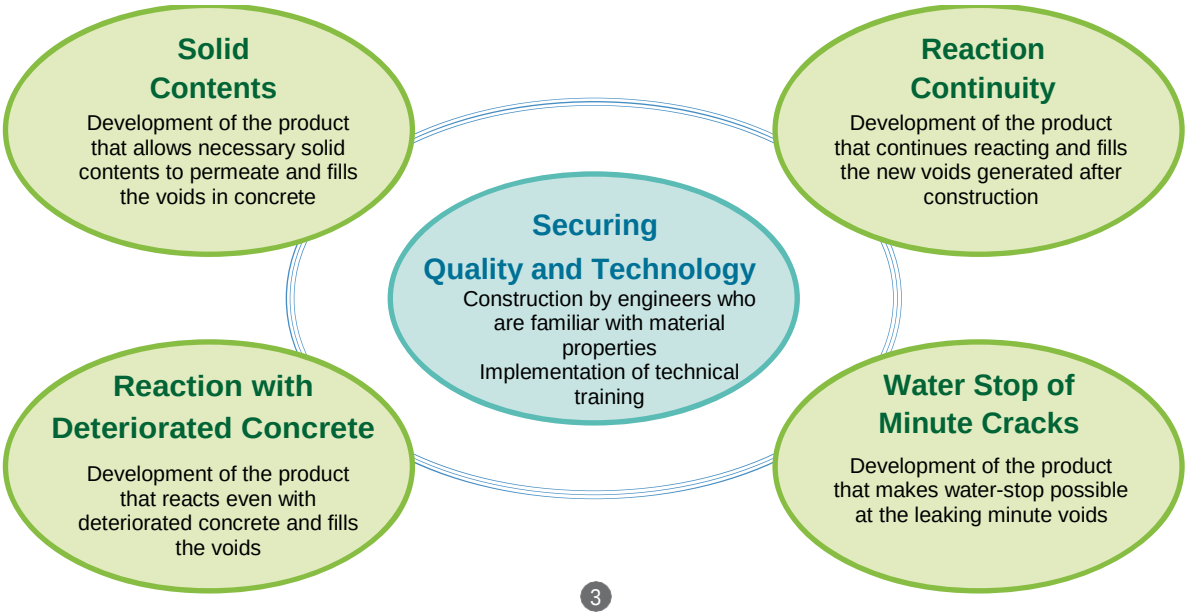
Main Reaction and Action of Hydration Activator





Performance

The Quality and Technical Capabilities Corresponding to Needs



Waterproofing Material of Concrete Body

CS-21

Reacts with calcium component in the concrete and fills the voids. Best for waterproofing the body of structures such as parking lots, roofs, basements and water tanks.

By applying and permeating hardened concrete, CS-21 generates stable reactant (CSH crystal) through reaction with calcium and other components in the concrete, filling up the voids.
It also fills the new voids formed after the work as the unreacted main constituent, even after dried and solidified, generates reactant when it dissolves with water. These reactions densify the voids at the surface as well as those at the deep parts, inhibiting entry of water and other deterioration factors on a long-term basis.

■ Product Outline

Appearance:	Colorless and transparent liquid
Main component:	Sodium silicate
Specific gravity (Density):	1.24 - 1.28 (g/㎤)
pH value:	11.3 - 12.3
Dry solid content:	31.5 - 33.5 (%)

■ Intended Use

Coating method:
Body waterproofing, surface protection, treatment of construction joint, crack repair, etc.
Injection method:
Water leakage repair, crack repair (by this product only or with cement materials)

5 kg plastic container　　2 kg plastic container

Reliable 10-Year Guarantee for Waterproofing Capability

We provide a 10-year guarantee for new waterproofing work on parking lots, roofs, etc.
Using undiluted, highly concentrated solution will enhance the filling rate. This product is effective with body waterproofing of parking lots, roofs, basements, water tanks, etc., and its effectiveness has been verified to last for more than 20 years through the follow-up inspections.
In utilizing the product, co-operations from the designer, the main contractor, the construction company, and the waterproofing company will be indispensable in order to construct water-tight concrete. (Please refer to the technical data “Waterproofing of Concrete Body.”)

Waterproof the body Improve durability

- Fills up minute voids and improves water-tightness
- Self-stop effect continues
- Inhibits entry of deterioration factors

Free design Fewer restrictions

- No restrictions from details
- Reduces loads on floor slabs
- Can be used for both exterior and interior waterproofing

Significant shortening of work period

- Can be completed in a shorter period of time
- Less likely to be affected by weather
- Shorter time to interfere with other work processes

Less aging deterioration Easier to manage

- As durable as concrete
- Abnormality can be visually checked
- Partial repair is possible
- Rework is easy

High Environmental performance and safety

- No environmental impact
- No harmful constituent
- Non-combustible and does not spread fire
- Can be used in the water facilities

Abundant experiences Long-term security

- Experienced with more than 20 years, or more than one million m^2, of body water-proofing

Test Results and Certification

■ **Waterproofing Effect**
The waterproofing effect has been confirmed through the Standard Test of Architectural Institute of Japan (JASS8 T-301(b) Quality Standard of Permeability coefficient).

■ **Surface Protection Effect**
The effects of water absorption, neutralization, chloride ion permeation, and scaling suppression has been confirmed through the Standard Test of Japan Society of Civil Engineering (JSCE-K571, K572).

■ **Safety**
The results of the test stipulated by the ordinance of MHLW based on Water Supply Act (JWWA Z108) show conformance to the evaluation standard as well as the safety of application on the concrete that the tap water directly contacts.

■ **Housing Warranty Insurance**
The applicable insurance companies for housing warranty based on the comprehensive three confirmations

- Anshin Insurance Co., Ltd.
- Organization for Housing Warranty Ltd. (Previously, Foundation of Housing Warranty)
- Japan Housing Insurance Inspection Organization, Co., Ltd. (JIO)
- House G-men Co., Ltd.
- House Plus Housing Insurance Co.,Ltd.

Surface Protecting Material for Newly Cast Concrete

CS-21 Neo

NETIS Registration No. CG-160013-VE Designated as Technology to be Promoted

Reaction type silicate-based surface penetrant

Suitable for improving quality and durability of newly cast concrete

Maintaining the basic performance of densifying the surface part with reactant generated by spreading and permeating hardened concrete, the permeability of this product is enhanced. As it can keep filling up minute cracks formed over time, it maintains the long-term integrity of concrete cover, improving the durability.

■ Product Outline

Appearance:	Colorless and transparent liquid
Main component:	Sodium silicate
Specific gravity (Density):	1.10 - 1.14 (g/㎤)
pH value:	11.0 – 13.0
Dry solid content:	15.0 – 20.0 (%)

■ Intended Use

Surface protection of newly cast concrete structure, etc.

- Range of application: Neutralization, Suppression of salt and/or freezing damages
- Out of application range: ASR, Chemical attack

20kg plastic container

■ **Surface Protection Effect**

The effects of water absorption, neutralization, chloride ion permeation, and scaling suppression has been confirmed through the Standard Test of Japan Society of Civil Engineering (JSCE-K572)

■ **Safety**

The results of the test stipulated by the ordinance of MHLW based on Water Supply Act (JWWA Z108) show conformance to the evaluation standard as well as the safety of application on the concrete that the tap water directly contacts.

NETIS Registration Information (Summary)

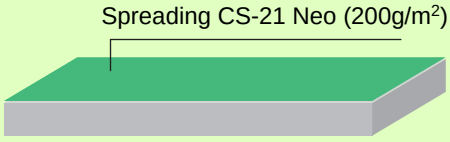
Name of Technology: Sodium silicate-based Surface Penetrant CS-21 Neo
Alternative Title: Surface Protection of Newly Cast Concrete Structures
Outline:

1. What is this technology for?
   The surface penetrant intended for surface protection of newly cast concrete structures. By spreading and permeating hardened concrete, at an early stage, dry solid contents and the reactant generated densifies the surface part. In the long term, it fills up minute cracks and voids as the unreacted main component continues reacting with calcium hydroxide.
2. What technology was used previously?
   Surface penetrant method (Reaction type silicate surface penetrant method)
3. Where in public works can it be applied to?
   Surface protection of concrete of newly built structures.
   Examples: Bridges, box culverts, dams, and buildings

Innovation and Expected Effects:

1. What is its novelty? (The improvement from traditional technologies)
   In this new technology, the construction process is simplified and the operability is improved by the enhanced permeability of the material.
2. What effect is expected?
   (The merit of using this new technology)
   Price reduction of the material and improved operability can shorten work period and reduce cost.

Schematic Diagram of Application Method



Surface Protecting Material for Existing Concrete

CS-21 Builder

NETIS Registration No. CG-1170009-A

Two-liquid mixing type, reaction type silicate-based surface penetrant achieves the long-life of existing concrete.

CS-21 Builder is a two-liquid mixing type, reaction type sodium silicate-based surface penetrant that is mixed with supplemental chemicals whose main component is calcium hydroxide, which tends to lack in existing concrete.
It keeps the liquid state for some time after mixing and stays in the permeated voids as gel, continuing to generate reactants, and thus achieving long-life of concrete by filling up newly formed minute cracks and voids.

■ Physical Property of the Liquid Mixture

Appearance:	White or pale pink liquid
Main component:	Sodium silicate (Main agent) Calcium Hydroxide (Auxiliary)
Specific gravity (Density):	1.18 - 1.22 (g/㎤)
pH value:	11.0 – 13.0
Distillation residue:	25.0 – 29.0 (wt%)

■ Intended Use

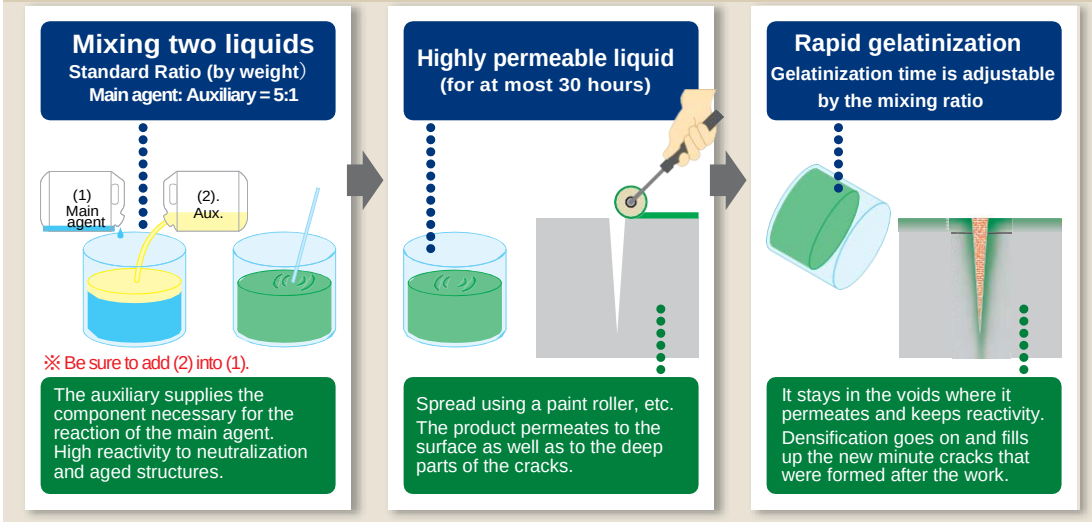
Surface protection of existing concrete structure, Crack repair, etc.

- Range of application: Neutralization, Suppression of salt and/or freezing damages
- Out of application range: ASR, Chemical attack

Main agent:
5 kg plastic container

Auxiliary:
4 kg plastic container

The Model Reaction of CS-21 Builder



NETIS Registration Information (Summary)

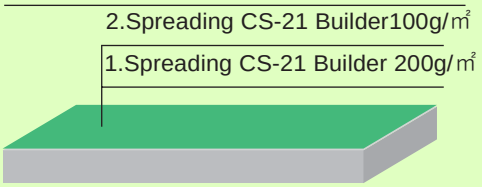
Name of Technology: Two-liquid mixing type silicate-based Surface Penetrant CS-21 Builder
Alternative Title: Surface Protection of Existing Concrete Structures
Outline:

1. What is this technology for?
   The surface penetrant intended for surface protection of existing concrete structures where neutralization is advancing.
   By spreading on hardened concrete and permeating, the penetrant, which is consisted of main and auxiliary agents, fills up minute cracks and voids; the main agent of which densifies the surface part with reactant from the calcium component in the concrete and from that supplied from the auxiliary agent, and the auxiliary agent of which has the function of supplying calcium hydroxide that tends to decrease over time.
   In the long run, longer life can be expected as the unreacted main component continues reacting with calcium hydroxide.
2. What technology was used previously?
   Surface penetrant method of applying silicate-based surface penetrant and the auxiliary separately.
3. Where in public works can it be applied?
   Surface protection of concrete of existing structures in repair work.
   Examples: Bridges, tunnels, box culverts, dams, and buildings

Innovation and Expected Effects:

1. What is its novelty? (The improvement from traditional technologies)
   By applying mixed penetrant instead of applying two kinds of liquid separately, the construction process can be simplisied and the operability is improved.
   Apply and permeate it while its viscosity is low and the permeability is high just after mixing. After a certain time, it gelatinates and shows good retention in the voids.
2. What effect is expected?
   (The merit of using this new technology)
   The improved operability with the 2-liquid mixing type can shorten work period and reduce cost.

Schematic Diagram of Application Method



Injecting Water Stop Material

CS-21 Moisture

CS-21 with higher concentration and viscosity.
Suitable for repairing water leakage by high pressure injection.

Maintaining the basic performance of CS-21, this product is more concentrated and thus has more reactive component. That shortens the reaction time with calcium component in the concrete, making it suitable for water stop works in a shorter time period.
As it is highly viscous, it is less likely to disperse and has better water retention curing property. This is the most suitable injecting water stop material for high pressure injection.

■ Product Outline

Appearance:	Colorless and transparent liquid
Main component:	Sodium silicate
Specific gravity (Density):	1.27 - 1.31 (g/㎤)
pH value:	11.6 – 12.6
Solid dry content:	34.5 – 39.5 (%)

■ Intended Use

Injecting water stop material in high pressure injection in repairing water leakage

5 kg plastic container

Injecting Water Stop Material

CS-21 Quartz

The reactivity of CS-21 has been further improved.
Suitable for repairing water leakage of concrete structures whose material is aged.

Calcium component in the concrete is gradually lost over time, causing neutralization. In such old buildings, reaction with calcium component becomes less reactive and reactants become less likely to be generated. Keeping the basic performance of CS-21, CS-21 Quartz further improves the reactivity with the concrete where neutralization is advanced.

■ Product Outline

Appearance:	Colorless and transparent liquid
Main component:	Sodium silicate
Specific gravity (Density):	1.16 - 1.20 (g/㎤)
pH value:	10.4 – 11.4

■ Intended Use

Injecting water stop material in repairing water leakage in neutralizing concrete.
(Not suitable for coating method)

5 kg plastic container
450 g cartridge

Concrete Renovation Auxiliary Material

CA-21

Shows the power in water stop work of existing concrete.
The auxiliary material to be mixed with CS-21.

The amount of calcium hydroxide in the concrete gradually decreases over time.
CA-21, whose main component is calcium hydroxide, works on such existing concrete, when mixed with CS-21.
Injection method: Auxiliary material for crack repair.

■ Product Outline

Appearance:	White or pale pink liquid
Main component:	Calcium hydroxide
Specific gravity (Density):	1.02 - 1.06 (g/㎤)
pH value:	12.8 – 13.8

■ Intended Use

Materials for water stop and/or crack repair

4 kg plastic container

Crack Repair Material

CS-21 Crack Repair Set

NETIS Registration No. CG-110003-VE Designated as Technology to be Promoted

The set for repairing cracks on concrete to renovate the aesthetic appearance. The putty in three colors can make the repaired part less noticeable.

CS-21 Clear densifies the inner part of cracks and inhibits entry of water and deterioration factor.
CS Putty is a dry hard type inorganic material that is close to concrete. Rubbing into minute voids, It fills up the voids and recovers the aesthetic appearance inconspicuously.

■ Product Outline: CS-21 Clear
Appearance: Colorless and transparent liquid
Main component: Sodium silicate
Specific gravity (Density): 1.05 (g/㎤) or higher
pH value: 11.3 or higher
■ Product Outline: CS-21 Putty
Appearance: Gray paste
Main component: Calcium carbonate, silicon oxide, lithium silicate
Specific gravity (Density): 1.9 (g/㎤) or higher
pH value: 10.5 or higher
■ Intended Use
Water leakage repair other than injection method,
Sealant for injecting into cracks, etc.

Priming Treatment and Surface Protection Material

CS-21 Clear

Densifies the concrete surface. Suitable for surface preparation before renovation, using polymer-cement mortar, etc.

When polymer-cement mortar is used for repairing concrete cracks or section, CS-21 Clear will accomplish more effective repair finish by densifying the base.
It can also shorten work periods as it is not necessary to sprinkle water before and after applying the material. Furthermore, it can be used for surface protection of concrete section repair material.

■ Product Outline
Appearance: Colorless and transparent liquid
Main component: Sodium silicate
Specific gravity (Density): 1.05 - 1.09 (g/㎤)
pH value: 11.3 – 12.3
■ Intended Use
Surface preparation material for repairing concrete section,
Surface protection of concrete section repair material

20 kg plastic container

Concrete Section Repair / Surface Coating Material

CS Mortar #100PS #100P CS Filler #120P

The polymer-cement mortar that exerts its great power in repairing concrete section of lost parts in the structure and coating concrete surface.

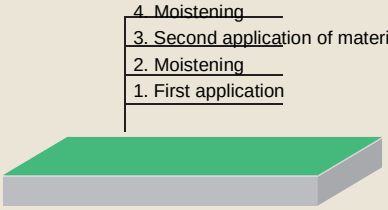
CS Mortar and CS Filler are pre-mixed products that can make stable polymer-cement mortar by mixing with water and kneading on-site.
CS Mortar is reinforced with fibers, having enough resistibility against cracks and abrasion.
The rapid hardening type, #100PS, achieves practical strength in a short time.
With CS Filler, it is easy to make flat and smooth finish with the thickness of 1 -2 mm.
It can be applied easily by spreading with trowel, paint roller, and/or brush, or spraying.

CS Mortar #100PS 25 kg
CS Mortar #100P 25 kg
CS Filler #120P 25 kg

Method

Construction Method

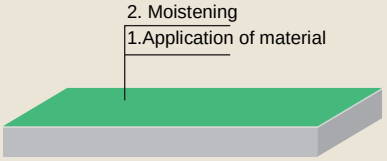
Coating Method (Double Application/CSII Method)



Cleaning
Moisture control of the surface
Application (First time)
Moistening (First time)
Application (Second time)
Moistening (Second time)

Main material
CS-21 / CS-21 Neo / CS-21 Builder

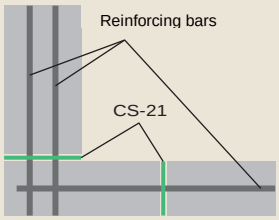
Coating Method (Single Application/CSI Method)



Cleaning
Moisture control of the surface
Application of material
Moistening

Main material
CS-21 / CS-21 Neo / CS-21 Builder

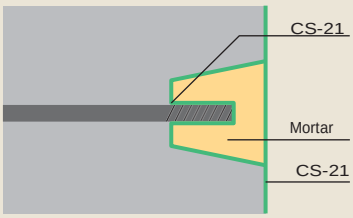
Waterproofing of Construction Joints



Cleaning
Moisture control of the surface
Application of CS-21
Moistening
Concrete placement

Main material
CS-21

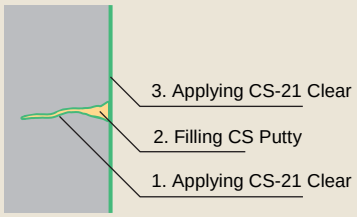
Waterproofing of Imprinted Hole for Separator End



Cleaning
First application of CS-21
Filling mortar
Second application of CS-21
Moistening

Main material
CS-21

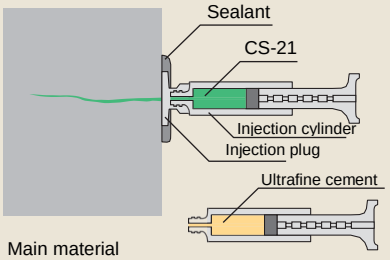
Crack Repair (Coating + Filling)



Priming treatment
Application of CS-21Clear (First time)
Filling CS Putty
Application of CS-21Clear (Second time)

Main material
CS-21 Crack Repair Set

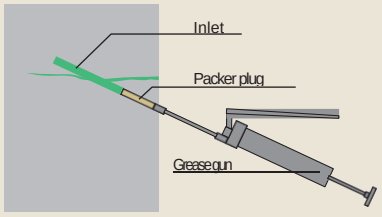
Crack Repair (Low Pressure Injection)



Priming treatment
Fitting injection plug
Crack sealant
Injection of CS-21
Injection of ultrafine cement
Removing injection plug
Application of CS-21
Moistening

Main material
CS-21

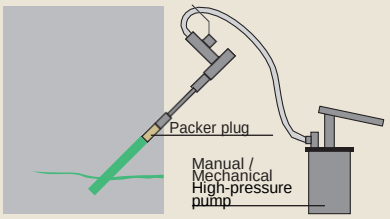
Water Leakage Repair (Injection)



Priming treatment
Drilling inlet
Fitting packer plug
Injecting material
Removing plug head
Application of CS-21
Moistening

Main material
CS-21/CS-21SP/CS-21 Quartz

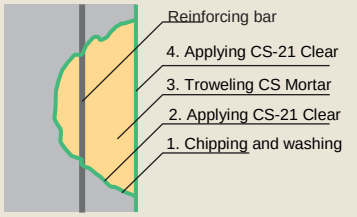
Water Leakage Repair (High Pressure Injection)



Priming treatment
Drilling inlet
Fitting packer plug
Crack sealant
Injection of material
Injection of ultrafine cement
Removing plug head
Application of CS-21
Moistening

Main material
CS-21/CS-21SP/CS-21 Moisture

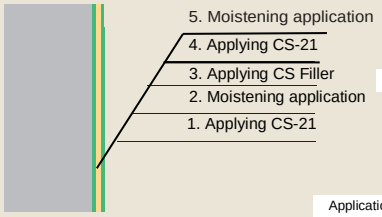
Section Repair



Chipping and washing
Application of CS-21Clear (First time)
Filling CS Mortar, Coating
Application of CS-21Clear (First time)

Main material
CS-21 Clear + CS Mortar

Protective Decoration



Cleaning
Moisture control of the surface
Application of CS-21 (First time): Body
Moistening (First time): Body
Application of CS Filler
Moisture control of the surface
Application of CS-21 (Second time): Coating material
Application of CS-21 (Second time): Coating material

Main material
CS-21 + CS Filler

Results

Rich Experience of Construction Nationwide for More Than 20 Years
























Aston®

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※For more details, please refer to other documents, such as “Products and Summary of Methods,” “Technical Documents,” “Procedure Manual for Construction,” “Performance Table,” and so on.