



To Sustain Rich Global Environment

Basic approach

With the increasing momentum of ESG, SDGs and carbon neutrality, companies are required to make a higher level of effort than ever before to respond to global climate change. The Group aims to achieve a high level of balance between solving environmental issues, including realizing a decarbonized and recycling-oriented society and conserving biodiversity, and ensuring the sustainable development of its business. To these ends, the Group has set up the Environmental Management Committee that deliberates on and examines group-wide initiatives to address general environmental issues including climate change and the evaluation and review of such initiatives. The Group also manages environmental measures and ensures the implementation thereof from a sustainability perspective.

Environmental policy and our environmental management system

The Group acquired the certification for integrated management system including environmental management system (ISO 14001) in February 2012, in addition to the certification for quality management system (ISO 9001) that has been implemented. Five efforts are specified in our environmental policies that form the backbone of our environmental management system. Under those policies, we promote the development and provision of eco-friendly products and construction methods, while implementing activities such as reducing wastes, saving natural resources and energy, and recycling, with of course complying with laws and regulations in mind.

Environmental Policies

As a corporate group that is indispensable for creating “roads,” we will strive to preserve the global environment, improve the local living environment and contribute to the realization of a sustainable society. To these ends, we will promote environmental management and make the following efforts.

April 1, 2025

Manabu Obata, Representative of Nichireki Group

1. We comply with environmental laws and regulations, and promote an environmental management system.
2. We promote the reduction of waste products, saving of natural resources, energy conservation, and recycling activities.
3. We develop eco-friendly products and construction methods, and provide them to society.
4. We promote environmental protection activities and strive to prevent pollution.
5. We strive to further improve environmental awareness through education and business activities to reduce the impact on our environment.

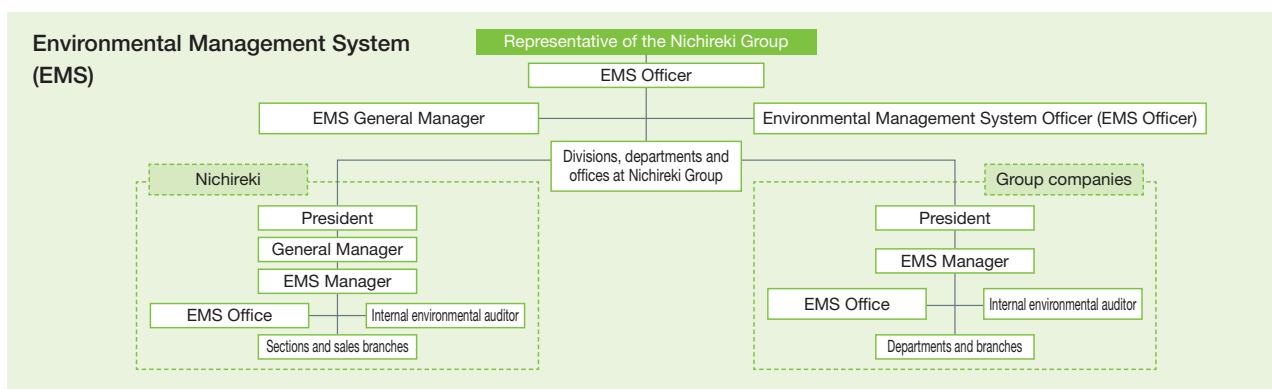
ISO Certificate of Registration (Union of Japanese Scientists and Engineers ISO Registration Center)



Medium- to long-term targets

Item	FY2022 results	FY2023 results	FY2024 results	FY2025	FY2043	SDGs mapping
Sales ratio of eco-friendly products and construction methods*	23.9%	22.2%	22.3%	30% or more	80% or more	     

* Eco-friendly products and construction methods refer to those more conscious of environment than existing ones. Sales ratio refers to a ratio to consolidated net sales.



Realization of a decarbonized and recycling-oriented society 足るを以て循環する

The Nichireki Group has always worked to create eco-friendly roads by developing cold paving using asphalt emulsion. In addition to our conventional efforts, in recent years, we have contributed to further reducing CO₂ emissions and realizing a decarbonized society by providing value through *Tastainability*[®] products and construction methods ▶ P.31. Such efforts include reducing the temperature of mixture production using modified asphalt for warm mix, extending the lifespan of pavements through the use of highly durable materials, and making effective use of resources through recycling. As one of our goals, by FY2043, the 100th anniversary of our founding, we aim to achieve a consolidated sales ratio of eco-friendly, high-value-added products and construction methods exceeding 80%.

In our day-to-day business activities, we are focusing on initiatives to reduce environmental impact. For example, we promote resource reuse by thoroughly sorting waste within the office and switching to green electricity in our offices and plants. We will further accelerate our efforts toward the realization of carbon neutrality (eliminating net emissions of greenhouse gases including CO₂) by 2050.

Conservation of biodiversity

Forest thinning is an effort that contributes to the conservation of biodiversity. Felling trees at appropriate intervals in a dense forest allows enough sunlight to reach the trees to form a healthy forest, which enables to protect the habitats of diverse living organisms living in the forest. Timber from forest thinning is used in various ways; however, there are also cases where unused forest-thinning materials are incinerated for disposal. Nichireki uses such forest-thinning materials for promenades in parks as ASWOOD paving ▶ P.42, which blends harmoniously with the surrounding nature, by crushing the materials and mixing them with asphalt emulsion, thereby promoting the recycling of forest-thinning materials and protecting ecosystems.

Promoting construction methods such as heat-blocking paving ▶ P.41, which contributes to mitigating the urban heat island effect, and soil-based paving, which has excellent water retention properties, also helps conserve the living environment for animals and plants.

Moreover, we have also been contributing to the conservation of ecosystems from a perspective of community activities by, for example, proactively participating in various activities, including cleaning and greening of roads and rivers in the regions across Japan where our offices are located.



ASWOOD paving

Environmental information disclosure

Nichireki Group recognizes the preservation of the global environment as one of its management material issues and is advancing the disclosure of information regarding its environmental initiatives. Disclosure based on the TCFD^{*1} recommendations has been continuously provided in the Integrated Report ▶ P.29. Additionally, we respond to the CDP^{*2} questionnaire, and in FY2024 received a B rating for climate change. The CDP score is evaluated on an eight-level scale (A, A-, B, B-, C, C-, D, D-). A "B" rating is the third-highest, indicating that the company has been evaluated at the "Management Level," demonstrating effective management and action regarding its environmental impacts.

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES



^{*1} TCFD refers to the Task Force on Climate-related Financial Disclosures, established by the Financial Stability Board (FSB), an institution composed of financial ministries and central banks from various countries that oversees international financial matters, at the request of the G20 to examine how climate-related information should be disclosed and how financial institutions should respond. In June 2017, the TCFD released its final report, recommending that companies and other entities disclose information on climate-related risks and opportunities in the areas of "governance," "strategy," "risk management," and "metrics and targets."

^{*2} CDP, formerly Carbon Disclosure Project which originated in the U.K. in 2000, is an international environmental non-profit organization that operates a global environmental disclosure system. Specifically, in response to requests from investors, companies, governments, and other entities worldwide, CDP sends environmental questionnaires to companies, provides an information disclosure platform, and conducts scoring and analysis of the responses.

Information disclosure based on TCFD recommendations

The Nichireki Group considers addressing the impact of climate change on its business to be one of its key managerial challenges. Accordingly, we support the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and proactively take measures against climate change.

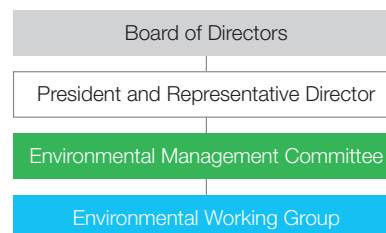
We clarify the impact on our business of the risks and opportunities brought about by climate change and take measures, thereby improving our business continuity, contributing to a sustainable society, and enhancing our corporate value.



Governance

At Nichireki Group, the Board of Directors deliberates on and resolves key matters such as a basic policy for addressing general environmental issues including climate change. In particular, the Environmental Management Committee, chaired by the President and Representative Director and comprised of General Managers of Planning, Corporate, Business Strategy, and Technology Development Strategy Divisions, deliberates on and examines how to address significant environmental issues affecting the entire Group. Such deliberated and examined issues are ultimately presented to the Board of Directors. The Board of Directors is reported and reviews each year the business risks and growth opportunities related to environmental issues as well as the progress of environmental management.

Governance system diagram



Risk Management

At Nichireki Group, the above-mentioned Environmental Management Committee has a group-wide risk management system that regularly monitors climate change-related risks. In addition, we will seek to advance our approach of appropriately identifying and examining material risks that could significantly impact our business management by, for example, improving our scenario analysis and assessment so as to sufficiently hedge tail risk (the risk of an event with a small probability of happening but could cause enormous losses if once happened).

Strategy

The Group identifies climate change-related risks and opportunities from short-term and medium- to long-term perspectives. The Group also performs two types of scenario analysis—the 2°C scenario with the assumption that the goals of the Paris Agreement adopted in 2016 will be achieved and the 4°C scenario with the assumption that no additional policy responses will be provided—, assesses the level of impact of such risks and opportunities on its business, and considers countermeasures. We will assess the resilience of the countermeasures on an ongoing basis and consider new countermeasures as necessary.



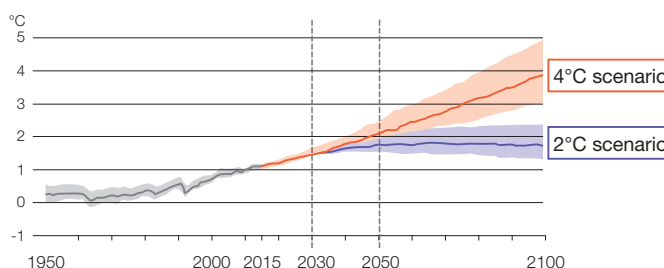
2°C scenario

A scenario assuming that countries around the world will have stricter regulations and policies toward decarbonization and accordingly take stricter measures against climate change, and that the increase in the global average temperature will be limited to below 2°C above pre-industrial levels.

4°C scenario

A scenario assuming that countries around the world will neither introduce any additional regulations or policies nor take sufficient measures against climate change and that the increase in the global average temperature will be 4°C above pre-industrial levels.

Projected global average surface temperature change (relative to the average of 1850 to 1900 period)



While 2°C and 4°C scenarios show a nearly identical change in temperature up until 2030, the gap between the two scenarios widens after 2030

Source: Intergovernmental Panel on Climate Change (IPCC), Sixth Assessment Report (AR6), Synthesis Report (SYR), Figure SPM.4 (a)

The Nichireki Group's risks and opportunities expected, financial and business impact levels assessed, and countermeasures based on the scenarios are as shown in the table below.

Classification	Type	Risks and opportunities expected	Financial and business impact		Countermeasures
			2°C	4°C	
Transition risks	Policies, laws and regulations	- Limitation of our business activities due to greenhouse gas emissions regulations - Increase in facility costs due to greenhouse gas emissions regulations - Cost increase due to the introduction of carbon tax	High	Medium	- Purchase low-carbon fuel and green power, and install solar panels - Develop low-carbon manufacturing methods and construction methods as well as construction technology, etc. (e.g., cold paving materials, robotic construction) - Promote the innovation of manufacturing processes (at the Tsukuba Big Ship and other sites) - Use low-carbon vehicles and equipment, etc.
	Technology	- Mandatory use of alternative materials and recycled materials - Intensifying competition in technology development toward the creation of a decarbonized society	High	Medium	- Develop products and construction methods using sustainable materials - Put more effort into developing low-carbon products and construction methods
	Market	- Increase in procurement costs due to soaring petroleum based raw materials - Increase in waste disposal cost	High	Medium	- Consider increasing raw materials suppliers or narrowing down the current raw materials suppliers - Examine and develop alternative materials - Promote recycling
	Reputation	Changes in reputation of our efforts to address climate change among investors and consumers	High	Medium	Put more effort into making propositions of low-carbon products and construction methods and developing them
	Physical risks				
Physical risks	Acute	- Increase in the costs of restoring our production facilities and logistics infrastructure if being severely damaged during extreme weather events - Suspension of production and shipment due to the difficulty of obtaining raw materials resulting from extreme weather events	Medium	High	Strengthen business continuity planning (BCP) in our manufacturing sites and supply chain
	Chronic	Decrease in productivity with increasing temperature during summer	Medium	High	- Improve a work environment by using air-conditioning clothing, power assist suits, etc. - Promote labor-saving practices by using IoT, AI, robots, and other solutions
Opportunities	Products and services	Increases in needs for products and construction methods adapted to climate change and opportunities for receiving orders	High	Medium	Put more effort into making propositions of low-carbon products and construction methods and developing them in response to changes in the needs of road administrators and users
	Resilience	Increase in infrastructure resilience needs amid intensifying and more frequent natural disasters	High	Medium	- Expedite the development of products and construction methods that help prevent and mitigate disasters - Promote our one-stop solutions business that comprises all the processes from design and proposal based on survey, diagnosis and prediction with the use of IoT and AI to manufacture and sales followed by construction and management
	Resource efficiency	Reduction in operating costs with increase in productivity through the innovation of manufacturing processes	High	Medium	Install more productive manufacturing equipment that uses IoT and AI (at the Tsukuba Big Ship and other sites)

Metrics and Targets

The Group has set the long-term target of achieving net-zero greenhouse gas emissions across its value chain by 2050. Taking into account the goal set by the government of “aiming to reduce greenhouse gas emissions by 46% (from FY2013) by 2030,” the Group has also set the medium-term target of “reducing Scope 1 and 2* greenhouse gas emissions by 50% (from FY2013) by FY2030.”

To achieve these targets, we will promote technological innovations in manufacturing methods and others, the purchase of green power and the installation of solar panels. In the medium and long run, we will also proactively use vehicles and equipment that use low-carbon and decarbonized fuels, hydrogen and electricity. Furthermore, we will work at increasing sales of eco-friendly products such as longer-life and warm mix modified asphalt and other paving materials, and encouraging the development of new low-carbon cold-laid paving materials and construction technology.

As for Scope 3, we are working to calculate the amount of CO₂ emissions for each category and will continue to consider specific reduction measures together with those for Scope 1 and 2.

Nichireki Group's CO₂ emissions

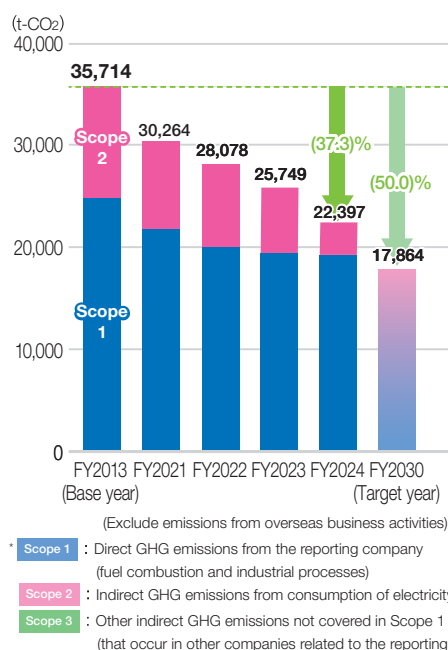
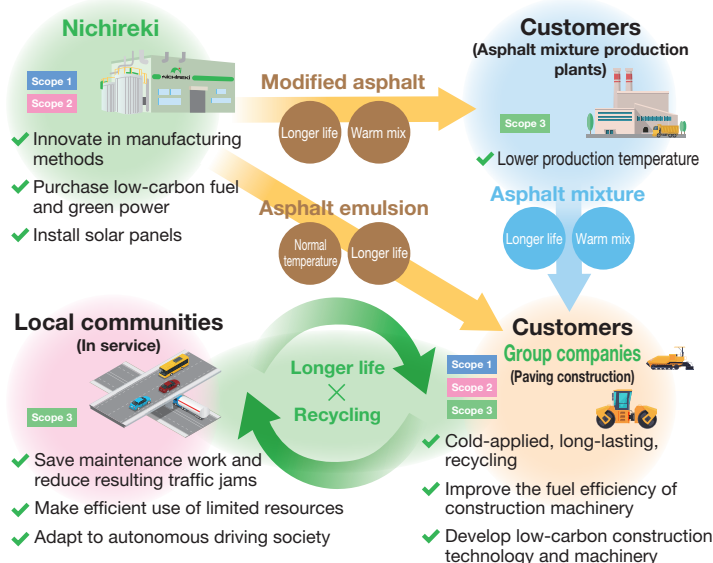


Image diagram of CO₂ reduction in our business model



Eco-friendly Products and Construction Methods

The Nichireki Group contributes to conserving the living environment, the local environment, and even the global environment through the provision of eco-friendly products and construction methods. We have long been working to create eco-friendly roads by offering products and construction methods, such as asphalt emulsions, that can be handled at normal temperatures. Looking ahead, we will contribute to environmental conservation at a higher level, including further reduction

Nichireki's Eco-friendly *Tastainability*[®] Products and Construction Methods

Global Environment

Local Environment

Living Environment

Building recycling-oriented society

- Wood chip paving (ASWOOD paving ▶ P.42) *for sidewalks Low carbon Recycling Normal temperature Safety and security
- On-site base course recycling construction method (STABI-CEMENT RC construction method ▶ P.33) Low carbon Long lasting Recycling Normal temperature
- Modified asphalt for warm mix recycled mixture (CLEANPHALT AF/AFH, CLEANPHALT SAR/SAH) Low carbon Recycling Warm mix
- Modified asphalt for recycled mixture (AF PHALT/H, TOUGHPHALT SUPER RV) Low carbon Recycling

Groundwater recharging

- Wood chip paving (ASWOOD paving ▶ P.42) Low carbon Recycling Normal temperature Safety and security
- Permeable stone paving (COLORPHALT TO) *for sidewalks Low carbon Normal temperature Safety and security

Ecosystem conservation measures

- Heat-blocking paving (THERMOTEC construction method ▶ P.41) Low carbon Normal temperature Safety and security
- Soil-based pavement (Polycamic construction method) *for sidewalks Low carbon Normal temperature Safety and security
- Water-retentive paving (AQUASPAVE construction method) Safety and security

Mitigating the rise in surface temperature of roads

- Heat-blocking paving (THERMOTEC construction method ▶ P.41) Low carbon Normal temperature Safety and security
- Soil-based pavement (Polycamic construction method) *for sidewalks Low carbon Normal temperature Safety and security
- Water-retentive paving (AQUASPAVE construction method) Safety and security

Ensuring traffic safety

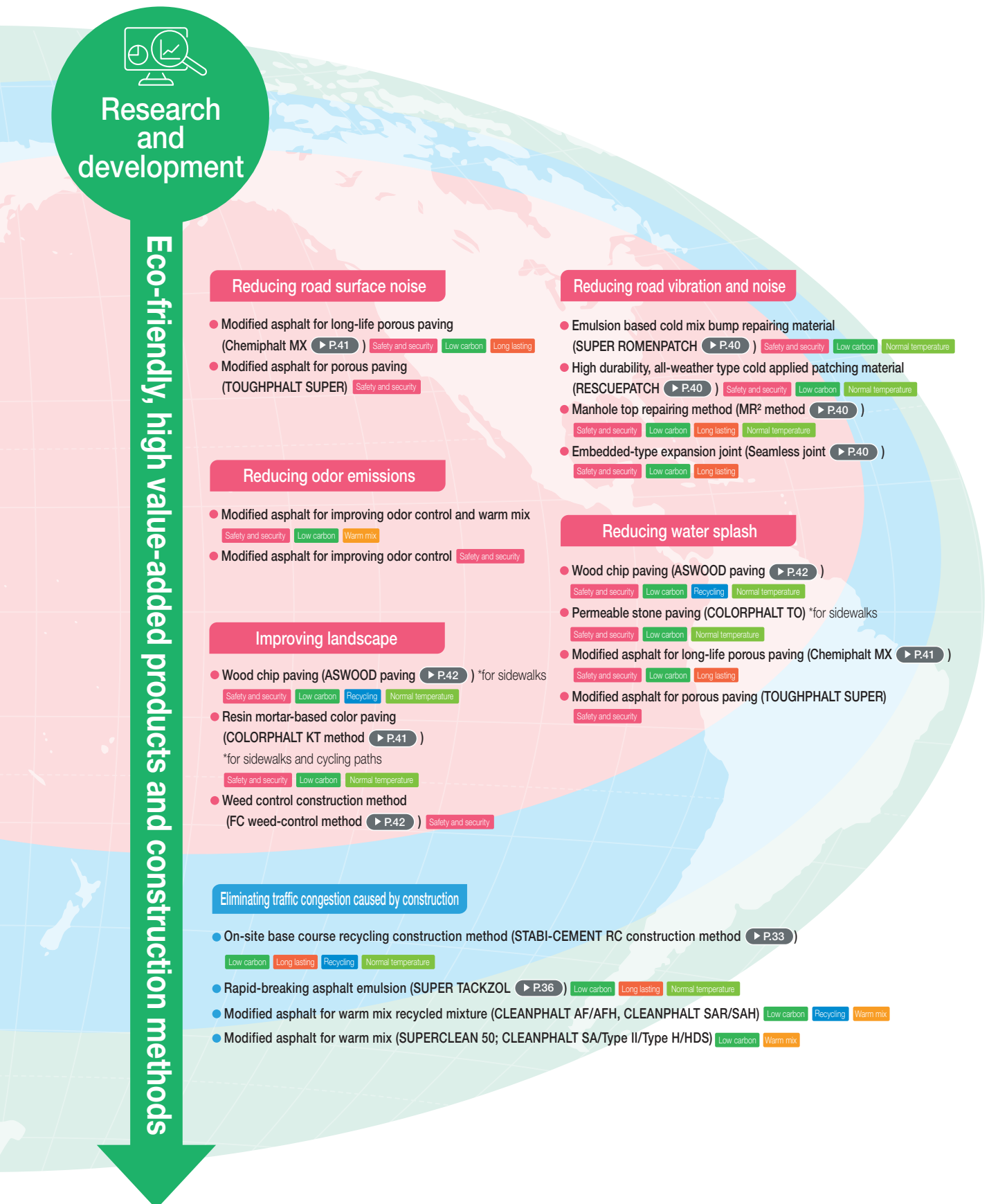
- Resin-based anti-skid paving (COALCUT R construction method) Safety and security Low carbon Normal temperature
- Resin mortar-based color paving (COLORPHALT KT method ▶ P.41) *for sidewalks and cycling paths Safety and security Low carbon Normal temperature
- Road marking (Lining) ▶ P.41 Safety and security

Curbing global warming

Reducing the number of constructions

- On-site base course recycling construction method (STABI-CEMENT RC construction method ▶ P.33) Low carbon Long lasting Recycling Normal temperature
- Rapid-breaking asphalt emulsion (SUPER TACKZOL ▶ P.36) Low carbon Long lasting Normal temperature
- Asphalt emulsion surface treatment construction method (SUPER SURFTREAT construction method ▶ P.35) Low carbon Long lasting Normal temperature
- Crack prevention cushion layer construction method (EMULTEC SAMI construction method ▶ P.39) Low carbon Long lasting Normal temperature
- Molded water cut-off material (L-seal tape ▶ P.36) Low carbon Long lasting Normal temperature
- Crack sealant (COALCUT K) Low carbon Long lasting Normal temperature
- Modified asphalt for warm mix and longer life (SUPER SHINAYAKAPHALT ▶ P.34 ; SUPER CONTAINERPHALT ▶ P.35) Low carbon Long lasting Warm mix
- Modified asphalt for warm mix and longer life + On-site base course recycling construction method (SUPER SHINAYAKAPHALT; SUPER CONTAINERPHALT + STABI-CEMENT RC construction method ▶ P.34) Low carbon Long lasting Recycling Warm mix
- Modified asphalt for longer life (Noncrackphalt ▶ P.39 ; CONTAINERPHALT S; REKIPHALT SUPER ▶ P.38) Low carbon Long lasting
- Modified asphalt for long-life porous paving (Chemiphalt MX ▶ P.41) Low carbon Long lasting Safety and security
- Modified asphalt for longer life + On-site base course recycling construction method (Noncrackphalt; CONTAINERPHALT S; STABI-CEMENT RC construction method) Low carbon Long lasting Recycling
- Modified guss asphalt for bridge leveling layer (MG PHALT) Low carbon Long lasting
- Highly durable bridge deck waterproofing methods (HQ PAVERANE construction method ▶ P.37 ; HQ HIBRANE AU* construction method ▶ P.37 ; MULTI FRESH construction method ▶ P.38) Low carbon Long lasting
- Hot-applied crack sealant (CRACKSEAL NX) Low carbon Long lasting

of CO₂ emissions through the supply of “*Tastainability*®” products and construction methods that add new performance and functionality, such as longer life, recyclability, and warm mix. We will also work to improve the living environment of roadside residents, including reducing vibration and noise, ensuring traffic safety, and mitigating odors, thus contributing to creating sustainable roads. The chart below shows Nichireki’s representative lineup of eco-friendly products and construction methods.



Nichireki's Long-life Product and Construction Method Series



STABI-CEMENT RC construction method

■ STABI-CEMENT RC construction method involves crushing the existing pavement at the exact location where it has been damaged and then mixing it with asphalt emulsion and cement to construct new pavement. This construction method constructs a strong base course with asphalt flexibility and cement stiffness, contributing to the pavement's longevity. This is also effective in preventing liquefaction phenomena caused by earthquakes.



■ STABI-CEMENT RC construction method uses most of the existing pavement as it is on-site, reducing materials being carried in and out, which also contributes to energy conservation and effective use of resources. In particular, the amount of pavement waste removed from the site per construction project is reduced by around 80% compared to the replacement method, and **CO₂ emissions can be reduced by approximately 20%.**



20% reduction in CO₂ emissions by reusing existing pavement



■ As it is a cold construction method that uses asphalt emulsion, it is eco-friendly. In addition, compared with the full layer reconstruction method, it shortens the construction period, thereby helping to reduce economic losses caused by traffic congestion as well as suppress CO₂ emissions.

Damaged road pavement



Construction with a road stabilizer



During construction

Liquefaction resistance test

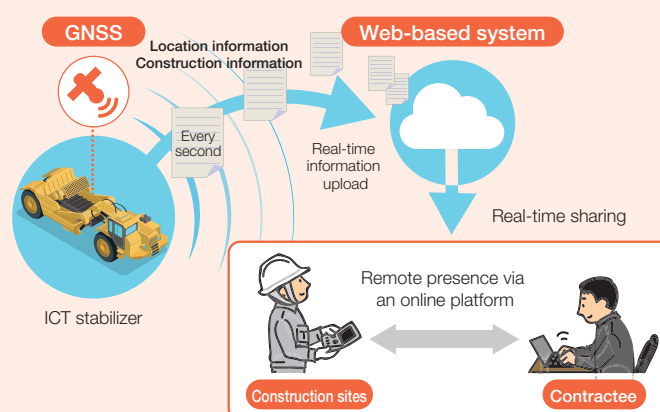


Digital technologies for smarter construction works

We utilize the Smart Stabilizer Monitoring System as part of our efforts to introduce ICT in this construction method. With this system, sensors are attached to the road stabilizer to measure various data in real time during construction. This method enhances construction accuracy and allows for the construction of a higher-quality base course, further extending the pavement life.

In addition, by combining the streaming of on-site images from wearable cameras with web conferencing, the contractee and other construction managers can check measurement data and on-site conditions from anywhere, which also contributes to improving productivity at construction sites.

Smart Stabilizer Monitoring System (image diagram)



NETIS* registration number:
CG-240013-A

*An acronym for the New Technology Information System, a database for promoting the use of new technology operated by the Ministry of Land, Infrastructure, Transport and Tourism

Toward Further Long-Life Performance with *Tastainability*[®]

The Smart Stabilizer Monitoring System won the Jury's Special Prize in the Infrastructure DX Competition, which was held to discover advanced technologies that contribute to DX in the infrastructure field, as part of the Construction Technology Expo 2023 Kinki, organized by the Kinki Regional Development Bureau of the Ministry of Land, Infrastructure, Transport and Tourism in Osaka Prefecture in November 2023.

System overview ►



SUPER SHINAYAKAPHALT

■ SUPER SHINAYAKAPHALT is a special modified asphalt that is flexible enough to be bent by hands and tough enough to withstand traffic loads. SUPER SHINAYAKAPHALT with 1.7 times greater performance than conventional asphalt mixture helps extend the life of pavement.



■ In addition, the temperature of mixture production can be lowered by 50°C from 180°C to 130°C compared to our conventional SHINAYAKAPHALT. This enables a reduction in fuel consumption during mixture production, cutting **CO₂ emissions by approximately 22%**.



In asphalt mixture production
22% reduction in CO₂ emissions

After construction

Conventional asphalt mixture



SUPER SHINAYAKAPHALT



Bending Comparison: SUPER SHINAYAKAPHALT vs. conventional mixture ►



STABI-CEMENT RC construction method



SUPER SHINAYAKAPHALT

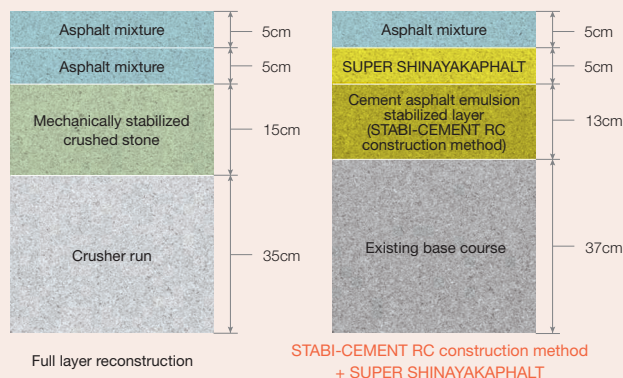


In a 50-year pavement life cycle
49% reduction in CO₂ emissions

This hybrid method achieves unprecedentedly long-lasting pavement by paving a long-lasting asphalt mixture (SUPER SHINAYAKAPHALT) on the base constructed by reusing existing pavement at the exact location where it has been damaged (STABI-CEMENT RC construction method).

It enables longer-life paving than ever, reducing **CO₂ emissions by approximately 49%** in a 50-year pavement life cycle.

Basic pavement cross section





SUPER CONTAINERPHALT

■ SUPER CONTAINERPHALT is a specially modified asphalt designed for ultra-heavy traffic, offering exceptionally high permanent deformation resistance. It delivers high durability even in areas where heavy-load vehicles operate, such as ports and airports, thereby contributing to the extended service life of pavements.



■ The temperature of mixture production can be lowered by 30°C from 185°C to 155°C compared to our conventional CONTAINERPHALT S. This enables a reduction in fuel consumption during mixture production, cutting **CO₂ emissions by approximately 13%**.

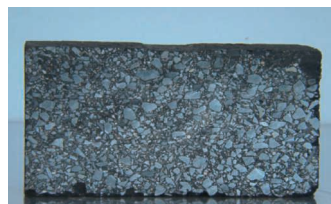


In asphalt mixture production
13% reduction in CO₂ emissions

Polymer-modified asphalt type II



SUPER CONTAINERPHALT



After construction



SUPER SURFTREAT S construction method

■ SUPER SURFTREAT S construction method is an ultra-thin pavement construction method that is highly resistant to wear and tear and protects the pavement surface before damage progresses. By applying a surface treatment, the road surface is made to look like new, and the functions of the road surface, such as its non-slip properties and noise reduction, are restored, leading to a longer lifespan for the pavement (prolongation) and, in turn, a reduction in medium- to long-term repair costs.



■ As it is a cold construction method that uses a special asphalt emulsion, it does not generate CO₂ during heating, meaning it is an eco-friendly construction method. For example, compared to heated thin-layer paving, it can reduce **CO₂ emissions by approximately 61%**. Another feature of this method is that it can be applied to various surfaces other than carriageways.



Compared to hot mix thin-layer pavement
61% reduction in CO₂ emissions

A specialized vehicle that can complete the work by itself



Leveling with a specialized vehicle



After construction





SUPER TACKZOL

■ SUPER TACKZOL is a tack coat  emulsion of the rapid-breaking type that significantly shortens curing time compared with conventional tack coats. Stronger interlayer bonding than conventional products helps extend pavement life.



■ This is an eco-friendly material as it can be applied at normal temperature. As it breaks rapidly even in cold winter conditions, curing is almost unnecessary. In addition, during construction in hot summer conditions, stickiness is suppressed, preventing adhesion to tires of asphalt mixture dump truck and other equipment. As a result, the paving process can promptly proceed to the next stage, contributing to shorter construction times.

Spraying with a specialized vehicle



Condition one minute after spraying at a road surface temperature of 5°C



L-seal tape (for milled surfaces)

■ L-seal tape is a molded water-stop tape used in repair works such as milling overlays to prevent water infiltration into the pavement body through construction joints (cold joints). By preventing water from penetrating the pavement, it helps sustain interlayer bonding strength, the moisture resistance of the mixture, and the supporting capacity of the pavement, thereby contributing to an extended pavement life.

NETIS registration number:
QS-210048-VE

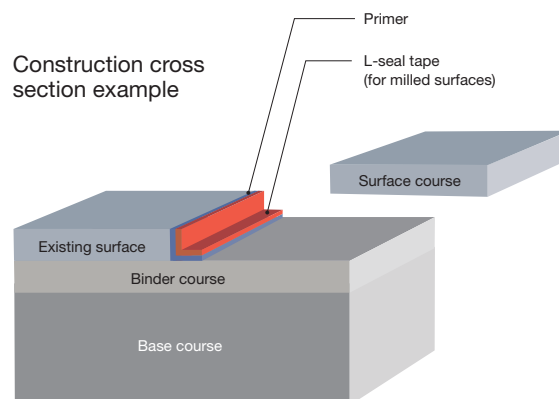


■ As it is a tape with adhesive properties at normal temperature, it offers excellent workability and handling, and is an eco-friendly material.

After construction



Construction cross section example



Nichireki's Long-life Product and Construction Method Series: Bridges

A bridge is an important lifeline that connects people, goods, transportation, and economy. Therefore, it must be durable enough not to disrupt daily lives. Nichireki offers a wide range of options for bridge deck waterproofing, which is essential for extending the service life of bridges to meet the needs of road administrators. Increasing the durability of the deck waterproofing layer enables a reduction in repair frequency of pavement, which in turn leads to reducing CO₂ emissions by approximately 50% to 75% in a 50-year pavement life cycle.



HQ PAVERANE construction method

■ HQ PAVERANE construction method is a waterproofing method with excellent shear fatigue resistance that has passed a crack opening and closing load test equivalent to 30 years of service. As this is a high-performance pavement waterproofing method that demonstrates durability by combining the pavement and waterproofing layers, it protects the deck from de-icing agents and airborne salts and contributes to extending the pavement life.

NETIS registration number:
KK-240046-A

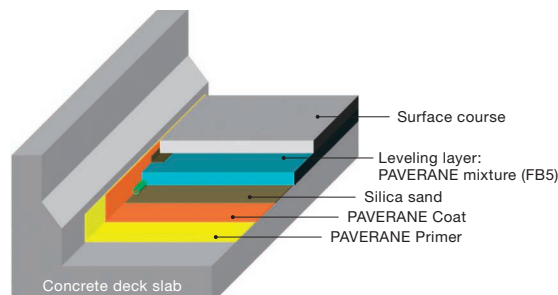


Compared to conventional waterproofing
in a 50-year pavement life cycle
75% reduction in CO₂
emissions

Construction in progress



Construction cross section example



HQ HIBRANE AU⁺ construction method

■ HQ HIBRANE AU⁺ construction method is a highly durable asphalt-urethane membrane-type waterproofing method for bridge decks, which has passed the performance standards that apply a load equivalent to 30 years of service. This method allows seamless construction from the deck to the edge of the rise, and it also features excellent adhesion between the waterproof layer and the pavement. Lower construction temperatures reduce CO₂ emissions during construction compared with the conventional HQ HIBRANE AU method.

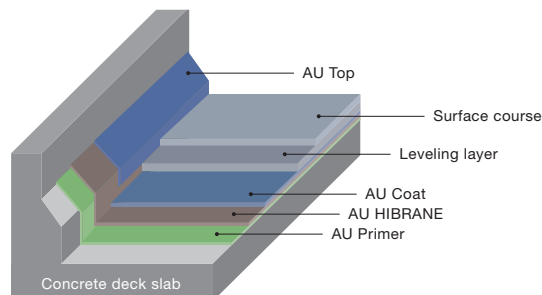


Compared to conventional waterproofing
in a 50-year pavement life cycle
75% reduction in CO₂
emissions

Construction in progress



Construction cross section example





MULTI FRESH construction method

MULTI FRESH construction method is a composite waterproofing construction method that applies a highly durable hot-applied asphalt membrane-type waterproofing material with excellent adhesion to asphalt pavement on top of a primer that penetrates even the finest cracks in the concrete deck surface. This method would improve the stiffness and fatigue resistance of deck, contributing to extending the life of pavement.

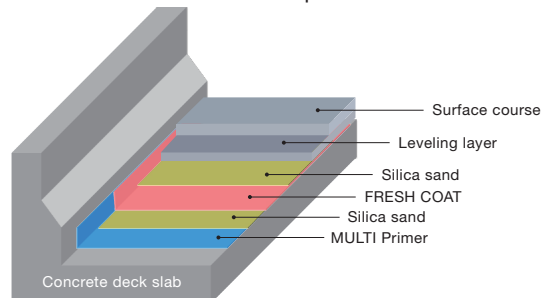


Compared to conventional waterproofing in a 50-year pavement life cycle
50% reduction in CO₂ emissions

Construction in progress



Construction cross section example



Comparison of highly durable bridge deck waterproofing methods

	Durability	Workability	Lifecycle cost
HQ PAVERANE construction method	◎	◎	◎
HQ HIBRANE AU ⁺ construction method	◎	○ ⁺	◎
MULTI FRESH construction method	○	○	○
Conventional waterproofing	△	○	△

With either the HQ HIBRANE AU⁺ construction method or MULTI FRESH construction method, a further extension of pavement life can be expected by laying a long-lasting asphalt mixture (REKIPHALT SUPER) on the waterproofing layer.

Introduction to waterproofing methods ▶



REKIPHALT SUPER

REKIPHALT SUPER is a polymer-modified asphalt with outstanding workability and resistance to stripping. It allows the acquisition of mixtures with a high degree of compaction, regardless of the timing of construction, resulting in longer life pavement.

Construction example



L-seal tape (for bridge ends)

L-seal tape is a molded water-stop tape that prevents water from entering the pavement body through the boundary between the edge of a bridge and the newly paved asphalt mixture. It is highly effective in preventing water from entering the top surface of the deck, leading to longer pavement life.

NETIS registration number:
QS-210048-VE

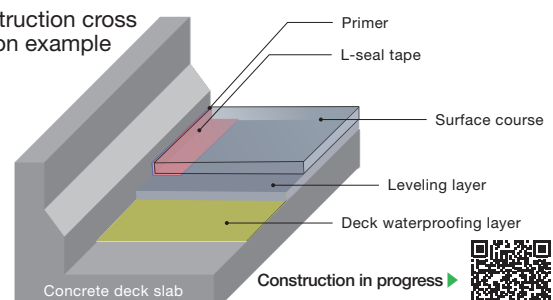


As it is a tape with adhesive properties at normal temperature, it offers excellent workability and handling, and is an eco-friendly material.

After construction



Construction cross section example



Construction in progress ▶



Nichireki's Product and Construction Method Series to Meet Diverse Needs

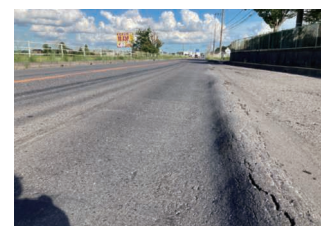
Damage to asphalt pavement

The principal types of asphalt pavement damage are cracks and rutting. The factors contributing to such occurrences include pavement materials, deterioration and fatigue during service, and pavement structure, and these factors often interact with one another.

Cracks in pavement



Rutting in pavement



Preventing cracks

EMULTEC SAMI construction method

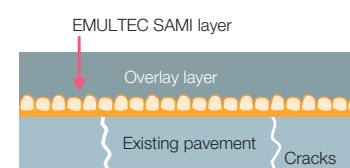


■ This is a cold-type cushion layer construction method designed to suppress reflection cracks by forming a stress-relief layer through the precise spreading of modified asphalt emulsion and precoated aggregates. It can suppress the occurrence of reflection cracks on the pavement surface during overlay and milling overlay operations.



■ As it is a cold construction method, it does not generate CO₂ associated with heating, meaning it is an environmentally friendly construction method.

Construction cross section example



Noncrackphalt



■ This modified asphalt is mainly applied for thin-layer paving in areas where reflection cracks are of concern, such as existing asphalt pavements with cracks and the joints of concrete pavements in composite pavements. It contributes to longer pavement life by retarding crack formation in the surface layer.

SUPER SHINAYAKAPHALT



■ This modified asphalt combines excellent flexibility and toughness, enabling it to suppress pavement damage such as cracks and rutting, thereby contributing to longer pavement life.



■ Reducing the production temperature of the mixture can lead to lower fuel consumption and **an approximate 22% reduction in CO₂ emissions.**

▶ P.34

Preventing rutting

POLYPHALT SS



■ This modified asphalt is mainly used for asphalt pavements on heavy-traffic roads. Combining rubber-like and resin-like properties, it offers outstanding permanent deformation resistance, wear resistance, and flexibility.

NICHIPHALT HDS



■ This modified asphalt is used for asphalt pavements on ultra-heavy-traffic roads. Improved crack resistance also contributes to greater pavement durability and longevity.

SUPER CONTAINERPHALT



■ This modified asphalt is used for asphalt pavements in areas where ultra-heavy-load vehicles operate, such as ports and airports. Its high resistance to rutting contributes significantly to longer pavement life.



■ Reducing the production temperature of the mixture can lead to lower fuel consumption and **an approximate 13% reduction in CO₂ emissions.**

▶ P.35

Improving the living environment

The Nichireki Group contributes to improving the living environment for communities along roads by providing various forms of value, such as reducing vibration and noise caused by uneven surfaces and potholes, preventing water splash, enhancing traffic safety, and improving the landscape.

Reducing road vibration and noise

SUPER ROMENPATCH



- SUPER ROMENPATCH is a cold-applied asphalt emulsion mixture with outstanding wear resistance used for repair of bumps on roads.

NETIS registration number:
KT-190089-VE



- This is an eco-friendly material as it enables construction at normal temperature. As construction does not require machinery, the work can be easily done.

SUPER ROMENPATCH



After construction



RESCUEPATCH



- RESCUEPATCH is a cold-applied mixture (patching material) with outstanding durability used for repair of potholes on roads.



- This is an eco-friendly material as it enables construction at normal temperature. This also enables construction even when the construction surface is wet by rain or snow.

RESCUEPATCH



After construction



MR² method



- MR² method is a construction method to repair bumps between manholes and pavement with less vibration and noise. The material cures quickly, enabling construction in a short time.



- It does not cause lack of compaction due to a decrease in temperature, contributing to extending the pavement life.



- As a cold-applied mixture is used for construction around manholes, this construction method is friendly to the environment.

During construction (removal of a manhole)



After construction



Seamless joint

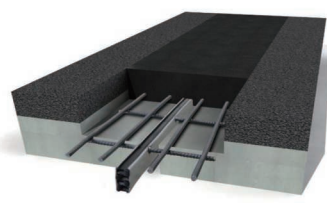


- Seamless joint is an embedded-type expansion joint used to embed bridge joints. As steel and rubber parts are not exposed on the road surface, this enables smooth driving of vehicles.



- Seamless joint has outstanding water shut-off performance and quality stability, which allows them to be used over a long period, contributing to extending the life of bridges.

Seamless joint



After construction



Reducing road surface noise / Reducing water splash

Chemiphalt MX



■ Chemiphalt MX is porous paving that prevents water from accumulating on the road surface in rainy weather. This paving prevents slipping, water splash, and deterioration of visibility during driving, reducing traffic accidents. This also reduces noise from the road surface caused by driving.

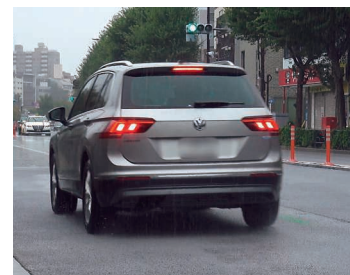


■ Chemiphalt MX has outstanding aggregate scattering resistance and demonstrates high durability, contributing to extending the life of pavement.

Conventional paving



Porous paving



Mitigating the rise in surface temperature of roads

THERMOTEC construction method

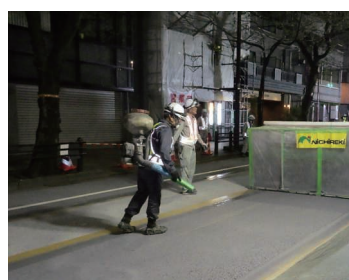


■ This heat-blocking paving limits the rise in temperature of paved surfaces during the day by reflecting near-infrared rays, which account for about half of the solar radiation energy. During summer months with clear weather, it is expected to reduce road surface temperatures by around 10°C, which will also help to alleviate the heat island effect.



■ This is an eco-friendly method as it allows construction at normal temperature.

Construction in progress



After construction



Ensuring traffic safety

Road Marking



■ Using road markings that appear to be three-dimensional and color paving visually alerts drivers to reduce driving speed and prevents them from accidentally entering the wrong lane, thereby contributing to ensuring traffic safety.

Road markings that appear to be three-dimensional



Dedicated ETC lane marking on the Metropolitan Expressway



Improving landscape

COLORPHALT KT method

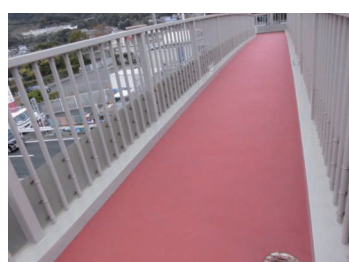


■ This is a resin mortar pavement made from epoxy resin and various aggregates. It has excellent flexibility and is ideal for use in pedestrian bridges. It also has excellent slip resistance, ensuring safe walking even in the rain.



■ This is an eco-friendly method as it allows construction at normal temperature.

After construction



Toward a More Comfortable Road Environment with *Tastainability*[®]

Improving landscape

ASWOOD paving



■ ASWOOD paving is wood-based (wood chip) paving made by mixing a rubber-modified asphalt emulsion ASWOOD Emulsion, which has outstanding flexibility, and wood chips produced by finely crushing forest-thinning materials and other materials. ASWOOD paving has outstanding water permeability and cushioning properties, making it easy on the feet of walkers and runners and preventing the formation of puddles, thereby reducing water splash. Further, its gentle texture that blends in with the surrounding natural scenery brings comfort and relaxation to people. It also helps recharge groundwater by facilitating the infiltration of rainwater and other water into the soil, thereby increasing the supply of water to the underground aquifer.



■ Using forest-thinning materials and other resources without combusting prevents CO₂ from being emitted into the atmosphere and contains CO₂ as it is within the materials and resources (CO₂ fixation). For example, when we construct 1,000 m² of pavement with 4 cm in thickness using the ASWOOD paving method, we can fix approximately 18 tons of CO₂, which is equivalent to the amount absorbed by 1,300 Japanese cedar trees per year. This method also enables the utilization of trees damaged by Japanese oak wilt disease*, which has been spreading across the country in recent years, or by pine weevils as well as bamboos from an abandoned bamboo forest.

* A contagious disease that causes trees to die of necrosis and water-blockage, as a result of Japanese oak wilt pathogen are spread throughout the tree when platypus quercivorus (oak ambrosia beetle) burrow into the trunks of oak, chinquapin, and chestnut trees. New adults that have grown and emerged within the tree body carry Japanese oak wilt pathogen on their bodies. When they move to and invade other healthy oak trees, they spread the damage to the surrounding area.

Source: The Forestry Agency website (https://www.rinya.maff.go.jp/j/hogo/higai/naragare_R5.html), partially edited.



■ As it is possible to carry out the entire process from mixture production to construction at normal temperature, this method is extremely friendly to the environment. It can reduce CO₂ emissions by approximately 34%, compared to the typical pavement using hot mix.



Compared to the typical pavement using hot mix
34% reduction in CO₂ emissions

ASWOOD paving



Construction example



Nichireki supports the purpose of "Wood Change" promoted by the Forestry Agency as activities to change to a sustainable society through the use of wood and is actively driving efforts to promote wood utilization.

Construction examples ▶



FC weed-control method

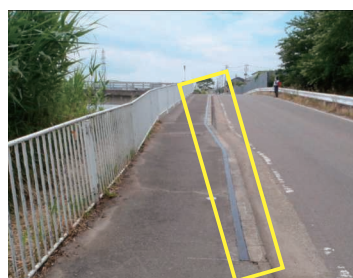


■ This method involves milling pavement joints, gaps, and uneven sections, where weeds tend to grow, using the compact milling machine *FC Chipper mini*, and then filling them with the elastic mixture *Falcon*. Falcon adheres closely to existing concrete and asphalt layers and follows the movement of the pavement, thereby providing long-term water-blocking and weed-prevention effects.

Before construction



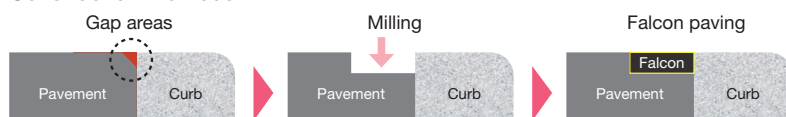
After construction



Over one year after construction



Construction methods



Construction in progress ▶



GLOCAL-EYEZ enables anyone anywhere to easily inspect the road surface conditions, such as cracks and rutting, by shooting the paved road with a smartphone mounted on an ordinary car such as a road patrol car. This system allows you to instantly check inspection results online using AI to automatically analyze images extracted from videos taken with a dedicated app and uploaded to the cloud.

Sample images of inspection using GLOCAL-EYEZ

-
- Figure 1 consists of two images. The left image shows a narrow, paved street in Tokyo, Japan, with traditional Japanese buildings on either side and utility poles. The right image shows a hand holding a smartphone displaying a navigation app interface with a map and a route highlighted.

- [illegible]



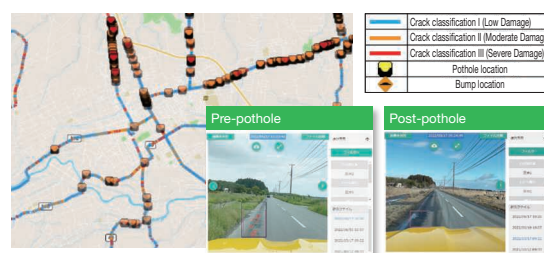
In February 2024, in collaboration with Aomori Prefecture, we developed a new AI model that predicts areas at risk of developing potholes by analyzing the causes of road surface potholes during the winter in snowy and cold regions using GLOCAL-EYEZ. We used the inspection results collected before and after the occurrence of potholes, gathered through daily patrols, as training data. By analyzing the damage that could lead to potholes and training the AI accordingly, we enabled accurate prediction.

Through this initiative, we are working to establish a preventive maintenance-type pavement maintenance cycle that integrates inspection, diagnosis, construction, and management, unlike the conventional approach focusing primarily on corrective maintenance.

We mounted smartphones on patrol vehicles to capture images of the roads on a daily basis.



AI predicts the risk level of developing potholes by using pre-pothole images as the training data.



In Ushiku City, Ibaraki Prefecture, beginning in February 2025, we, together with the city and the Center for Infrastructure Management Research (IMC), Tohoku University, are conducting a demonstration experiment aimed at establishing an infrastructure maintenance cycle utilizing DX through evidence-based policy making (EBPM). In this initiative, GLOCAL-EYEZ is being applied.

By linking road surface data with sewer pipe camera inspection data, we enable unified management of inspections and diagnoses that were previously conducted separately for each type of infrastructure, such as roads and sewers. Furthermore, by assigning levels of maintenance importance, we make it possible to prioritize infrastructure maintenance activities.

Given the limited availability of civil engineering professionals and budgets nationwide, we will continue to promote the use of GLOCAL-EYEZ across Japan as a means of addressing these challenges by providing efficient, low-cost, and up-to-date road surface monitoring without relying on manual labor.

SMART ROMEN CATCHER FWD

ROMEN CATCHER FWD applies an impact load by dropping a weight to the road surface identified as needing repair based on road surface inspections by GLOCAL-EYEZ and other methods and measures the deflection amount that occurs as a result. This enables non-destructive diagnosis of the structural soundness of the road pavement by identifying which layer is damaged as well as proposal of an appropriate repair method depending on the damage state.

SMART ROMEN CATCHER FWD



Measurement of deflection amount



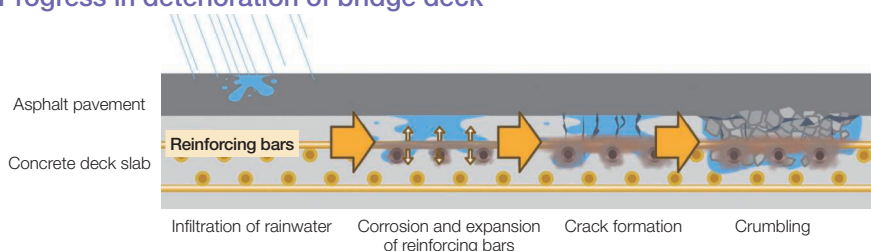
Technology overview ▶



SMART SHOBAN CATCHER

When water seeps into a concrete deck, which supports the pavement of the bridge, reinforcing bars inside the deck corrode and expand, resulting in cracks on the deck. The propagation of cracks results in crumbling of concrete, deck potholes, and other severe damage; therefore, it is necessary to construct a highly durable bridge deck waterproofing layer.

Progress in deterioration of bridge deck



Deck pothole

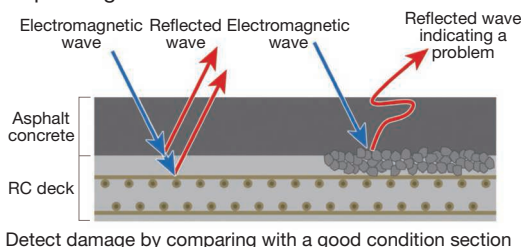


SMART SHOBAN CATCHER is a measuring vehicle that uses electromagnetic wave technology to investigate the damage to the upper surface of a concrete deck on a road bridge (from the underside of the pavement to the upper reinforcing bars) without having to remove the asphalt pavement (non-destructive). The method analyzes the damage by comparing the reflections of the sound and damaged concrete decks, taking advantage of the property that electromagnetic waves are reflected at the interface between asphalt pavement and concrete deck.

SMART SHOBAN CATCHER

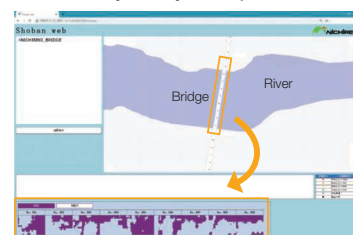


Differences in reflection of electromagnetic waves depending on the condition of the deck



Detect damage by comparing with a good condition section

Preliminary analysis report screen



Purple indicates where the bridge deck is damaged.

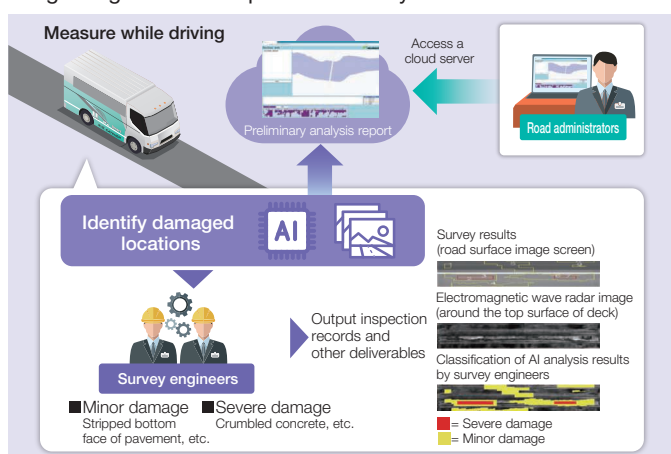
A trained AI, developed based on training data from skilled survey engineers, performs the analysis of damage. In addition, by uploading the results of AI analysis from the site to a cloud server, road administrators can quickly be notified of the preliminary analysis report. The use of AI and the internet can shorten the time needed for analysis work. For example, analysis work on electromagnetic wave reflection waveforms, which previously took even skilled engineers at least five days from measurement to report preparation, can now be completed in one day.

In addition, it is possible to create a more accurate repair design by combining open-cut inspection as appropriate according to the damage situation analyzed by the SMART SHOBAN CATCHER.

The SMART SHOBAN CATCHER has been evaluated by external organizations, such as being registered in the NETIS as a "non-destructive inspection system for bridge surface pavement and the upper sections of decks" and being listed in the Ministry of Land, Infrastructure, Transport and Tourism's Inspection Support Technology Performance Catalog as a "system for determining damaged areas on the top surface of decks."

* A catalogue-style compilation of performance values for standard items set by the government, requested from developers and submitted by them

Image diagram from inspection to analysis



NETIS registration number:
CB-150004-VE

Technology overview ▶



ROMEN CATCHER SUPER MWD

In recent years, measuring pavement deflection amount with a Falling Weight Deflectometer (FWD) [▶ P.44](#) has become a widely adopted approach to assessing pavement structural soundness. However, measuring pavement deflection amount using the FWD requires traffic control, as the measurement is conducted with the vehicle at a standstill, posing challenges for large-scale surveys. To address this issue, through joint research with the Public Works Research Institute (a national R&D agency) and other organizations, we developed the Moving Wheel Deflectometer (MWD), a mobile deflection measurement device that enables continuous measurement of pavement deflection while the vehicle is in motion, without the need for traffic control.

Our ROMEN CATCHER SUPER MWD is a multi-measurement device that, in addition to the basic functions of the MWD, can simultaneously survey factors that significantly affect the accuracy of deflection amount analysis, such as pavement thickness, as well as surface damage conditions required for pavement diagnosis (crack ratio, rutting depth, and IRI). It can also detect road surface potholes requiring urgent repair. This represents the integration of our road surface condition measurement technology (ROMEN CATCHER LY Series), electromagnetic wave survey technology (SHOBAN CATCHER) [▶ P.45](#), and smartphone-based road inspection technology (GLOCAL-EYEZ) [▶ P.43](#).

ROMEN CATCHER SUPER MWD

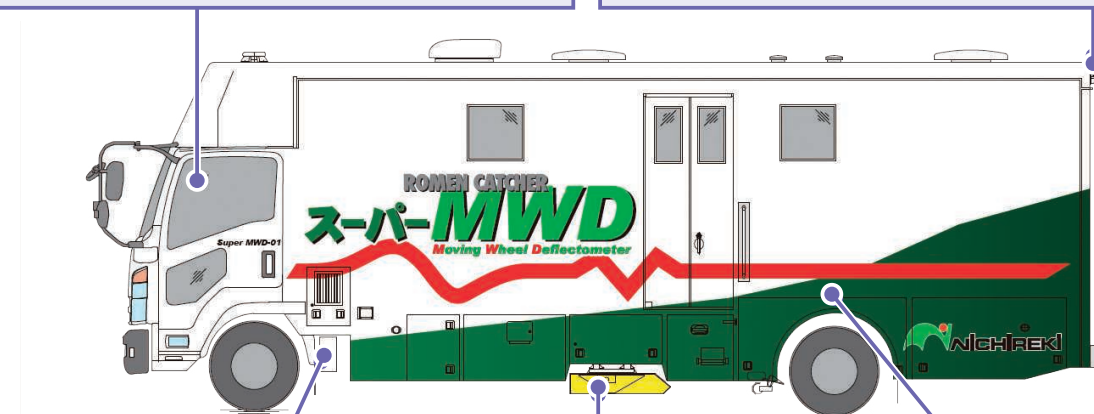
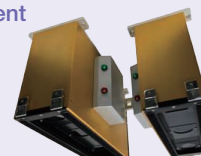


Measuring device of ROMEN CATCHER SUPER MWD

Road surface condition
measurement and inspection of
roadside facilities
GLOCAL-EYEZ



Road surface condition measurement
(cracks and rutting)
3D camera unit
(Infrared Laser + 3D Camera)



IRI measurement (class 2)
Laser displacement
meter and IMU



Pavement thickness
measurement
Electromagnetic wave radar



Pavement deflection amount
measurement
Doppler vibrometer

