CARBON POOL CONCRETE

The Cities of Tomorrow Will Be Built with Eco-Friendly Concrete.

CP Concrete



Cities are where people come together and live their everyday lives.
From the paths we walk and the places we gather to the roads we travel and the buildings that keep us safe, every part of a city supports our daily lives.
We envision cities that are kinder to the planet, where everyone can live safely and comfortably for generations to come.
That is the vision behind CP Concrete.

Today, as climate change and environmental challenges become increasingly serious, the construction industry faces a growing need for sustainable solutions.
But being environmentally friendly is not enough.
Construction materials must also be strong, durable, and capable of supporting our lives well into the future.





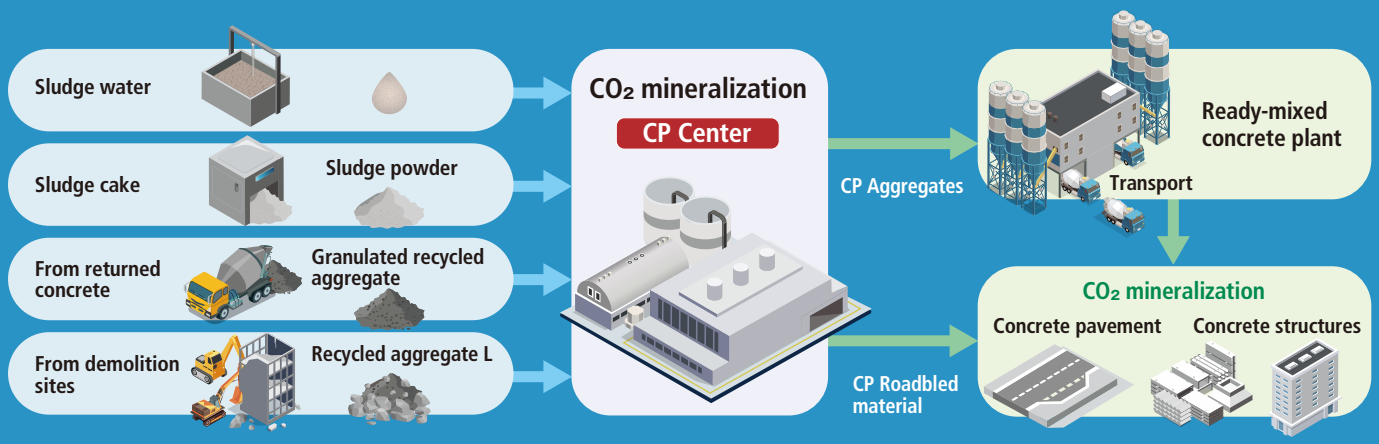
A new kind of concrete, developed to meet the needs of our changing world.
That is CP Concrete—designed to reliably support infrastructure while reducing CO_2 emissions.



What Is CP Concrete, which Absorbs and Stores CO_2?

CP Concrete is a technology that mineralizes CO_2 in materials previously treated as industrial waste and recycles them into concrete.

The project aims to develop CARBON POOL Concrete by mineralizing biogenic CO_2 and CO_2 emitted from industrial facilities in concrete-derived industrial waste, reusing that waste as concrete materials, and enabling additional CO_2storage after construction. This approach combines resource circulation with maximum CO_2 storage. Road pavement is the primary application, with future deployment in buildings and civil engineering structures while ensuring required performance, including workability and durability.



Key Features of CP Concrete

1. Uses industrial waste materials.
2. Target CO_2 storage: 120–160 kg/m³.
3. Can be produced using standard equipment at ready-mixed concrete plants.

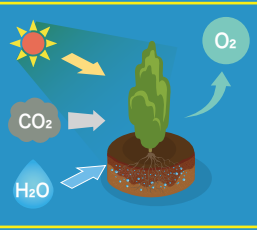
How Much CO_2 Can Be Stored?



Approximately 9–11 Japanese cedar trees = 1 m³ of CP Concrete

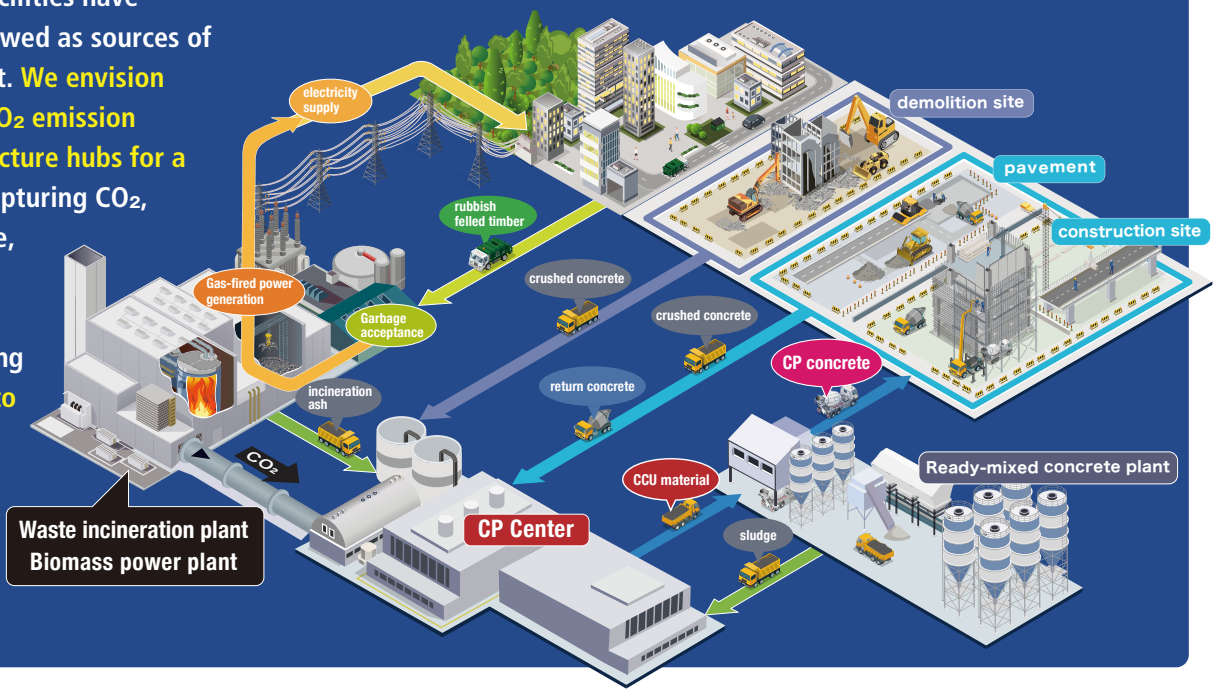
The target is 120–160 kg-CO_2/m³. The amount stored in 1 m³ of CP Concrete is estimated to equal the CO_2 absorbed annually by approximately 9–11 Japanese cedar trees.

*Based on an estimated annual CO_2 absorption of approximately 14 kg per cedar tree (Forestry Agency of Japan).



From Japan to the World : Creating a New Circular System Around Urban Incineration

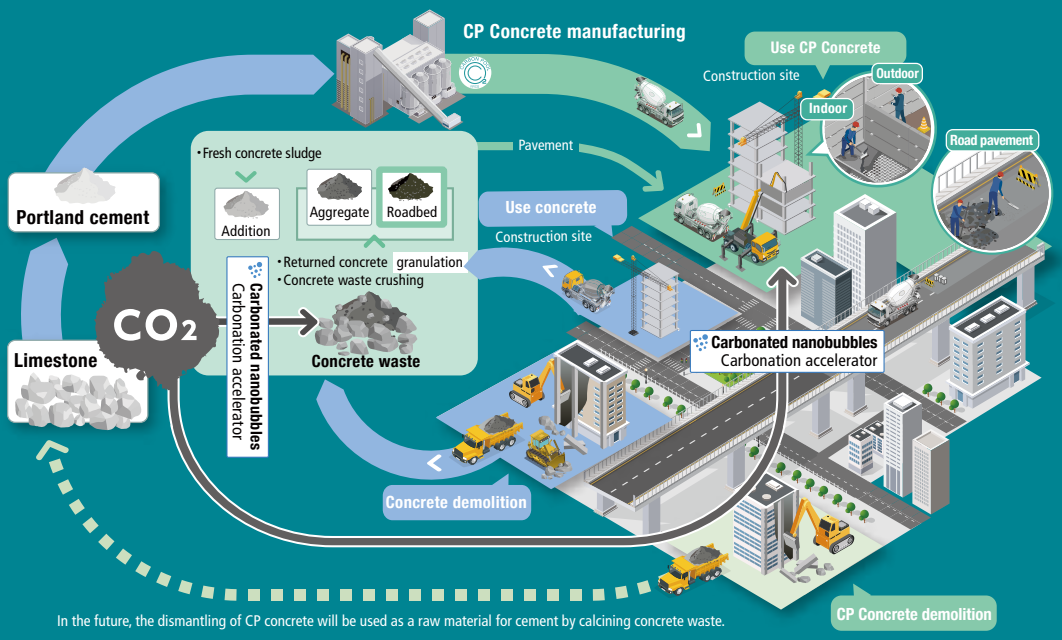
Urban incineration facilities have traditionally been viewed as sources of environmental impact. We envision transforming these CO_2 emission sources into infrastructure hubs for a circular society. By capturing CO_2, storing it in concrete, and reusing that concrete for urban pavements and building components, we aim to establish a local cycle that turns waste into valuable resources.



Project Overview — R&D Theme 1

Development of carbon pool concrete and implementation in pavements and structures

Develop CARBON POOL (CP) Concrete by mineralizing biogenic and industrial CO_2 in concrete-derived industrial waste, reusing the resulting materials in concrete, and storing additional CO_2 after construction. The goal is to maximize both resource circulation and CO_2 storage, initially in road pavements and subsequently in building and civil engineering applications, while maintaining required workability and durability.



In the future, the dismantling of CP concrete will be used as a raw material for cement by calcining concrete waste.

Implementation structure

Core Technology Development

Hazama Ando Corporation
- Niigata University (FY2023)
- The University of Tokyo (FY2024–FY2026)

Local Environmental Technology Development

- UCHIYAMA ADVANCE CO., LTD.
- Osaka-Hyogo Ready-Mixed Concrete Industrial Association
- Haiko Onoda Remicon Co., Ltd.

Development for Practical Deployment

Pavement

Taisei Rotec Corporation
- The Nippon Road Co., Ltd.
- Sato Watanabe Co., Ltd.

Structures

Hazama Ando Corporation
- Asunaro Aoki Construction Co., Ltd.
- Asanuma Corporation
- Topy Industries, Limited

Project Overview — R&D Theme 2

Development of technology related to quality control/fixation evaluation methods for concrete produced with maximized volumes of CO_2 emissions reduction and CO_2 fixation

Establish methods for measuring and evaluating CO_2 storage in CP Concrete, as well as quality control methods, and develop an integrated assessment system covering life-cycle CO_2 emissions ($LCCO_2$), life-cycle assessment (LCA), and life-cycle cost (LCC). This will help demonstrate CP Concrete' s environmental and economic benefits, support its social acceptance, and accelerate effective deployment.



Implementation structure

Development of Synthesis and $LCCO_2$ Assessment Methods

$LCCO_2$–LCA–LCC Assessment and Design System and Deployment Scenarios
- The University of Tokyo

Development of Quality Assessment and Quality Control Methods
- Tokyo Metropolitan University

Development of LCA Methods for Materials and Resources
- National Institute for Environmental Studies

Development of LCC Assessment Methods
- Meisei University

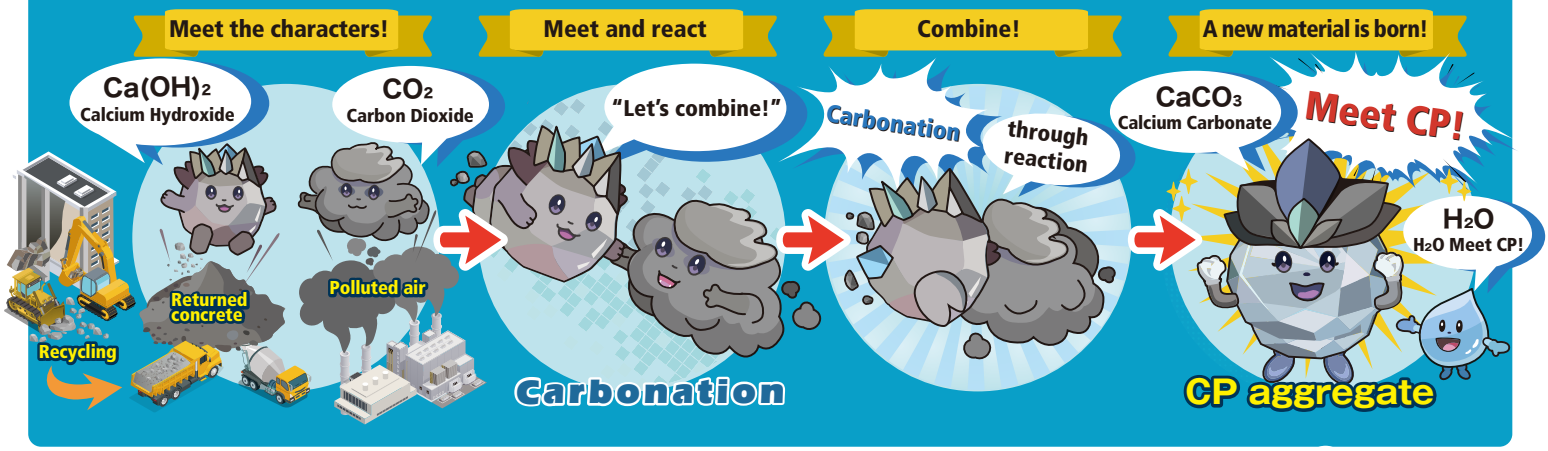
How CP Concrete Is Made

(Carbon Pool Concrete)

1 Recycling Waste into CO_2-Absorbing Materials

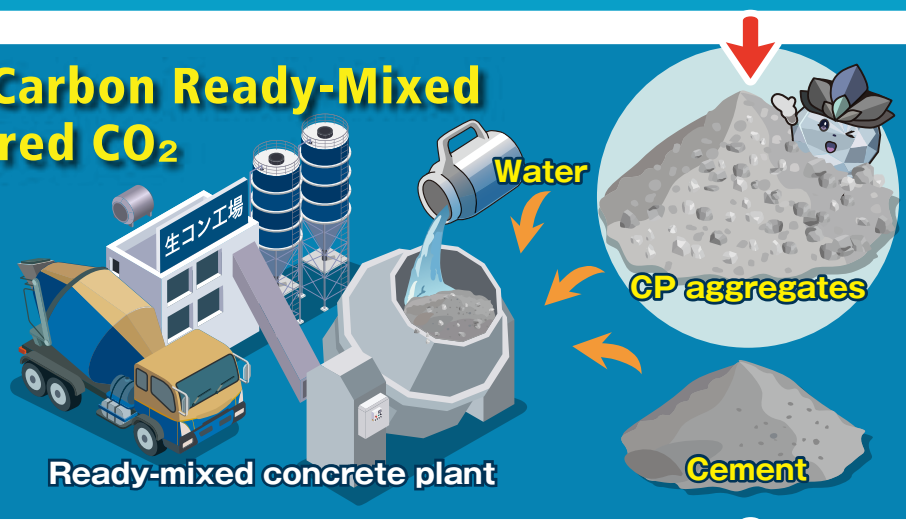
$Ca(OH)_2$ + CO_2 → $CaCO_3$ + H_2O

Returned concrete from construction sites is recycled into aggregates (gravel and sand) instead of being discarded. Calcium compounds in the aggregates react with CO_2 in the air to form stable calcium carbonate.



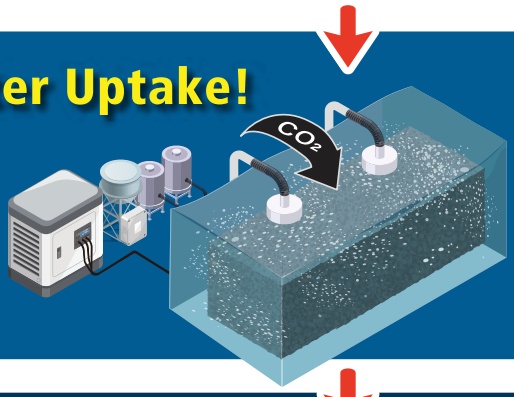
2 Producing Lower-Carbon Ready-Mixed Concrete with Stored CO_2

Concrete is produced using CP aggregates containing mineralized CO_2, together with water and cement. Because the aggregates themselves store CO_2, the environmental impact associated with concrete production can be substantially reduced compared with conventional concrete.



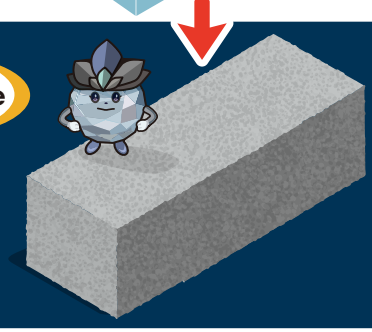
3 Additional CO_2 Treatment for Greater Uptake!

Even after placement, a specially formulated alkaline solution is applied to promote further CO_2 penetration and mineralization within the concrete. This process also helps create a denser concrete structure.



4 CP Concrete Is Complete!

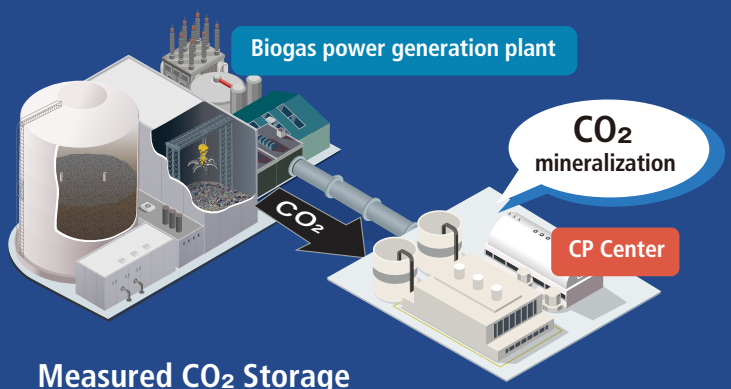
The finished concrete continues to absorb and mineralize CO_2 from the air, making it a material suited to a decarbonized society.



Collaboration for a Greener Planet

1 Capturing CO_2 from a Biomass Power Plant

At the Ibuki Green Energy biomass power plant in Maibara, Shiga Prefecture, experiments were conducted to absorb CO_2 into concrete directly from flue gas generated when construction wood waste and forest residues are burned to produce electricity.



Measured CO_2 Storage

83.6 kg per m³

Technical measures

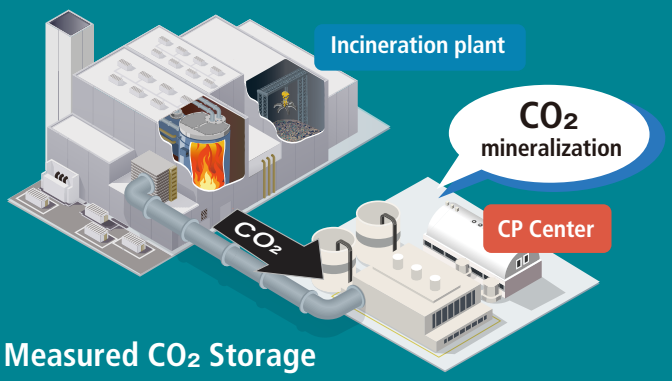
- Flue gas contains substantial moisture. Excess moisture can fill pores in the concrete and prevent CO_2 from penetrating effectively.
- The moisture content of the flue gas was adjusted, and gas flow and exposure methods were optimized.
- Measures were also taken to maintain the flue gas temperature, as higher temperatures were found to promote CO_2 uptake by the concrete.

Helping Reduce Atmospheric CO_2!

By storing biogenic CO_2 from biomass combustion in concrete, the process has the potential to remove CO_2 from the atmosphere. Using flue gas directly, without separating out the CO_2, also enables more efficient CO_2 utilization.

2 Capturing CO_2 Recovered from a Waste Incineration Plant

Experiments were conducted to absorb CO_2 recovered from Tokyo's Itabashi Waste Incineration Plant into concrete.



Measured CO_2 Storage

43 kg per m³

Technical measures

- Concrete was placed in a sealed curing chamber and exposed to CO_2 gas while its concentration and temperature were monitored and controlled.
- To address possible CO_2 leakage, the system was equipped with a leakage alarm, web cameras, and remote monitoring of CO_2 concentration and chamber temperature.

Why Reduce CO_2 from Waste Incineration?

Burning waste releases large amounts of CO_2. For example, Tokyo's 23 wards generated approximately 1.5 million tonnes of combustible waste in 2024, corresponding to an estimated 1.5 million tonnes of CO_2 emissions. Storing some of this CO_2 in concrete could help reduce greenhouse gas emissions. CO_2 generated locally could be stored in local infrastructure, such as park benches and roads.

CP Concrete Pilot Projects

CP Concrete was applied to the parking lot and garden paths at LAGO Otsu in Otsu City, Shiga Prefecture, operated by the traditional Japanese confectionery company Taneya.



Japan' s first CP porous concrete pavement. Approximately 3.0t of CO_2 were permanently mineralized in the concrete—equivalent to the annual CO_2 absorption of 214 Japanese cedar trees.





CP Porous Concrete Pavement :
Garden paths : 39.8 m³ CO_2 fixed : 1,672 kg (42.0 kg-CO_2/m³).
Parking lot : 31.5 m³ CO_2 stored : 1,323 kg (42.0 kg-CO_2/m³).

CP Concrete was applied to selected pavement areas and benches within the Future City Pavilion at Expo 2025 Osaka, Kansai, Japan.







This concrete absorbs and fixes **biomass-delivered CO_2** emitted from the Itabashi Waste Incineration Plant in Tokyo and the Ibuki Green Energy biomass power plant, and stores it in the floor slabs and benches – presenting a vision for the concrete of the future.

- CP porous concrete pavement: 25.5 m³,CO_2 stored: 1,084 kg (42.5 kg-CO_2/m³).
- CP concrete pavement (pedestrian area): 13.8 m³ CO_2 stored: 251 kg (18.2 kg-CO_2/m³).
- CP concrete pavement (pedestrian area, containing sludge): 14.3 m³ CO_2 stored: 405 kg (28.3 kg-CO_2/m³).
- CP concrete pavement (roadway): 15.5 m³ CO_2 stored : 549 kg (35.4 kg-CO_2/m³).
- CP concrete slabs: 3.4 m³ CO_2 stored: 439 kg (129.0 kg-CO_2/m³).
- CP concrete benches: 9 m³ CO_2 stored: 443 kg (49.2 kg-CO_2/m³).

CP Concrete Pilot Projects 2

In March 2026, a cooperation agreement was concluded with Hino City, and CP Concrete was used at Nishihirayama Asobiba and in front of Toyoda Station.



At Nishihirayama Asobiba, 2.5t of CO_2 were stored—equivalent to the annual absorption of 179 Japanese cedar trees.
At Toyoda Station, CP porous concrete stored 0.1t of CO_2—equivalent to 7 Japanese cedar trees.





CP Concrete
Nishihirayama Asobiba — Benches CO_2 stored: 900 kg (81 kg-CO_2/m³).
Nishihirayama Asobiba — Ramp CO_2 stored: 1,365 kg (65 kg-CO_2/m³).
Toyoda Station — PRC slab CO_2 stored: 94 kg (15 kg-CO_2/m³).

In March 2026, CP Concrete was used for the first time in a large structural element: a riverbank protection block weighing approximately 3t, at the Anegawa River bank protection project in Shiga Prefecture.



CP Concrete riverbed protection block



CO_2 stored: 340 kg (67 kg-CO_2/m³).

Some of the manufactured blocks underwent CO_2 mineralization at the Ibuki Green Energy biomass power plant in Maibara, Shiga Prefecture, storing biogenic CO_2. A total of 0.34t of CO_2 was stored, equivalent to the annual absorption of 24 Japanese cedar trees.

CARBON POOL CONCRETE CONSORTIUM

https://carbon-pool.com
info@carbon-pool.com

※ This project is funded through 2030 under the Green Innovation Fund Project "Development of Technology for Producing Concrete and Cement Using CO_2" administered by NEDO (New Energy and Industrial Technology Development Organization).

