

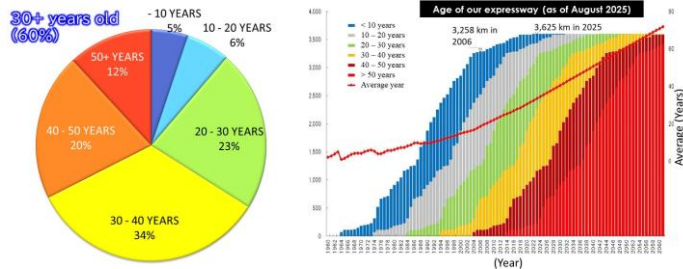
NEXCO-West's Maintenance Initiative

NEXCO-West et ses initiatives de maintenance



Our Bridge Situation

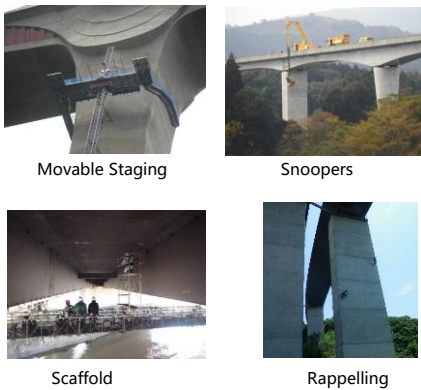
- Maintaining approx. **9,000 bridges**
- About **60%**: more than **30 years old**



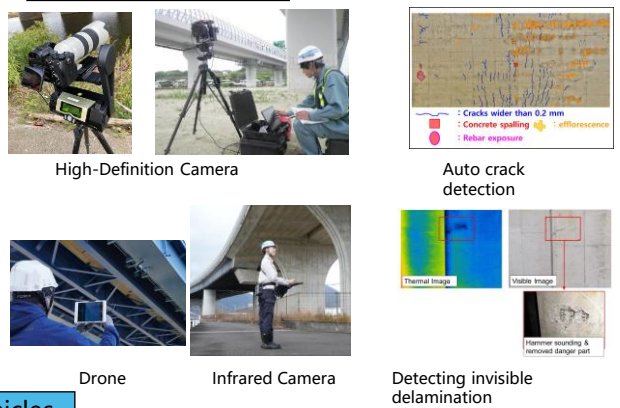
Inspection Technologies

- The Road Act mandates **detailed close-up inspections every 5 years** from 2014.
- The new regulations caused a significant **increase in inspection costs** (more than double).
- Inspections for hard-to-access locations and improving the efficiency became an urgent issue.
- NEXCO-West began to actively implement **new technologies for efficient & effective inspections**.

Traditional Method

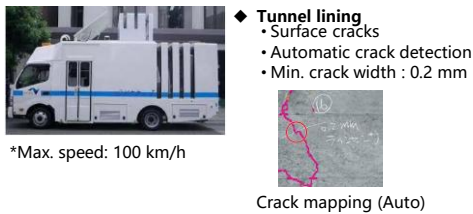


New Technologies

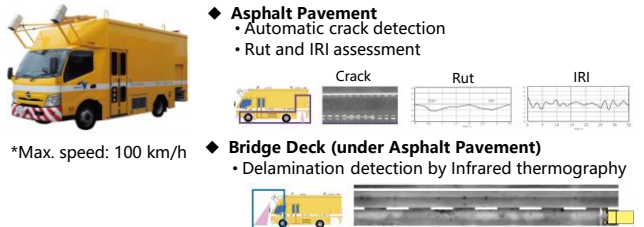


Inspection Vehicles

Tunnel Inspection Vehicle (eQ-doctor T)

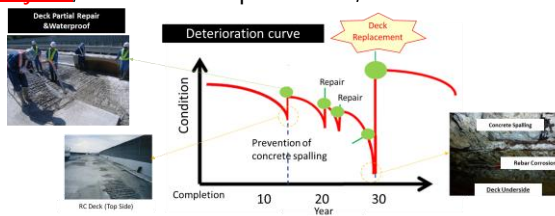


Road Surface Inspection Vehicle(Kei-Doc2.0)



Renewal Project

- ❑ Our bridges have **not been restored to a satisfactory condition** even after repeated repairs.
- ❑ For such bridges, **renewal projects**, such as deck replacements, were initiated in 2015.



Renewal with Minimal Social Impact

- ❑ To reduce construction time onsite, **Precast Concrete Decks** are being used instead of cast-in-place.
- ❑ 4-lane roads are consolidated to 2-lanes on each side of the expressway with a two-way traffic operation in lower traffic areas.
- ❑ In the secured work zone, the existing deck is removed and replaced with the precast decks.
- ❑ Single-operation erection of superstructures was performed in higher traffic volume areas.



Replacement of precast concrete decks



Nishi-Shimono viaduct in Chugoku Expressway



Example of Traffic Regulations



Single-operation erection of superstructures (Chugoku Expressway Renewal)

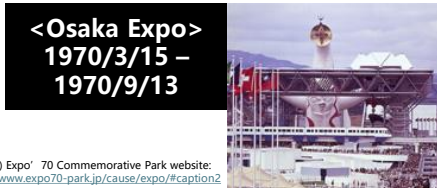


Chugoku Expressway Renewal Project

Projet de renouvellement de l'autoroute Chugoku



- ❑ This section was constructed just **before the 1970 Osaka Expo** (about 50 years old).
- ❑ This area has been urbanized in the last 50 years, and our bridges became deteriorated.
- ❑ Development of motorization has led to an increase in large-vehicle traffic, and deregulation has led to an increase in the total weight of vehicles.
- ❑ Additionally, highways are exposed to harsh conditions, such as salt damage caused by anti-icing agents (sodium chloride) sprayed on road surfaces.



(Source) Expo' 70 Commemorative Park website:
<https://www.expo70-park.jp/cause/expo/#caption2>



(Source) Geospatial Information Authority of Japan website:
<https://mapps.gsi.go.jp/contents/ImageDisplay.do?specificationId=418437&isDetail=true>

50 years



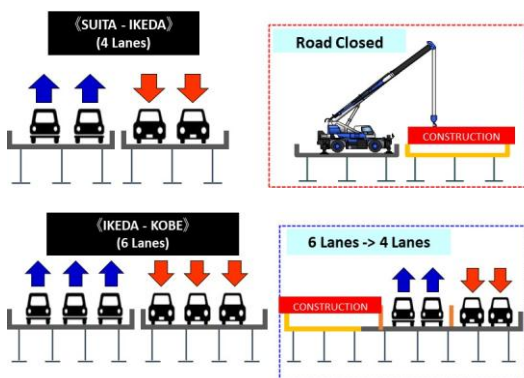
Chugoku Expressway (Current)



Bridge Deterioration



- ❑ Waited for the completion of the **parallel Shin-Meishin Expressway** before proceeding with the Chugoku Expressway Renewal project **to secure an alternate route.**



- ❑ Conventional deck replacement methods would cause **serious traffic congestion.**
- ❑ **100-day road closures** between Suita IC and Ikeda IC were performed for 2 years, while the Shin-Meishin Expressway and local road parallel to Chugoku Expressway served as **detour routes.**
- ❑ For a 6-lane section between Ikeda and Kobe cities, **two lanes for each direction** were secured during the construction.

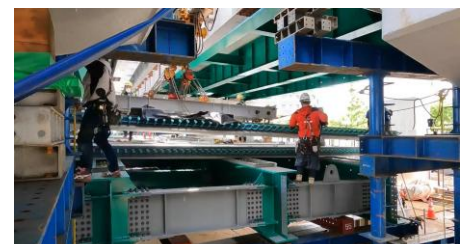
- ❑ Several countermeasures to reduce traffic regulation time were implemented.



Deck Replacement by a Gantry Crane (at Low Clearance)



Erection by a Crane



Jack-up Erection Method



NEXCO-West's Initiatives to Strengthen Disaster Response Capabilities on Expressways - 1

“Quick Recovery of Accessibility in the Event of a Disaster”

NEXCO-West et ses initiatives visant à renforcer ses capacités de gestion des catastrophes sur ses autoroutes - 1

“Rétablissement rapide de l'accessibilité en cas de catastrophe”



1. Major earthquakes and heavy rains that have occurred in west Japan in recent years

Earthquakes

The Japanese islands is located in one of the world's most seismically active regions, and earthquakes occur frequently.



Landslide

- **The 2016 Kumamoto Earthquake** [Magnitude 7.3]
April 16, 2016 (Epicenter: inland)
- **2018 Osaka Earthquake** [Magnitude 6.1]
June 18, 2018 (Epicenter: inland)
- **2024 Hyuga-nada Earthquake** [Magnitude 7.1]
August 8, 2024 (Epicenter: ocean)

Heavy rains

In recent years, the number of torrential rain disasters is also on the rise due to climate change.



- **2018 West Japan Torrential Rainfall**,
(Area: from Chugoku area to Shikoku island), July 3-8, 2018
- **Torrential Rainfall at Stationary rainy front**,
June 2023 (Area: Kouyama tunnel portals), June 28, 2023
- **2024 10th Typhoon “Shanshan”**
(Area: Eastern Kyushu) August 27-September 1, 2024

2. Missions and roles in the initial response to disasters

Mission① : Saving human life

Target① : Securing access for emergency services within 24 hrs


- Support the activities of [police departments\(PD\)](#), [fire departments\(FD\)](#), [the Self-Defense Forces\(SDF\)](#), [medical service\(DMAT\)](#), etc., who are assembled from **across the country within 72 hrs.**, when survival rate drops significantly.



Mission② : Early recovery of economic activity

Target② : Within 72 hrs, securing access for emergency transport for logistics, and within one week, opening expressway to the public.

- Restoring carriageways for **transport of emergency supplies** to disaster area


→


Flat surface for carriageway

3. Challenges and solutions for securing access for emergency transport within 24 hrs

❑ Challenge 1: Grasp the damage along expressways

- Large-scale disasters require time to assess damage due to road disruptions and numerous damages



Damage from the Kumamoto Earthquake
Approx. 400 locations

■ Solution 2: Sharing video surveillance by SDF

- Quickly and comprehensively grasping the damages over area and its scale from the sky (by Helicopter)



SDF(Self Defense Force) → [reference] Kumamoto earthquake 2016 → NEXCO WEST

* Video footage provided by a Ground Self-Defense Force Helicopter

■ Solution 1: Data collection using PDA

On-site : Smartphone



real time

Office : PC browsing, form output





SDF Personnel
NEXCO Personnel

Joint training of Helicopter surveillance video transmission



NEXCO-West's Initiatives to Strengthen Disaster Response Capabilities on Expressways - 1

“Quick Recovery of Accessibility in the Event of a Disaster”

NEXCO-West et ses initiatives visant à renforcer ses capacités de gestion des catastrophes sur ses autoroutes - 1
 “Rétablissement rapide de l'accessibilité en cas de catastrophe”



3. Challenges and solutions for securing access for emergency transport within 24 hrs

Challenge 2
 • Securing temporal access for emergency service

(Emergency service)

※ Great East Japan Earthquake (East Nippon Expressway Company Limited)

Solution 2
 • Repair cracks in the road

Surveying Cracks Filling with crushed stones Finishing surface/paving

Solution 3 Cooperation with organizations at same stake
 • Joint training with organizations at same stake

NEXCO Maintenance team (In Orange)
 Police officers (in Blue)
 Police vehicles Firefighters

Correcting steps with sandbags
 Driving over temporal pass covering steps

Solution 1
 • Securing temporal passage over steps by installing sandbags and steel plates

4. Challenges and solutions for ensuring access to the public within one week

Issue : Safe and appropriate emergency recovery

Solution 2: Detailed investigation and recovery planning by internal and external experts
 Cooperation with organizations at same stake

Solution 1: Acquisition of detailed survey data by Laser profiler (LP)

■ Point cloud acquisition by Aerial laser surveying

Solution 3: Securing 2 lanes for provisional operation with using 4lanes width until full restoration

Collapse ROW for 4lanes
 Restoration Provisional operation with two-way traffic

■ Operating with **provisionally lowered rainfall standard for road closure** until completion of full restoration work and countermeasures. **Inform the public of the temporary operation and promote public awareness of the operation.**

5. Incident Response Drills and Review of Past Disaster Events

■ Conduct “ joint drills with stakeholders”

Medical Service team Police NEXCO
 Fire Department

■ DIG: Disaster Imaging Game” simulation by various stakeholders
 [Typical subjects in joint drill]
 • Update of *communication protocol*
 • How to use emergency access
 • Emergency response
 • Recovery scenario

SDF rescue unit
 Joint drill: using emergency gate

SDF correspondents setting satellite communication sys.
 Joint drill :Establishing Com. Link network

■ Review of past disasters and improvement of operation

Review of “2016 Kumamoto Earthquake”

On-site tour for review of damage and restoration

Review of various studies on recovery operation

