

Development of new construction methods for large-scale renovation work

As we look forward to celebrating the 60th Anniversary of the Tokaido Shinkansen at the start of October, we must ensure the civil engineering structures remain in good condition for the future. We have therefore been carrying out large-scale preventive maintenance work since fiscal year 2013.

Concrete bridges are among the structures targeted in our large-scale renovation work, and we have been using a method that covers the cantilever slabs with highly corrosion-resistant plated steel plates (hereafter referred to as steel plates) to prevent cracks and other deterioration due to the ageing of the concrete.

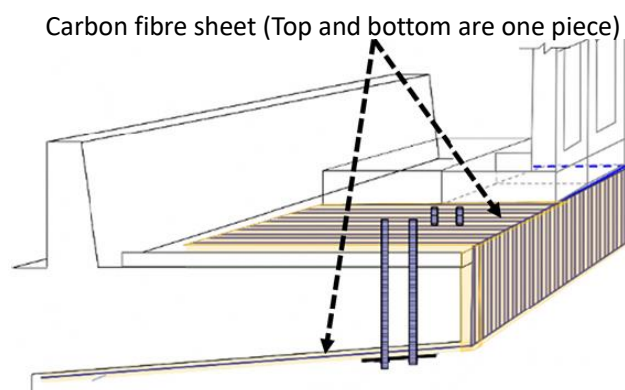
In order to steadily carry out large-scale renovation works on concrete bridges in the future, we have been developing technologies to improve conventional construction methods that use heavy steel plates. Based on various verification tests at our research centre in Komaki, Aichi prefecture, we have now developed a new construction method using light, high-strength carbon fibre materials.

1. Overview

- The surface of the cantilever slab is covered with a carbon fibre sheet and a surface protection material is applied. (Appendix 1)
- It is able to prevent cracks caused by deterioration of concrete over time, to the same extent or better than conventional construction methods.



Carbon fibre sheet



2. Impact of introducing a new product

Based on the verification tests conducted during the development stage, the following effects can be expected:

- Improved safety and work efficiency
The weight of a single carbon fibre sheet is less than 1/60 of that of a steel plate (maximum 60 kg/sheet), making them easy to handle. As a result, the burden on workers is significantly reduced and the safety of the covering work is greatly improved. In addition, construction can be done by one person, which improves work efficiency compared to the conventional method (photo on the right), which required three or more people to complete the work.



Work using conventional methods

- Cost reduction
The new method requires less labour for coating work, and since it requires fewer components and is cheaper than steel plates, it is expected to reduce costs by about 30% compared to conventional methods.
- Shortening of construction period
The new construction method can shorten the construction period because it does not require large-scale removal and restoration even if there is a building under the viaduct. (Appendix 2)

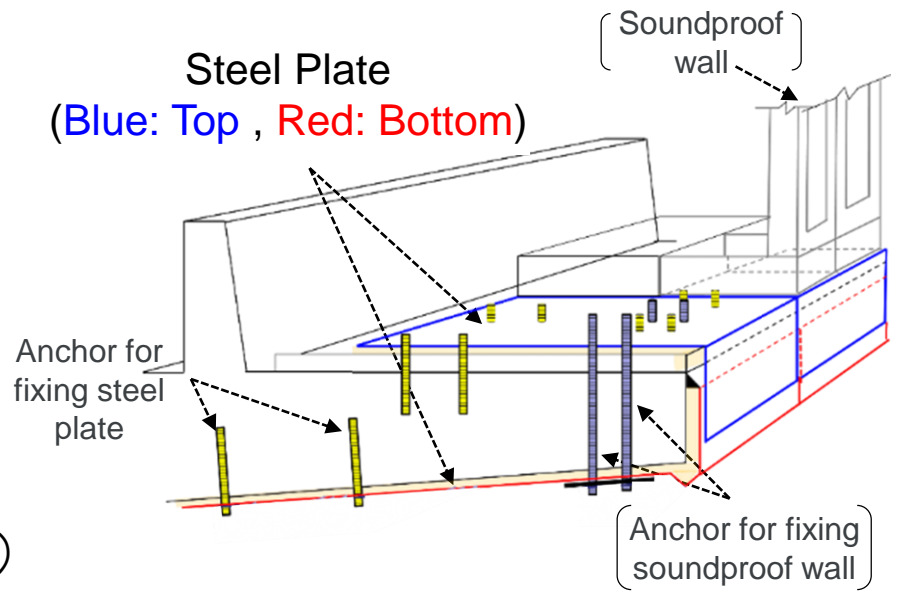
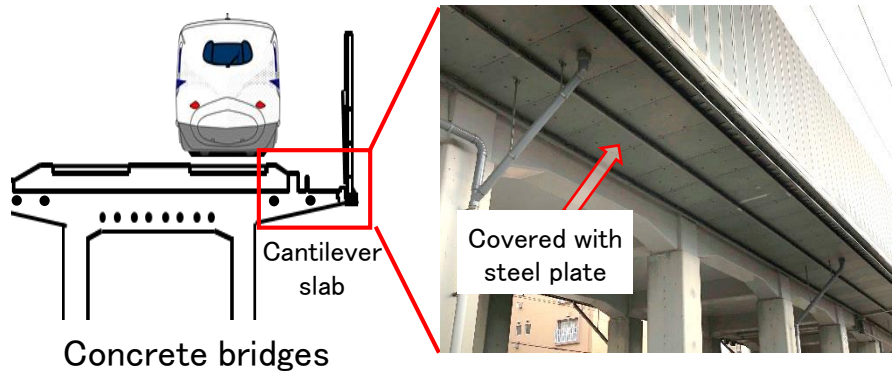
3. When to introduce

The new construction method will be sequentially used from September 2024.

Appendix 1 Comparison of construction methods in large-scale renovation work

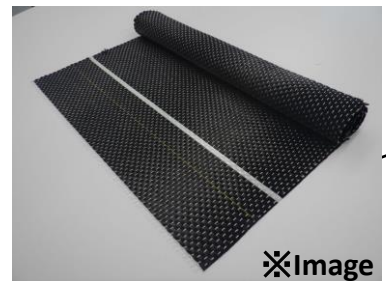
【Conventional Method】

- Covering the surface of “Cantilever slab” of concrete bridges with steel plates. (Fixed with anchors)
- Maximum weight of steel plate is 60kg/sheet.

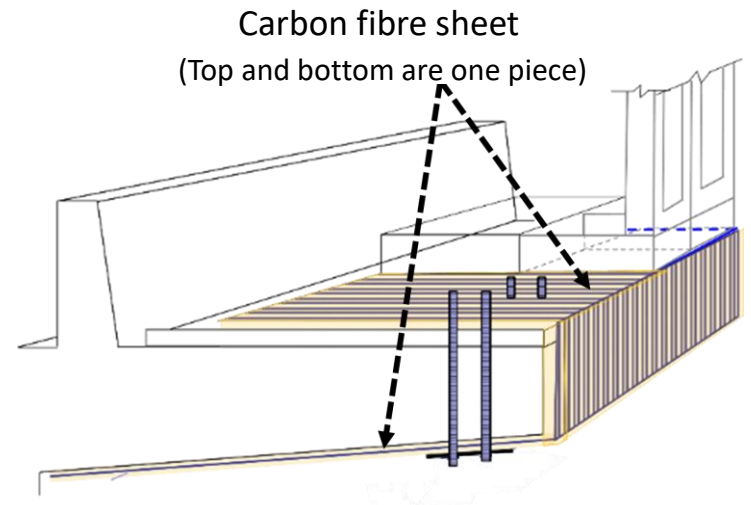
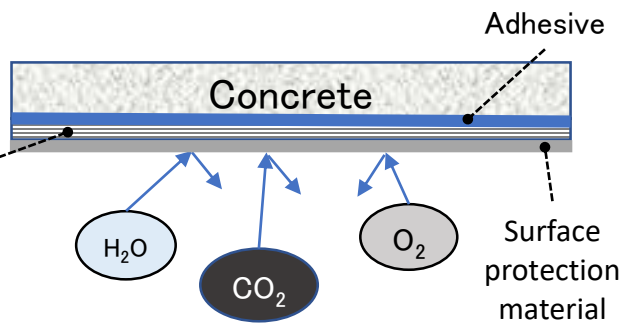


【New Construction Method】 (Patent pending)

- The surface of the “Cantilever slab” is covered with a carbon fibre sheet (fixed with adhesive), and a surface protection material is applied to the surface of the carbon fibre sheet.
- The weight of a carbon fibre sheet is 1/60 or less compared to a steel sheet of the same area.



Carbon fibre sheet



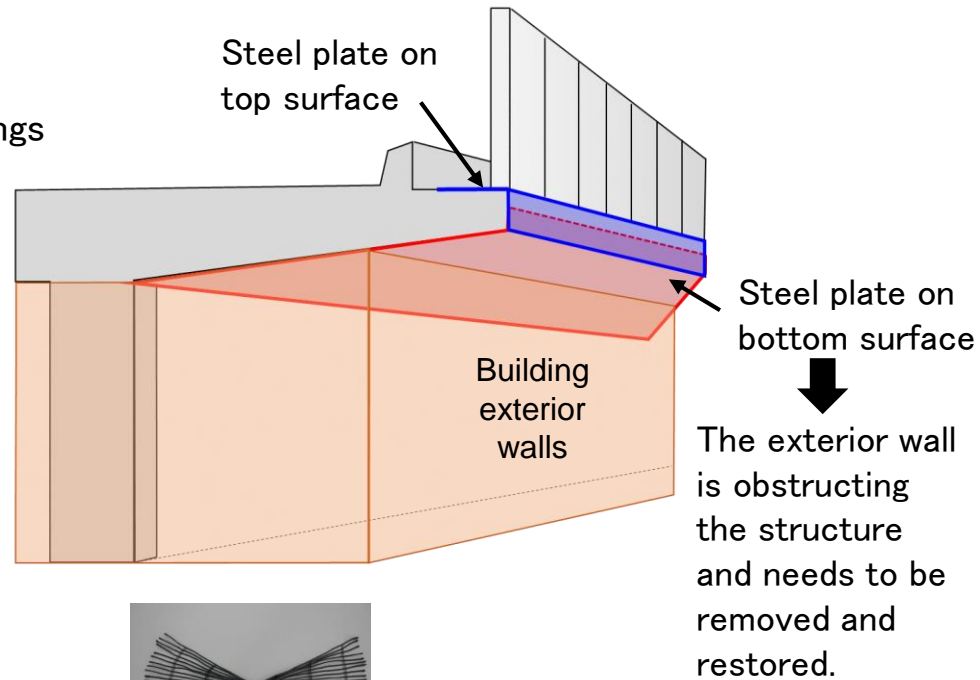
【Conventional Method】

- In order to install the steel plates, the obstructing exterior walls must be removed and restored.
- In some cases, relocation and restoration of buildings may be necessary.



Building exterior walls

Under-viaduct equipment



【New Construction Method】 (Patented)

- Dividing carbon fibre sheet and cover the inside and outside of building walls.
- Carbon fibre sheets inside and outside the building walls are integrated by “Carbon fibre anchors”.
- This can be installed by simply drilling small holes in the external wall to allow the anchors to pass through, while ensuring that the system is effective in reducing cracking.
- Shortening construction times, as large-scale removal and restoration of buildings is not required.

