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Artikel: Elevated bridge in Hanshin expressway in Osaka (Japan)
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8. Elevated Bridge in Hanshin Expressway in Osaka (Japan)

Owner: *Hanshin Expressway Public Corporation*
Consultant: *Prof. Dr. K. Horikawa*
Contractor: *Takara Giken Co. Ltd.*
Work's duration (Field work): *6 months (2 weeks)*
Repair date: *1986*

Replacement of Flange without Traffic Interruption

Heavy corrosion appeared at the lower flange plate, the lower end of web plate and one of the vertical stiffeners of a plate girder bridge (Fig. 1). It was caused by leakage of water through the timber plate used for a mold, which had been left in the concrete slab after completion. The location of the corroded area was the main girder near the span center of a 2-span continuous girder bridge for highway. The bridge was an elevated bridge in such a heavy traffic urban area (Fig. 2), that it was impossible to use any intermediate supports for the girder during repair and also impossible to suspend the traffic on the highway. Thus, the corroded area had to be repaired under loading and vibration.

Following alternatives were discussed.

1) To remove rust from the surface of the corroded area and paint it.
2) To remove rust from the surface of the corroded area and weld a reinforcing cover plate.
3) To remove the corroded area and install new members.

Thinking of the heavy corrosion, method 3) was adopted in the repair using a by-pass member, which was to carry the force that was carried by the part to be removed, during the repair. This repairing method is named «By-pass Method». Connections of the new part were of both welding and fastening with H.T. bolts; the lower flange was welded and the web was fastened with H.T. bolts.

Before the repair at site, experiments were conducted in the laboratory under similar loading conditions to the corroded part, containing all the repair process that should be done at site such as gas cutting and welding to examine the validity of the by-pass method as well as the workability of the field welding.

According to the results of experiments, the by-pass member was applicable to the actual repair at site and also the stress caused by the shrinkage due to welding played a role of intentionally induced pre-stress. However, it was found that lack of fusion and cracks in the first layer could not be avoided when welding was conducted under vibration. Therefore, to prevent those flaws, following procedures were considered as necessary:

1) To reduce the vibration as much as possible
2) To make the X type groove for welding and to remove the first layer by gouging
3) To keep the root gap from 1 mm to zero
4) To make a scallop in the part of web plate where the welding line crosses the web plate
5) To set end tabs
6) To adopt the relay welding process.

The repaired girder is shown in Fig. 3. The Technical Merit of Kansai Branch of JSCE was awarded for this work.

(K. Horikawa, H. Suzuki)

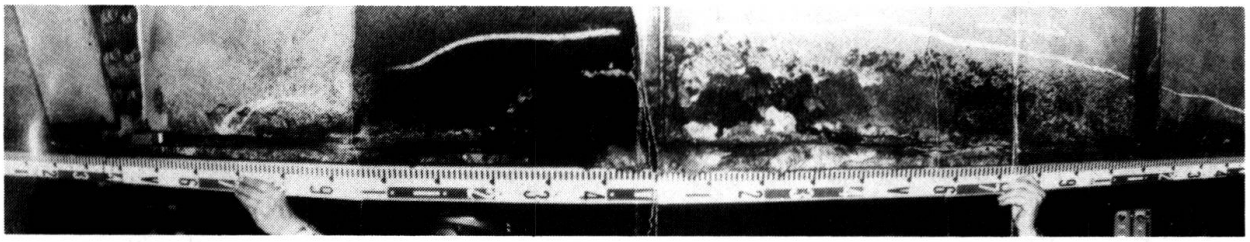

Fig. 1 Corrosion in a bridge

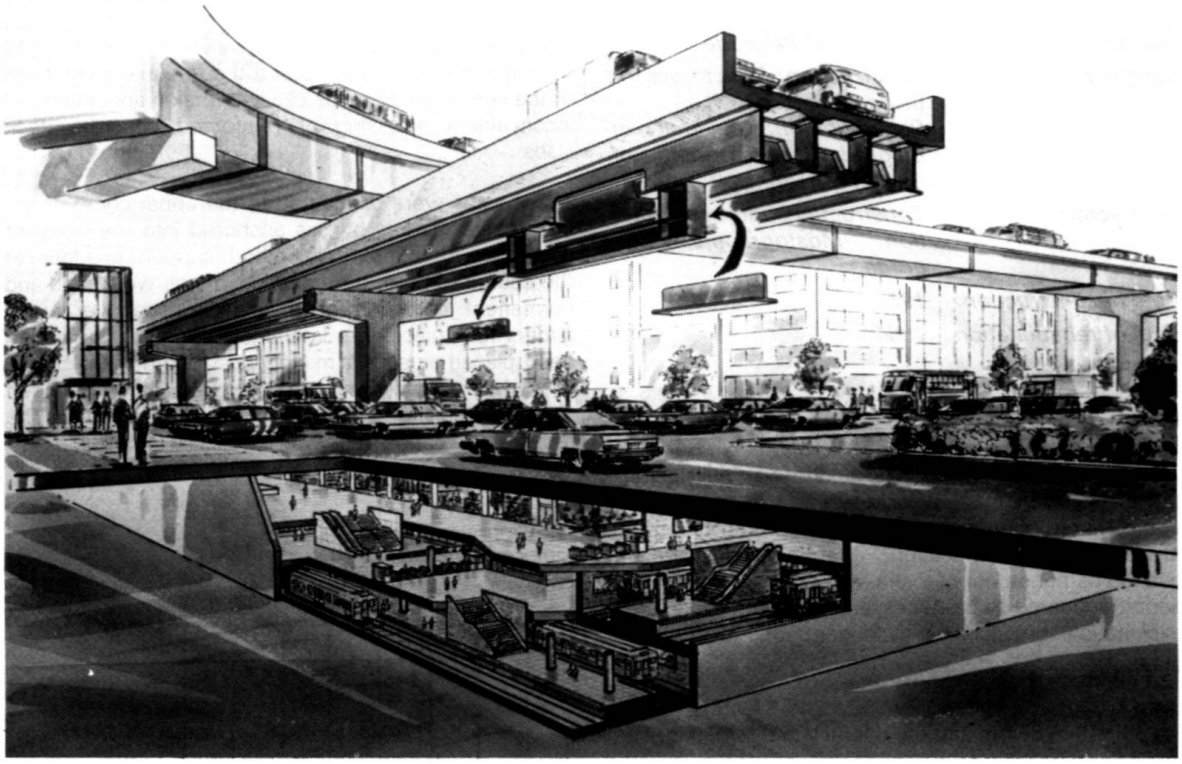

Fig. 2 Elevated bridge

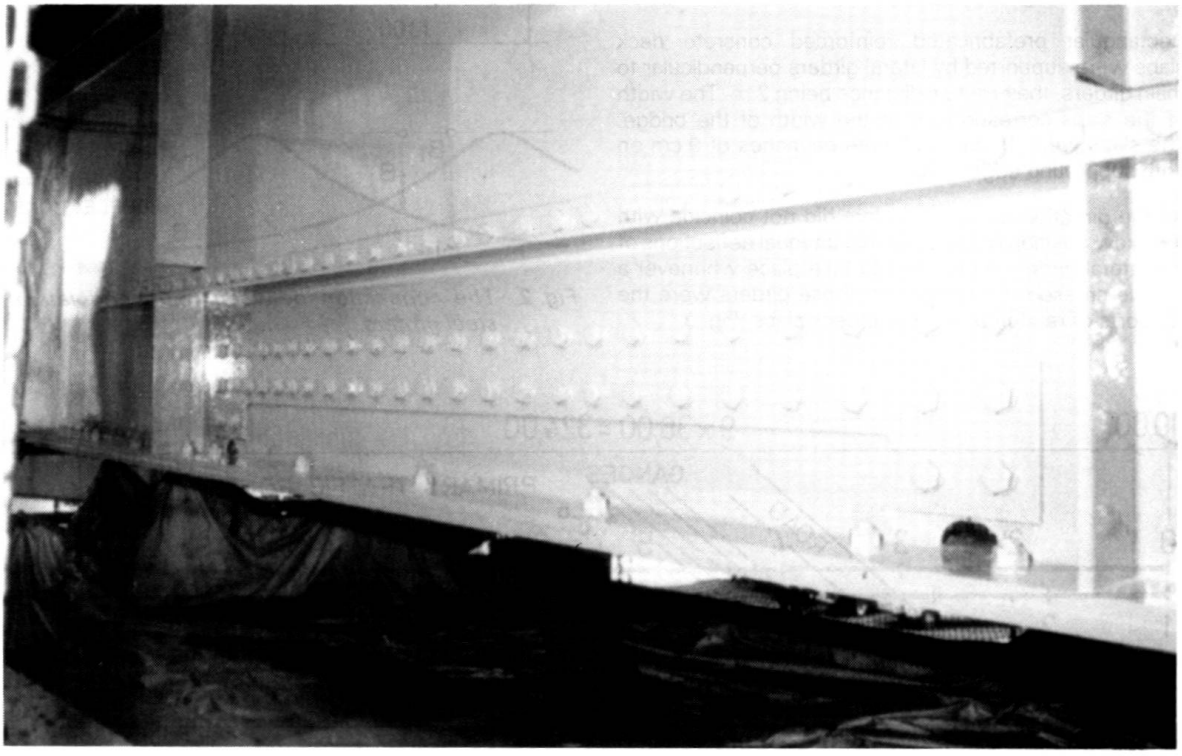

Fig. 3 Girder after remedy at site