Evaluation for Corrosion Characteristic of Steel Girder Bridge

Structure LAB 065338B Naoto Maruyama

1. Introduction

Corrosion environment for steel material in Okinawa is a severe accelerated corrosion environment because of high humidity with high temperature, and huge amount of the air-born salt . A weathering steel bridge had been exposed for 28years in Okinawa, Kunigami Village. The weathering steel bridge is located only 50m from the coast, and it existed in the environment to which a huge amount of air-born salt adhered by the north strong wind. As a result, severe corrosion damages was happened the end of girders.

In the present study, we carried out evaluation of corrosion characteristic for steel girder type bridges using weathering steel bridge under the real severe accelerated corrosion environment. Corrosion bridge is shown in **Fig.1** and **Photo.1**. This bridge type is simple composite steel girder bridge with 3 main girders. Length of bridge is 35.0m and width is 6.4m. Steel products is SMA50A , SMA50B , SMA41A and SS41

Photo.1 Corrosion Bridge

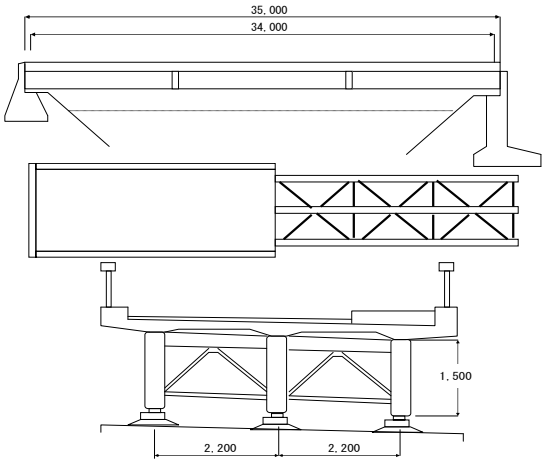

Fig.1 Study Bridge

1.2. Surveyed Bridges

The difference in between a corrosion situation inside and outside in the main girders are shown in **Fig.2**. The supplemental rust controlling surface treatment remains, and the cleansing property by rain can be confirmed to two main girders (G1,G3). On the other hand, it was a situation in which nonadherent layered rust almost occurred on the entire surface in inside aspect. The difference of the corrosion of the center part and the end of the main girder is shown in **Fig.3**.

As a result of detailed investigation, the rust of the center part of the main girders become less than the rust of the end, and a decrease in web thickness in the center part is less than the web thickness at the end.

2. Thickness Measurement

The thickness measurement carried out the corrosion member of plate. The measurement of the web uses the ultrasonic thickness gage (5MHz type). The measurement procedure of the web is shown in **Fig.4**. The measurement situation is shown in **Phot.2**.

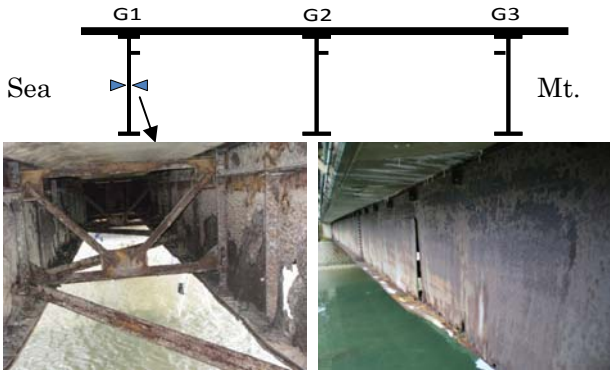

Fig.2 Corrosion Situation(inside and Outside)

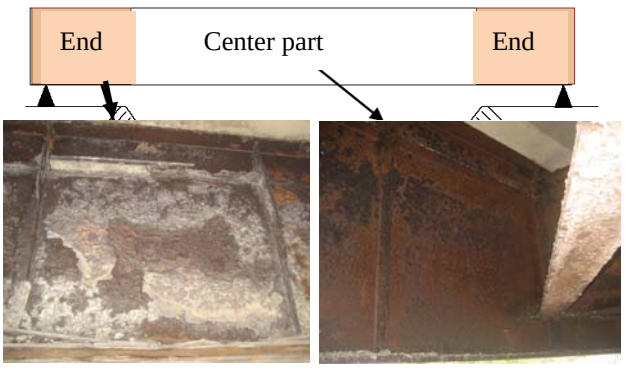

Fig.3 Corrosion of the center part and the end

3. Experimental result

3.1 Web Thickness Distribution

The web thickness distribution from G1 to G3 is shown in **Fig.5**. The web divides by the web enclosed with a vertical stiffener. There are the web panels from P1 to P24. The obtained findings are listed as follows.

(1) On G1 girder from P1 to P7 panels, the web thickness decreases of the center part. However, from P8 to P18 panels is about design thickness of 9 mm.

(2) The web thickness of G3 becomes thin toward the lower flange from upper flange. Furthermore, intense corrosion produces the end of the main girder.

(3) G2 corrodes from both sides and corrosion of G2 is not intenser than G3.

3.2 Comparison of Corrosion of each Part

The web thickness characteristic and the amount of the web thickness in span central part and the end is shown in **Fig.6** and **Fig7**. The obtained findings are listed as follows.

(1) The corrosion characteristic of the end of G1. The thickness of center part of a web decreased.

(2) The corrosion characteristic of the center part of G3. A decrease in board thickness under the web is intense.

Photo.2 Measurement situation

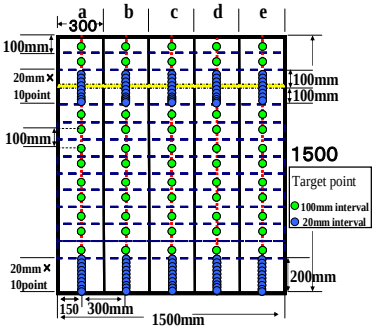

Fig.4 Measurement Procedure of the Web

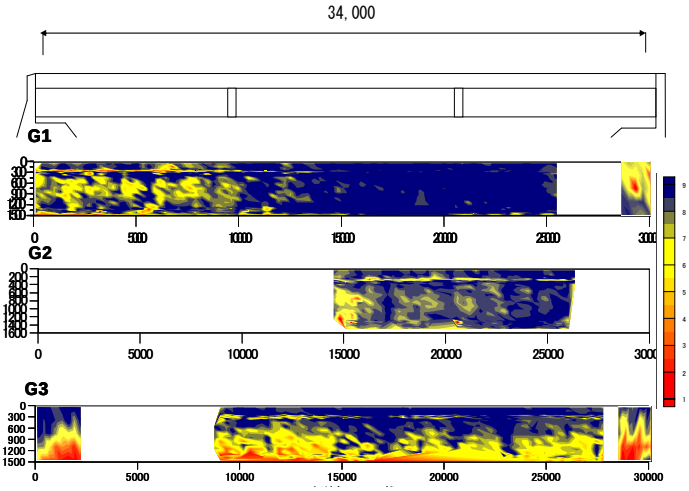

Fig.5 Web thickness distribution

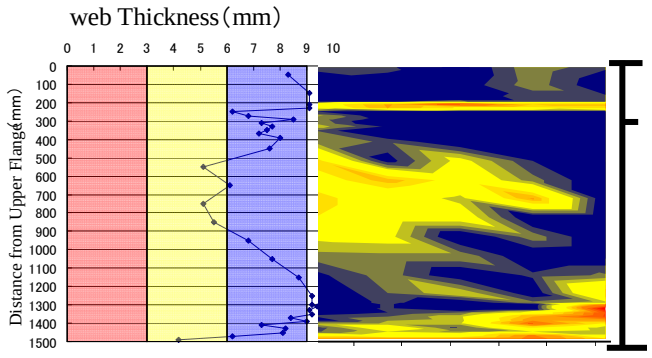

Fig.6 End of the main girder (G1-P4)

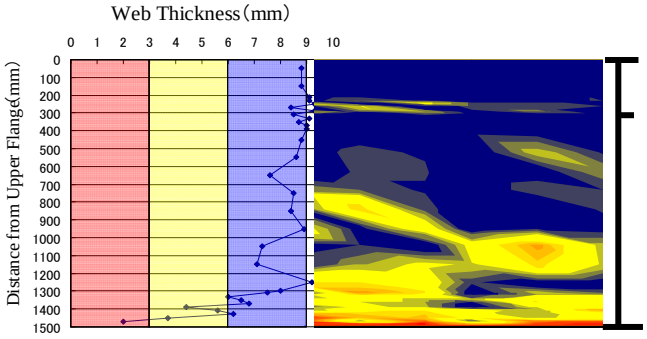

Fig.7 Center of the main girder (G3-P12)

4. Conclusion

From thickness characteristic for Steel girders, the obtained conclusions are listed as follows.

(1) As for the corrosion rate of the end and the center part of the main girder, the corrosion rate of the end is fast.

(2) In the sea side of the main girder (G1), the web thickness of the center part of the main girder is design thickness of 9 mm, and the smallest web thickness of the end is about 6mm.

(3). The corrosion characteristic of G1 was decreasing the thickness of center part of a web. In case of G3, A decrease in board thickness under the web was intense.

Reference

1)Toru, N., Kazuhiro N., Jyun M., Takashi O. 2001. Characteristics of Corrosion Damages in Steel Bridge Members. JSCE. No.668/I-54, pp.299-311