# Fatigue crack detection in orthotropic steel deck bridges applied by FMC/TFM using reflected waves of multiple paths (2)

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In recent years, many fatigue cracks propagating from the weld root of trough rib-to-deck welds have been detected in orthotropic steel deck bridges in Japan. These cracks are occurred from the root of rib-to-deck welds, and thus cannot be detected using visual inspection. Non-detective testing can effectively detect these cracks. Ultrasonic testing is the most reliable non-destructive method for these cracks. Various ultrasonic testing equipment has been developed so far, but it is difficult to detect small cracks. We have been developing advanced ultrasonic equipment applied FMC/TFM (Full Matrix Capture/Total Focusing Method). The developed equipment can scan inner cracks into rib-to-deck welds using the 32-channel linear array probe. Image resolution is improved applied by FMC/TFM, and can be expected to improve crack detection accuracy. In this paper, to confirm the crack detection accuracy of the developed equipment, crack investigations using the equipment were carried out using specimens with fatigue cracks induced by experiments. Crack detection accuracy is evaluated by comparing with real cracks induced in specimens. As a result, the developed equipment can detect cracks of 2.2mm or more in the height direction. In addition, crack detection accuracy was also confirmed in the actual bridge on metropolitan expressway. Crack detection accuracy in the actual bridge was almost the same as crack detection accuracy in the specimen.