



# Repair effect of externally bonded CFRP on propagation life of fatigue cracks initiated at in-plane welded gusset joints

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## Abstract

Focusing on fatigue cracks initiated at in-plane gusset welded joints, the delay in crack growth life due to externally bonded CFRP was experimentally verified. The results indicate that CFRP prevents the release of residual stress, subsequently delays crack growth in the compressive residual stress area.

**Keywords:** in-plane gusset, crack, CFRP, weld residual stress, repair

## 1 Introduction

Fatigue durability is a big issue for steel members subjected to cyclic loading from vehicle traffic, waves, etc. The patch plate repair method is generally adopted to repair and strengthen damaged steel members. However, as this method requires the use of welding or heavy equipment, it is difficult to utilize in a narrow space. In contrast, the repair method using externally bonded FRP circumvents handling difficulties in the construction site due to its lightness and ease of manipulation in the field. For this reason, the demand for the use of carbon fiber reinforced plastic (CFRP) to repair and strengthen steel

members is growing, owing to the material's high strength, high elasticity, and excellent corrosion resistance [1, 2].

The purpose of this study is to develop a repair method using CFRP that delays the fatigue crack propagation life generated from in-plane gusset welded joints. In this method, CFRP was made by applying the vacuum impregnation method (Vacuum-assisted Resin Transfer Molding, VaRTM). This repair method does not require the use of large equipment and can be applied at once in a short period of time.

However, the effect of CFRP formed and bonded by VaRTM to suppress the growth rate of fatigue