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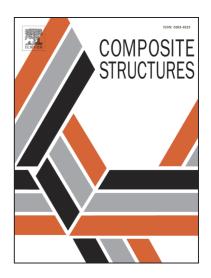
PII: S0263-8223(18)30901-2

DOI: https://doi.org/10.1016/j.compstruct.2018.07.032

Reference: COST 9949

To appear in: Composite Structures

Received Date: 5 March 2018 Revised Date: 14 June 2018 Accepted Date: 4 July 2018



Please cite this article as: Hartanto, D., Hamed, E., Agarwal, A., Foster, S.J., Behaviour of steel-CFRP lap joints under hygrothermal cycles and sustained loadings, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.07.032

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ACCEPTED MANUSCRIPT

Behaviour of steel-CFRP lap joints under hygrothermal cycles and sustained loadings

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ABSTRACT

The long term durability of FRP repaired steel structures is crucial for their safe use and

effective design. Past studies that investigated the durability of steel-FRP single lap joints

have focused on their response under extreme temperature and curing conditions, but without

representing the actual on-site conditions for typical civil engineering applications. This

paper presents an experimental investigation into the effects of hygrothermal cycles and

sustained loading on steel-CFRP bonded lap joints under typical environmental conditions. A

total of 72 lap joints were exposed to five hygrothermal cycles and sustained loading

conditions. Specimens that survived the long-term loading were immediately tested to failure

for evaluating their residual strength. The temperature cycles ranged from 15°C to 50°C and

the relative humidity ranged between 40-70% under different combinations. These practical

ranges of hygrothermal cycles were combined with practical curing temperatures and curing

times. Sustained loads that equal to 30% and 50% of the failure loads were also applied. The

results show that exposure to hygrothermal conditions only has little impact on the bonding

strength. However, when hygrothermal and sustained loading were applied simultaneously,

the bond strength of the lap joints was significantly affected in some circumstances.

Keywords: Creep; durability; fibre-reinforced plastic (FRP); hygrothermal; lap joints.

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