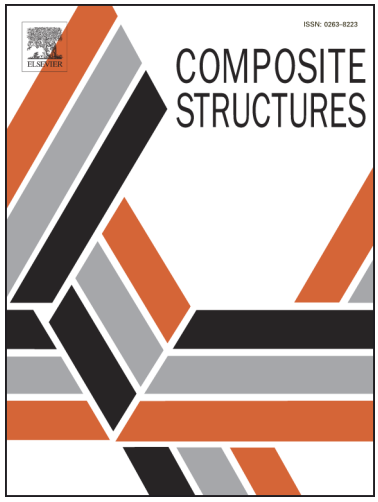


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Samir Emam, M.A. Eltaher

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# Buckling and Postbuckling of Composite Beams in Hygrothermal Environment

**Samir Emam**, Department of Mechanical Engineering, United Arab Emirates University, Al Ain, United Arab Emirates. Corresponding author. Email: semam@uaeu.ac.ae.

(On leave from Department of Mechanical Design and Production, Faculty of Engineering, Zagazig University, Zagazig, 44519, Egypt).

**M.A. Eltaher**, Department of Mechanical Design and Production, Faculty of Engineering, Zagazig University, Zagazig, 44519, Egypt.

## Abstract

This paper presents an investigation into the buckling and postbuckling of composite beams in hydrothermal environment. The free expansion due to both temperature variation and moisture absorption has been taken into consideration. In the meantime, the material properties are considered to be temperature- and moisture-dependent. A micromechanics-based model is proposed to consider the effect of the fiber volume fraction, temperature and moisture on the mechanical and hygrothermal material properties. The equilibrium equations are derived from the principle of virtual work where the small strain, moderate rotation assumption has been adopted. The classical Euler-Bernoulli beam (EBB) theory and the higher-order shear-deformation Reddy beam (RB) theory are presented. The critical buckling loads and the postbuckling amplitude are calculated at varying temperature, moisture, and fiber volume fraction. The model has been validated versus results published in the literature. The temperature variation has been found to significantly reduce the buckling load and increase the postbuckling amplitude. However, the contribution of the moisture concentration on the critical buckling loads has been found insignificant according to the assumptions made in this study. However, moisture has a noticeable effect on the postbuckling response.