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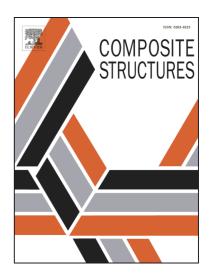
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## ACCEPTED MANUSCRIPT

#### Experimental study of CFRP strengthened steel columns subject to lateral impact loads

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#### **Abstract**

In both building and civil engineering structures, the occurrence of impact loading to column elements can be a significant issue, particularly in regard to disproportionate collapse. For existing structures vulnerable to impacts, the development of appropriate strengthening techniques is key to extending service life and improving robustness. In the case of structural steelwork, composites such as carbon fibre reinforced polymer (CFRP) offer a promising means of retrofitting and improving performance under impact. Towards this, the present study experimentally investigated a total of 12 square hollow section (SHS) columns under impact loads. The test series included both unstrengthened and CFRP strengthened samples with different fibre orientations with a view to finding the optimum CFRP configuration. As a means of simulating lateral impact on axially loaded elements, a purpose-built test rig was manufactured to apply a compressive preload to the samples prior to impact. Different preloading levels were applied to the samples before they were impacted transversely. The results show that the strengthening effectiveness increased with higher preloading level. The

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