

4th International Conference on

ADVANCED STEEL STRUCTURES

November 09-10, 2017 Singapore

Empa state-of-the-art research on CFRP strengthening of steel members

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Application of carbon fiber-reinforced polymer (CFRP) materials for retrofitting concrete girders has been extensively investigated and used in practice. Many studies demonstrated the beneficial influence of such composite strips for flexural, shear and confinement strengthening of concrete structures. However, strengthening techniques and the accompanying theory for steel structures have not been developed as thoroughly as those for concrete structures. There are several differences between the behavior of bonded joints in CFRP-strengthened concrete and metallic members, which will be briefly explained in this section. This work presents the most recent techniques that have been developed for strengthening of metallic members. Details of utilization of new advanced materials such as carbon-fiber reinforced polymer (CFRP) and iron-based shape memory alloys (Fe-SMAs) for pre-stressing existing metallic members are given. The paper begins with presenting the works on strengthening of metallic members using pre-stressed bonded and un-bonded CFRP material. The paper continues with explaining a new strengthening method using un-bonded pre-stressed Fe-SMA strips.

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