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A durable and very efficient external strengthening system is achieved if steel tendons for post-tensioning applications can be replaced with CFRP (Carbon Fibre Reinforced Polymer) tendons and if reliable anchorage systems are developed. This paper presents a newly developed and simple-to-use two-piece wedge anchorage for CFRP tendons with an integrated sleeve and a differential angle between barrel and wedge sections. Three longitudinal slits are cut into the one-piece wedge, with one slit open and the other two stopping 1 mm from the inner wedge hole. The integrated sleeve holds the wedge's sections together during presetting and loading, resulting in a circumferential confined gripping of the CFRP tendon and optimized surface friction area. Therefore, the one-piece wedge differs from conventional wedge systems, where the wedges act separately with adjacent spaces, wedging the separate tendon sleeve in the longitudinal direction. Evaluation of the failure modes during testing was one of the main keys in achieving an increasingly better performance of the anchorage until the final anchorage was developed. The obtained failure modes are therefore described to enlighten the importance of addressing them when testing. The test setup used and measured behaviour are described further together with the loading procedure. The anchorage reached the full capacity of the CFRP tendon and was seen to ensure a stable load of fracture.

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