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Durability of Concrete Beams Prestressed with CFRP

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The urgent need for sustainable structures is the driving force behind a growing international interest in the use of FRPs in infrastructure applications. However, to date, FRPs have not realised their full potential within the construction industry. One contributing factor is that the use of FRPs as primary structural elements is a relatively recent initiative and there is limited information on their long-term performance. In particular, since the typical service life of a civil engineering structure is 50-100 years, knowledge of the long-term durability of FRPs is of prime importance.

The research work, currently in progress at North Carolina State University and conducted in collaboration with Cambridge University, investigates the durability of concrete beams prestressed with CFRP tendons. A total of 15 beams have been constructed and tested under different mechanical and environmental conditions. The main parameters included in the program are the level of sustained stress in the CFRP tendons (either 55 percent or 70 percent of the ultimate load capacity of the tendons), the environmental exposure condition (either external exposure or continuous exposure to 15 percent salt spray at 130 °F temperature within an environmental chamber), the length of time under sustained load (either 9 or 18 months) and the type of testing to failure (either static or cyclic loading). Similar beams prestressed with steel strands are also tested as control specimens for comparison purposes.