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Abstract

Experimental Tests on Bond Performance between Corroded Steel Reinforcements and Concrete †

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Abstract: The corrosion of steel bars in concrete is a dangerous and extremely costly problem that causes losses of serviceability and structural capacity in buildings and bridges. Once the depassivation occurs, because of concrete carbonation or chloride attack, the oxides occupy approximately 2–6 times the iron volume, causing a pressure at the steel–concrete interface, and consequently cracks and bond-slip degradation. In particular, the reinforcement-concrete bond degradation influences the deformability of the element and consequently its service behavior. The present study is a part of an extensive research project—CONSTIN, between Oslo Metropolitan University and Niccolò Cusano University—aiming to evaluate the steel-to-concrete interaction in the presence of corrosion and to establish a variation law for the bond strength as a function of the corrosion level. The research assess the influence of different levels of corrosion on the interaction between the concrete and the most typical steel reinforcement typologies (steel strands and smooth and ribbed bars), characterized by the same diameter (equivalent to 12 mm) and bonded length. The different level of corrosion is reached with a specific duration of exposition of the embedded reinforcements to the accelerated electrolytic corrosion process. Some details about the laboratory procedure, the duration of exposition and the current density are provided. The preliminary results of the experimental campaign are presented.

Keywords: corrosion; bond-slip relationship; experimental tests

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