

## **The Effect of Pre-Twisting on the Ductility of Reinforcement.**

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In an ideal reinforced concrete structure, the reinforcement is placed in-situ and concrete poured with minimal disturbance to the reinforcement. This, however, is rarely the case as construction takes place in stages and it is normal to have continuity reinforcement passing through these joints. To assist with the construction, it is common practice to bend the bars out of position for either construction purposes or for safety reasons. To further complicate the issues, the continuity reinforcement may also be positioned incorrectly or manufactured with incorrect bends. In these situations the reinforcement is either bent or twisted until the orientation of the bar is correct. While bending of reinforcement is considered to be normal practice and assumed to have no effect on the tensile properties of the reinforcement, if the bends are larger than predefined bend diameters, the effect of twisting the reinforcement has no current limitations and its effect is unknown.

An investigation into the effect of twisting the reinforcement on the tensile properties of the bar has been carried out at the University of Western Sydney. This investigation has included testing of a number of specimens with various degrees of twist, and the effect of the twist on the behaviour of the reinforcing bars quantified. Additionally, a theoretical model based on work principles to predict the fracture strain of the reinforcement after twisting was also developed, and the experimental results compared. Based on the theoretical model and the test results, a design model has been proposed that gives guidance to the amount of twisting allowed if a minimum tensile fracture strain is specified. Using this model, the site engineer will be able to predict if the twists required to realign the reinforcement will have a detrimental effect on the design of the structure.