

Shear and Flexural Behavior of Concrete Members Reinforced with MMFX Steel

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ABSTRACT:

Corrosion of reinforcing steel is typically one of the main problems causing deterioration of concrete structures. The Microcomposite Multistructural Formable (MMFX) steel, which is a new commercially available steel, has proven to have high corrosion resistance in comparison with conventional steel without the use of coating materials. This characteristic was achieved by propriety alteration of the steel composition and microstructure. In addition, the MMFX steel has a higher strength than the conventional grade 60 steel which is attributed to the control of the MMFX steel's microstructure morphology. Therefore, replacing the conventional steel with the new MMFX steel is expected to be economically beneficial due to the use of lower reinforcement ratio, in addition to the advantage of increasing the service life of the structure.

A brief discussion of the fundamental characteristics of MMFX steel as a flexural reinforcement of concrete beams and slabs is presented.

This paper focuses on the use of MMFX steel for mat foundations typically used for high-rise structures. Mat foundations are normally not reinforced for shear and are usually heavily reinforced at locations of the columns, therefore reduction of the steel ratio, by using the MMFX steel to replace conventional reinforcement, will help reduce reinforcement congestion, construction time and improve concrete placement. Also, the use of MMFX steel for this type of application provides a high resistance to corrosion due to severe environmental exposure in comparison to the use of conventional grade 60 steel.

Two deep beams with identical cross-section and shear span to depth ratio of 2.45 were reinforced using MMFX steel and conventional grade 60 steel and tested to failure using the same loading configuration. The area of the longitudinal MMFX steel used in the beams was 40 percent less than the area of grade 60 steel to utilize the high tensile strength of the MMFX steel. Test results indicate that the replacement of the conventional grade 60 steel by MMFX steel with 40 percent less area of steel in such beams results in a similar behavior and load carrying capacity.