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Concrete Filled Double Skin Tubular Deep Beam Having Outer Circular and Inner Square Sections under Bending-Shear

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ABSTRACT: A concrete filled double skin tubular (CFDST) member consists of double concentric circular/square steel tube and in-filled concrete between two walls. The CFDST member may be lighter than an ordinary concrete filled steel tubular (CFT) member owing to the hollow section inside inner tube. Therefore, when the CFDST member is applied to high-raised bridge pier, reduction of the seismic action due to lighter structures can be expected.

The present study aims to investigate experimentally mechanical behavior of CFDST deep beam having an outer circular section and an inner square section (CS-CFDST) under bending-shear through asymmetric four-point loading testing method. Two selected test parameters are inner square width to outer circular diameter and the large diameter-to-thickness ratios of the steel tubes. As the results, observed failure modes were shear failure of in-filled concrete or outer tube's cracking at the position of maximum bending moment. Method to predict bending-shear capacities of CS-CFDST deep beam is mainly discussed. Furthermore, biaxial stress behavior of outer circular steel tube based upon elasto-plastic theory under plane stress conditions is also mentioned.

Keywords: Steel-concrete composite structures; concrete filled double skin tubular (CFDST); diameter-to-thickness ratio; inner width to outer diameter ratio; asymmetric four-point loading test

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