C04

Seismic Behavior of New Beam-Column Connections with Steel Fiber Reinforced Cementitious Composite (SFRCC) Slab

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1. Introduction

Traditional welded beam-column connections often fail in brittle fracture in the groove welding portion (mostly in the beam bottom flange). Considering this problem of current connections, this research proposes "weld-free" connections. A type of advanced concrete named SFRCC (steel fiber reinforced cementitious composites) is adopted in the proposed beam-column connection as shown in Fig. 1.

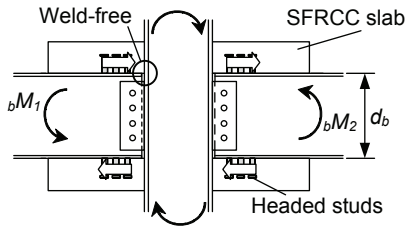

Fig.1 Proposed beam-column connection

2. Test Specimens

The test specimens were designed to simulate interior moment-resisting connections of a low-to medium-rise steel moment frame. Three specimens were fabricated at an approximately 0.6 scale. A relatively strong column (175 mm of the width, with a thickness of 12 mm) was used to ensure that the beam or floor slab would sustain yielding during cyclic loading before significant damage was developed in the column. The builtup H-shaped beam with the 220 mm in the height, 120 mm in the width, and 4.5 mm and 9 mm in the thickness of the web and flange was adopted. The SFRCC slab thickness was 90 mm and its width was 415 mm. The length of the slab varied with the arrangement of the headed studs. The test parameters were the arrangement of studs (number and layout) and the arrangement of rebars (size and layout). Specimen 'SC9' served as the standard specimen with 9 headed studs arranged in 3 by 3 manner and adequate rebars. Specimen 'SC8' was designed with 8 headed studs arrange in 4 by 2 manner and similar rebars as 'CS9'. Specimen 'SC9-SB' was designed with the same studs as 'CS9', while straight rebars were adopted. Three specimens were tested under cyclic loading to very large deformation.

3. Test Results

Workability of the new beam-column connection was experimentally proved. A strong SFRCC slab and sufficient number of studs are needed to guarantee the failure concentrated at the beam. It is noted that the number of studs had no influence on the initial stiffness of the connections. The rebars had large contribution to the ductility. One of the test results that show satisfactory performance is shown in Fig. 2.

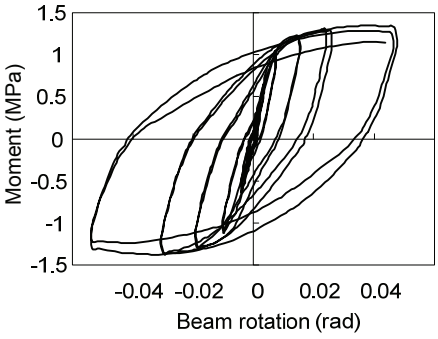

Fig.2 Beam moment versus beam rotation curve