

Development of Self-Reinforced Concrete Block for Improved Shear Wall Ductility

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Abstract:

This paper describes development of a new Self-Reinforced Block (SR Block) designed to achieve greatly increased compressive strains in order to enhance shear wall ductility. Design of SR Block to provide confinement of block concrete is presented. Proof-of-concept block making showed that reinforcing devices could be molded within the body of a hollow block using standard block making equipment. Prism tests using these SR Block showed equal strength to unreinforced block at 2% strain and over 80% strength at 3% strain. A spiral wire type of reinforcing device was molded into block for construction of a full scale shear wall. Tests of companion block prisms showed over 40% increase in compressive strength and over 80% retained strength at 3% strain. Fully reversed cyclic testing of the SR Block shear wall reached a ratio of ultimate deflection to yield deflection of 7.0 where ultimate deflection was defined as the point when post-yield capacity had decreased to 80% of the peak value. Using an idealized bilinear equal energy response, this ratio changed to 5.5. Compared to an identical wall utilizing standard block, the SR Block wall had superior ductility and capacity maintenance. Even so, examination of the wall after termination of loading showed that the ductility limit had not been reached but rather that resistance to lateral load had decreased due to a shear softening of the wall. A duplicate wall with improved shear resistance gave an idealized deflection ratio of 8.3. The implications for seismic design are discussed.

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