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	Authors:	A. A. Elsayed	
	Paper Title:	Improving of Impact Resistance of Concrete using Innovative Shapes of Steel Fibres	
1.	<p>Abstract: Concrete is often subjected to impact and other dynamic loads in service. These loads may occur due to blasts, traffic, and seismic activity. To enhance the impact resistance of concrete, many types of fibers can be used. In this research, two shapes of steel fibers are used: hook-ended shape (SF) and a new spiral shape (SSF). The innovative shape is introduced manually in fresh concrete with suitable vertical and horizontal alignment. The test program is designed to study the effect of SF, and SSF on the impact resistance of concrete and selected mechanical properties. The two shapes of steel fibers were added at the fraction volume of 0.5%, 1.0%, 2.0%, and 3.0%. The compressive strength of steel fibers reinforced concrete (SFRC) enhanced by 43.4% at 2.0% volume fraction relative to plain concrete. The compressive strength of spiral steel fibers reinforced concrete (SSFRC) enhanced by a 65% at 3.0% volume fraction relative to plain concrete. The splitting tensile strength and modulus of rupture of SFRC improved with increasing of fiber volume fraction recording 52.6% and 137.5% enhancement, respectively, at 2.0% volume fraction. The splitting tensile strength and modulus of rupture of interlocked spiral steel fibers (SSFRC*) improved with the increase in volume fraction up to 3.0%, recording 147% and 62.5% enhancement, respectively. Also, The toughness index of SFRC enhanced with the increase in the fraction up to 2.0%. The toughness indices I5, I10, and I20 registered values of 10.7, 20.5, and 35.1, respectively, at 2.0% fraction volume. The toughness index of SSFRC* enhanced with increasing the fraction volume up to 3.0%. The indices I5, I10, and I20 recorded values of 9.76, 18.78, and 35.8, respectively, at 3.0% fraction volume. The impact resistance of SFRC improved with the increase in the fiber content up to 2.0%, recording 33 times that of the impact resistance of plain concrete, at 2.0% fraction volume. The impact resistance of SSFRC* enhanced with the increase in the fiber volume fraction recording 116 times the impact resistance of plain concrete, at 3.0% fraction volume.</p> <p>Keywords: Reinforced Concrete; Steel Fibers; Strengthening; Impact; Mechanical Properties.</p> <p>References:</p> <ol style="list-style-type: none"> 1. ACI 544. I R-96, State-of-the-art report on fiber reinforced concrete, Farmington Hills, Michigan: American Concrete Institute, 2006. 2. American Society for Testing and Materials, Standard C-1 0 18, 1997, "Flexural Beam Test for the Testing of Steel Fiber Reinforced Concrete", ASTM, West Conshohocken. 3. Banthia .N, Gupta .P and Yan .C," Impact resistance of fiber reinforced wet-mix shot Crete", Part I: beam tests, Department of civil engineering, The University of British Columbia, Material and Structures, vol. 32, pp 563-570, Canada, 1999. 4. 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