

Dynamic Shear Energy Absorption of Ultra-High Performance Concrete

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Abstract : The exemplary mechanical performance and durability of ultra-high performance concrete (UHPC) has led to its rapid emergence as an advanced cementitious material. The uncharacteristically high mechanical strength and ductility of UHPC makes it a promising potential material for defense structures which may be subject to highly dynamic loads like impact or blast. However, the mechanical response of UHPC under dynamic loading has not been fully characterized. In particular, there is a need to characterize the energy absorption of UHPC under high-frequency shear loading. This paper presents preliminary results from a parametric study of the dynamic shear energy absorption of UHPC using the Charpy impact test. UHPC mixtures with compressive strengths in the range of 100-150 MPa exhibited dynamic shear energy absorption in the range of 0.9-1.5 kJ/m. Energy absorption is shown to be sensitive to the water/cement ratio, silica fume content, and aggregate gradation. Energy absorption was weakly correlated to compressive strength. Results are highly sensitive to specimen preparation methods, and there is a demonstrated need for a standardized test method for high frequency shear in cementitious composites.

Keywords : Charpy impact test, dynamic shear, impact loading, ultra-high performance concrete

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