

P41 Frequency Domain Assessment of Direct Shear in NSC and UHPC

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Abstract:

Direct shear is recognized as a possible response mechanism in structural concrete systems subjected to severe dynamic loads, and it could lead to catastrophic failure. Behavioral models for direct shear in normal strength concrete (NSC) were introduced in the 1970s, and their adaptation for the analysis of structural response under blast and ground shock effects was presented in the 1980s. The introduction of ultra high performance concrete (UHPC) for protected facilities has created the need to reevaluate direct shear in both NSC and UHPC, and to characterize this response mechanism more accurately. Therefore, direct shear impact tests were conducted on NSC and UHPC specimens with three reinforcement ratios, and the results were analyzed in both the time and frequency domains. This paper is focused on the assessment of direct shear in the frequency domain to identify the relationships between parameters in the direct shear resistance functions for NSC and UHPC and the power spectral density of the captured data from impact tests. The data for each type of specimen were analyzed by using the experimental time histories for impact force, displacement, velocity and acceleration. Finally, the results were compared also with those obtained from both the previous and modified direct shear models to identify the behavioral parameters that could explain the direct shear behavior under impact loading. This paper will present the study, the findings, and provide conclusions and recommendations. A companion paper will address the tests and the analysis in the time domain.

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