NUMERICAL STUDY OF DIRECT SHEAR BEHAVIOR IN NSC AND UHPC

T. Krauthammer[1], D. Levenhagen[1], B. Long[1], and R. Lewis[2]

[1] Center for Infrastructure Protection and Physical Security, University of Florida, Gainesville, FL 32611-6580, USA; [2] Defense Threat reduction Agency, Ft. Belvoir, VA 22060-6201, USA

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Unexpected and catastrophic direct shear failures were observed in the 1980s during research on the survivability of shallow-buried normal strength reinforced concrete (NSC) box-type structures subjected to airblast loads. That type of response was defined as a Direct Shear failure. Unfortunately, we do not have a good understanding of this structural response mechanism. Furthermore, there is no information on how structural members made of Ultra-High Performance Concrete (UHPC) would behave under similar conditions. Since this type of structural failure has very serious implications for both the survivability and fragility of critical facilities, we need urgently to develop a better understanding of direct shear behavior in both NSC and UHPC structures. We have to establish the relationships between structural parameters (e.g., material type and its ingredients, its strength, structural and geometrical details, etc.), loading conditions, and response. Furthermore, we have to understand and define the physical behavior of such systems, and how to control undesired direct shear responses in NSC and UHPC structures. This issue was addressed by a comprehensive computational simulations for simulating high-precision impact tests on direct shear specimens. Specimen parameters (e.g., material type and its ingredients, its strength, structural and geometrical details, presence of steel fibers, main reinforcement ratio, and specimen geometry) were investigated, in preparation for follow up tests.

The paper will describe the study and the obtained results, present recommendations for the upcoming tests, and provide conclusions and recommendations.