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Shock Compaction of Cortuf – an Ultra High Performance Concrete CHRISTOPHER NEEL, Air Force Research Laboratory — Several dozen impact experiments were conducted utilizing gun-driven, parallel-plate impacts in several complimentary configurations to produce weak shock waves in an Ultra-High Performance Concrete (UHPC) known as "cortuf" with no fiber reinforcement or coarse aggregate. This investigation shows that although different grades of concrete vary widely in quasi-static compressive strength, under dynamic shock loading (uniaxial strain), most have similar yield points that can be described as yield strength of 0.4 GPa. In cortuf, the dynamically determined compressive yield point agrees closely with the quasi-statically determined yield (in conditions of uniaxial strain), implying very little strain-rate strengthening in UHPC, but in low strength (conventional) concrete, the dynamically determined yield is much higher than the corresponding quasi-static yield point. Therefore, the yield point of concrete in high-rate uniaxial strain is found to be independent of unconfined yield strength, and limited to an upper bound of ˜0.4 GPa (HEL=0.5 GPa). Post-yield compaction is strain-rate dependent in cortuf as well as other formulations for which literature data is available. The Hugoniot up to 21 GPa is reported, and the results suggest that Portland-cement-based concretes without fiber reinforcement display shock behavior below 3 GPa which is dependent on the formulation and curing, but above 3 GPa, *most* can be represented by the empirical shock relation U_S =2.35 km/s +1.66u_P to at least 21 GPa.

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