

High-Load Bearing Deformation Block Made of UHPC

Petr Hála – Ph.D. Candidate, Czech Technical University in Prague, Faculty of Civil Engineering, 166 29 Prague, Czech Republic, Phone: +420 22435 3845, Email: petr.hala@fsv.cvut.cz

Radoslav Sovják, Ph.D. * (corresponding author) – Associate Professor, Czech Technical University in Prague, Faculty of Civil Engineering, 166 29 Prague, Czech Republic, Phone: +420 22435 4941, Email: sovjak@fsv.cvut.cz

Markéta Munduchová – Engineer, Rieder Beton, 586 01 Jihlava, Czech Republic, Phone: +420 56757 3229, Email: munduchova@rieder.cz

Vít Majer – Engineer, Rieder Beton, 586 01 Jihlava, Czech Republic, Phone: +420 56757 3230, Email: majer@rieder.cz

Tomáš Mičunek, Ph.D. – Associate Professor, Czech Technical University in Prague, Faculty of Transportation Science, 128 03 Prague, Czech Republic, Phone: +420 22435 9001, Email: micuntom@fd.cvut.cz

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Extended Abstract

Statistics indicates that one quarter of deadly traffic accidents are caused by the collision of vehicle with non-deformable objects. To address this issue and to decrease the transportation hazards, we developed novel Energy Absorbing System (EAS). It is comprised of blocks with cellular structures made of Ultra-High Performance Concrete (UHPC). These blocks are able to absorb impact energy because of the gradual brittle fracture process which occurs in the cellular structures and at the same time they are able to carry the weight of the structure above or to withstand the load generated by crossing vehicles. The UHPC used makes EAS suitable for use in harsh environmental conditions while still having reasonable production costs and the ability to be mass produced. All components of UHPC are commonly available in large volumes for a reasonable price and the resulting material can be shaped into various forms, which makes it easily adjustable to any possible impacting mass or velocity in order to control impact force and deceleration. It was demonstrated that the EAS comprised of blocks with cellular structures is able to absorb impact energy because of the gradual brittle fracture process which occurs in the cellular structure. During the conducted car crash test, the crumple zone of the car was not crumpled; car bounce of was eliminated

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and gradual deceleration of the car was recorded. The ability of the EAS made of UHPC to gradually decelerate impacting cart was demonstrated using experimental and numerical methods. The main objective of our recent project is to further improve the EAS in cooperation with the private sector and to begin its mass production.

