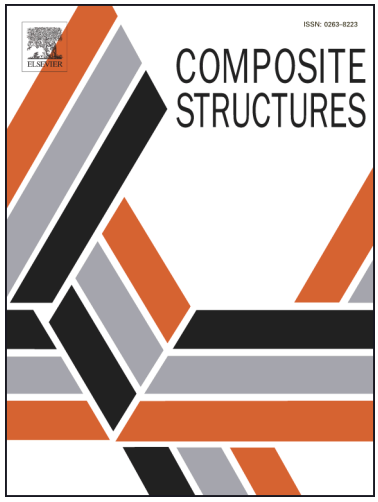

The development and ballistic performance of protective steel-concrete composite barriers against hypervelocity impacts by explosively formed projectiles

Alex Remennikov, Edward C.J. Gan, Tuan Ngo, Michael D. Netherton

PII: S0263-8223(18)30958-9
DOI: https://doi.org/10.1016/j.compstruct.2018.09.060
Reference: COST 10206

To appear in: *Composite Structures*

Received Date: 10 March 2018
Revised Date: 6 August 2018
Accepted Date: 18 September 2018

Please cite this article as: Remennikov, A., Gan, E.C.J., Ngo, T., Netherton, M.D., The development and ballistic performance of protective steel-concrete composite barriers against hypervelocity impacts by explosively formed projectiles, *Composite Structures* (2018), doi: https://doi.org/10.1016/j.compstruct.2018.09.060

THE DEVELOPMENT AND BALLISTIC PERFORMANCE OF PROTECTIVE STEEL-CONCRETE COMPOSITE BARRIERS AGAINST HYPERVELOCITY IMPACTS BY EXPLOSIVELY FORMED PROJECTILES

Alex Remennikov*[1], Edward C. J. Gan[2], Tuan Ngo[3], and Michael D. Netherton[4]

[1]Centre for Infrastructure Protection and Mining Safety, University of Wollongong, Wollongong, NSW 2522, Australia, e-mail: alexrem@uow.edu.au
[2]Faculty of Engineering and Information Sciences, University of Wollongong, Wollongong, NSW 2522, Australia, e-mail: ecjg428@uowmail.edu.au
[3]Department of Infrastructure Engineering, The University of Melbourne, Parkville, VIC, 3010, Australia, e-mail: dtngo@unimelb.edu.au
[4]Centre for Infrastructure Performance and Reliability, The University of Newcastle. Callaghan, NSW 2308, Australia, e-mail: michael.netherton@newcastle.edu.au

Abstract

Explosively formed projectile (EFP) is one of the most severe explosive and impact loading threats for civil infrastructure and military vehicles. Currently, there is no effective means of protection for military vehicles and infrastructure facilities from EFPs. This paper presents the experimental results of the hypervelocity impact of EFPs on steel-concrete (SC) barrier systems of finite dimensions. The SC barrier units tested were broadly representative of the type of protective SC units used in the expedient construction of barriers for mitigating improvised explosive device (IED) and EFP threats to critical infrastructure facilities. The response of non-composite, partially-composite and fully-composite SC barrier units was studied. All studied protective systems were capable of terminating the high-velocity projectiles effectively through the combined action of the concrete core and steel faceplates. The data gathered from these tests is also intended to further the understanding of impacts on SC composite structures at speeds greater than 1000 m/s and for the calibration of numerical models of EFP formation and its interaction with steel-concrete targets. 3D numerical simulations were performed to better understand the various stages of EFP interaction with the SC composite barriers and develop recommendations for their design optimisation. No previously published results on the EFP terminal ballistic performance of SC composite structures of finite dimensions have been found in the open literature.

Keywords: Explosively formed projectiles, hypervelocity impact, steel-concrete protective structures, terminal ballistic