

# Accepted Manuscript

Impact perforation of monolithic polyethylene plates: projectile nose shape dependence

I. Mohagheghian, G.J. McShane, W.J. Stronge

PII: S0734-743X(15)00018-4

DOI: [10.1016/j.ijimpeng.2015.02.002](https://doi.org/10.1016/j.ijimpeng.2015.02.002)

Reference: IE 2470

To appear in: *International Journal of Impact Engineering*

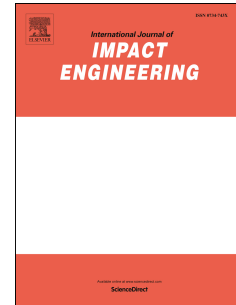
Received Date: 13 August 2014

Revised Date: 19 December 2014

Accepted Date: 3 February 2015

Please cite this article as: Mohagheghian I, McShane GJ, Stronge WJ, Impact perforation of monolithic polyethylene plates: projectile nose shape dependence, *International Journal of Impact Engineering* (2015), doi: 10.1016/j.ijimpeng.2015.02.002.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



# Impact perforation of monolithic polyethylene plates: projectile nose shape dependence

I. Mohagheghian, G.J. McShane\*, W.J. Stronge

*Department of Engineering, University of Cambridge,*

*Trumpington Street, Cambridge CB2 1PZ, UK*

## **Abstract**

Ductile thermoplastics, for example Ultra High Molecular Weight Polyethylene (UHMWPE), are of interest for their impact energy absorbing capabilities. While the impact perforation mechanisms of metallic targets have been investigated in some detail, far less progress has been made towards understanding the impact resistance of ductile polymers. The aim of this investigation is to identify the relationship between the projectile tip geometry and impact energy absorption of semi-crystalline thermoplastics. The focus of the study is light-weight monolithic plates of extruded polymer impacted normally by rigid projectiles at velocities up to  $100 \text{ ms}^{-1}$ . Three polymers will be considered: Low Density Polyethylene (LDPE), High Density Polyethylene (HDPE) and Ultra High Molecular Weight Polyethylene (UHMWPE). Polyethylene provides a convenient test material, as variations in microstructure provide a contrast in mechanical properties, without significant variations in density. Three distinct projectile nose shapes are considered: blunt, hemi-spherical and conical. For a conical tip, perforation occurs by ductile hole expansion. For this nose shape the high yield strength and strain rate sensitivity of HDPE offers an advantage over the other two polyethylenes. Perforation by blunt and hemi-spherical projectiles is more sensitive to deformation localisation. The high strain hardening of UHMWPE, which increases with strain rate, results in a significantly greater impact resistance than either HDPE or LDPE. The perforation

Download English Version:

<https://daneshyari.com/en/article/7173165>

Download Persian Version:

<https://daneshyari.com/article/7173165>

[Daneshyari.com](https://daneshyari.com)