

ELASTOMERIC POLYMERS FOR BLAST AND BALLISTIC RETROFITTING OF STRUCTURES

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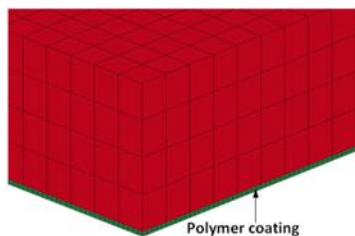
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Graphical abstract



Abstract

In many parts of the world, terrorism has become a major threat to nations, and terrorist activities and accidental explosions have been directed towards the destruction of buildings and critical infrastructures. As a result, almost every new development requires the consideration of safety and security aspects such that even a new building incorporates protective engineering features in its design. In this aspect, researchers have been investigating the use of elastomeric polymers (such as polyurethane and polyurea) for structural retrofitting applications due to attractive characteristics and morphology exhibited by these materials. This paper provides a review on this novel approach of strengthening structural elements and systems to enhance their capacity against blast and ballistic threats. The discussions in this review have been focussed on the application of this technique on the most widely used structural systems of masonry, concrete, metallic and composite structural systems. This technique offers an alternative to existing strengthening techniques in protecting structures against the risks of blast, ballistic and impact loads.

Keywords: Blast loading, ballistic loading, polyurea, polyurethane, retrofitting, coating

Abstrak

Di serata tempat di dunia, keganasan telah menjadi satu ancaman yang besar kepada kebanyakan negara, dan aktiviti-aktiviti pengganas dan letupan tidak sengaja terarah kepada kemusnahan bangunan dan infrastruktur yang kritikal. Akibatnya, hampir setiap pembangunan baru memerlukan pertimbangan dari aspek keselamatan, di mana pembinaan sebuah bangunan baru juga diperlukan untuk menggabungkan ciri-ciri kejuruteraan perlindungan dalam reka bentuk. Dalam aspek ini, para penyelidik sedang mengkaji penggunaan bahan polimer elastomer (seperti poliuretana dan poliurea) untuk aplikasi penguatan struktur di mana ia disokong oleh kecerahan dan morfologi menarik yang dipamerkan oleh bahan-bahan ini. Kertas kerja ini memberikan ulasan mengenai pendekatan novel ini untuk pengukuhan elemen dan sistem struktur untuk meningkatkan keupayaannya terhadap ancaman beban letupan dan balistik. Perbincangan dalam ulasan ini telah difokuskan kepada aplikasi teknik ini ke atas sistem struktur yang paling luas digunakan iaitu sistem-sistem struktur perbatuan, konkrit, logam dan komposit. Teknik ini menawarkan alternatif kepada teknik penguatan yang sedia dalam melindungi struktur terhadap risiko beban-beban letupan, balistik dan hentaman.

Kata kunci: Beban letupan, beban balistik, poliurea, poliuretana, penguatan, salutan

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