

UNIVERSITI TEKNOLOGI MARA

**THE EFFECT OF STITCHING
PARAMETERS ON THE PUNCTURE
RESISTANCE PROPERTIES OF HIGH
STRENGTH FABRIC SYSTEM**

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Thesis submitted in fulfillment
of the requirements for the degree of
Master of Science

Faculty of Applied Sciences

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I certify that a panel of examiners has met on 4 November 2014 to conduct the final examination of Suraya Ahmad Suhaimi on her Master of Science thesis entitled “The Effect of Stitching Parameters on the Puncture Resistance Properties of High Strength Fabric System” in accordance with Universiti Teknologi MARA Act 1976 (Akta 173). The Panel of Examiners was as follows:

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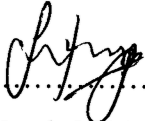
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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The effect of stitching parameters on the puncture resistance properties of high strength fabric system was investigated. There are three objectives in this study; to investigate the effect of stitching patterns on the puncture resistance properties of the high strength fabric system, to investigate the effect of stitch density on the puncture resistance properties of the high strength fabric system, and to suggest the mechanism of penetration of the high strength fabric system. Four types of stitching patterns used in this study; vertical, diagonal, square and diamond stitched patterns. The samples were stitched with the nylon thread in two types of stitch density; 4 stitch/cm and 8 stitch/cm. The puncture resistance test was conducted and the conical shape probe was used in the test. The probe moved downward at 100 mm/min and stopped automatically when the maximum puncture load achieved. The results showed that diagonal, vertical and unstitch patterns gave much highest puncture resistance performance. Fabrics that were stitched with high stitch density offer higher puncture load value from 2-layer to 4-layer. There is a possibility of fabric slippage on the 5-layer and 6-layer fabric because the fabric samples became thicker and the clamping gap increased. The shape of the probe also contributed to the mechanism of penetration. The conical probe was able to push aside the principal yarns. The sharp tip of the conical probe stretched the fibers and the stitch yarns, break the fibers and stitch yarns, and then penetrate into the fabric. The local yarn rupture was the fabric failure mode in this study. The puncture resistance of the high strength fabric system is dependent upon the number of fabric layers, types of stitching patterns, and the number of stitch density used to the fabric system.

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