

Technical Bulletin

Z Shield® Material: Ballistic Performance After Aging

Z Shield® Material

Z Shield® ballistic material is a non-woven, unidirectional composite cross-plyed in a 0/90 degree orientation, and sandwiched in a thermoplastic film to form a laminated continuous roll. The composite is comprised of PBO [poly(p-phenylene-2,6-benzobisoxazole)] high performance fiber, known as Zylon® fiber, impregnated with a resin matrix. Z Shield® material is one of the highest performing ballistic materials for soft armor on a weight to performance basis.

Honeywell Spectra Technologies is an ISO 9000 registered business. Because of those requirements, Honeywell follows design protocols during the development of new materials. This includes evaluation of the material for its performance and quality as well as the steps for commercialization prescribed by the DFSS (Design for Six Sigma) program.

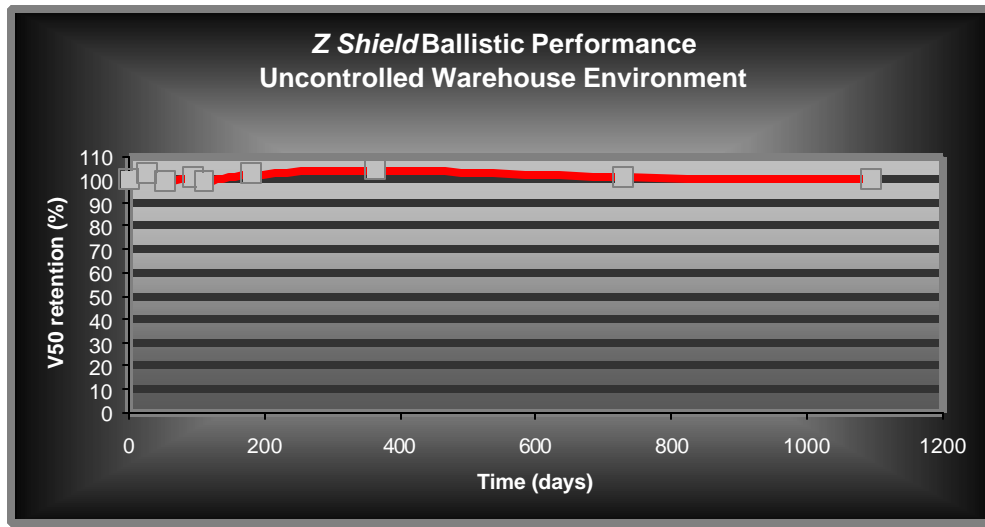
In addition to the performance and quality standards that are established at the commercialization of a new product and adhered to during production of the material, supplementary testing programs are implemented to document other material properties. One material property investigated on an on-going basis is normal aging of the material. This testing protocol examines the performance of the material over time.

Test Protocol

Typical life expectancy based on the body armor manufacturer's warranties in industry, for a maintained ballistic garment is 5 years. Hence, a testing program is established to monitor the performance of the ballistic material from initial production up to and beyond five years of shelf life. The V50 of the material is used as the indicator for performance and measured over time. The performance of the 'aged' material is then compared to the original material to observe the performance retention of the product.

Significant effort has been spent in the development of a robust test protocol. The influence of variability in testing is minimized through a series of DOE's (design of experiments) which eliminate the noise of testing associated with bullet type, sample configuration, shot pattern, sample preparation, testing fixture etc. Standard V50 testing follows the general guidelines and procedures of MIL-STD-662E.

Z Shield® material has been a commercial product since year 2000. Since its introduction, V50 testing has been performed and recorded to establish the performance of the material over time. The following is the data to date:



Z Shield® material stored in cardboard boxes in an uncontrolled warehouse in Petersburg, VA. Temperature and humidity levels were recorded by thermometer/ hygrometer readings with highs and lows of 95° F to 55° F and 90% - 20% relative humidity respectively.

Conclusion

The data presented regarding Z Shield® materials demonstrates that there has been no loss of ballistic performance over a three-year time period when stored in an uncontrolled warehouse environment. Based on the data, and from experience with other ballistic materials, there is no significant anticipated change in the ballistic performance response of the Z Shield® material for the five year suggested lifespan of most ballistic resistant vests assuming proper care and use.

In 1998, the National Institute of Justice published the Selection and Application Guide to Police Body Armor. Revised and renamed in November of 2001, the Selection and Application Guide to Personal Body Armor states, "Age alone does not cause body armor's ballistic resistance to deteriorate. The care and maintenance of a garment - or the lack thereof - have been shown to have a greater impact than age on the length of service life of a unit of body armor. Armor that is 10 years old and has never been issued may be perfectly acceptable for use, provided that the rated level of protection is still appropriate for the typical threats faced. Conversely, 2- or 3-year-old-armor that has been worn regularly and improperly cared for may not be serviceable."

On September 30, 2003, the National Institute of Justice reiterated the critical importance of properly caring for body armor in their release, NATIONAL INSTITUTE OF JUSTICE STATEMENT REGARDING SECOND CHANCE, INC. BODY ARMOR "UPGRADE" OFFER: "Proper care, storage, and cleaning of the armor are critical to maximizing its useful life. Storage of the armor in extreme environmental conditions or non-temperature-controlled environments (e.g., automobile trunks, non-climate-controlled storage rooms or areas) is not recommended under any circumstances."

For more information about Honeywell's ballistic materials, please visit our Web site: www.spectrafiber.com, where you can also find information about our partnership with the National Tactical Officers Association (NTOA) and the Safe Today, Alive Tomorrow safety awareness program.

For more information, please contact:

Toll Free: +1-800-695-5969
 Europe: +33 3 82 44 80 00
 Asia: +662 631 1969
 Web site: www.spectrafiber.com

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