



WORKPLACE TIPS

Proper Sizing: The Key to Extra Durability of Protective Apparel

By JAMES P. ZEIGLER

Today's protective garments—both limited-use and reusable types—are made from fabrics that have been specially engineered for both barrier and physical durability. Toughness and strength are important in these garments because protective clothing is often worn in industrial environments where exposures to cuts, punctures, snags and abrasives are common. If clothing is to provide reliable protection for the wearer, it must be tough enough to withstand these abusive conditions without compromising barrier.

Fabric durability is desirable in less-demanding work environments as well. The normal stretching and bending associated with routine industrial tasks can cause premature failure of garments at seams and in over-stressed areas such as knees, seats, underarms and elbows.

For these reasons, safety professionals should insist on protective apparel made from fabrics that provide demonstrated durability as well as excellent barrier properties. Many protective clothing manufacturers have responded to this demand by developing improved fabrics that provide a balance of barrier, comfort and wear-resistance. (See sidebar.)

GARMENT FIT CONTRIBUTES TO DURABILITY

While a protective fabric's inherent strength and toughness are important to garment durability, proper fit of the garment to the individual worker is probably the most-significant contributor to wear life. Garments that are not correctly sized—too tight or too loose, or that bind, sag or droop—will wear faster, snag and puncture more easily and fail more often. Ill-fitting garments can also interfere with job performance and, in some cases, may add to the hazards faced by the wearer.

Consequently, safety professionals should ensure that protective apparel is correctly sized for the workforce and make sure employees are trained to select garments that fit properly. (It should be noted that the general provision of OSHA's Personal Protective Equipment Standard, which includes protective apparel, requires that PPE be properly sized.)



SIZING GUIDELINES THAT IMPROVE THE DURABILITY & SAFETY OF PROTECTIVE APPAREL

Protective apparel experts recommend the following general guidelines for selecting garments that are correctly sized for durability and worker safety.

• **Consider special sizing needs of protective apparel.** Size designations used for protective apparel differ from those used for ordinary clothing. Thus, one cannot assume that a worker who wears a size "L" sweatshirt will require a size "L" protective coverall. Several factors must be considered when matching protective garments to individual work-

ers; these include body height, weight, shape and amount of clothing to be worn beneath the protective apparel. As a general rule, one should consult the special sizing charts developed by apparel suppliers. Better yet, garment fit and durability should be evaluated under simulated work conditions.

• **Be cautious when using sizing charts.** Unfortunately, protective clothing manufacturers do not follow the same sizing standards, and sizing charts will vary among brands and vendors. International Safety Equipment Assn. (ISEA) has developed a garment sizing standard that includes a sizing chart for limited-use protective apparel. Based on the wearer's height and weight, this chart has proven helpful in reducing the variability in sizes among different makes of clothing. However, while the ANSI/ISEA 101-1996 standard and other sizing charts may aid the selection process, a more-important gauge of correct size is an actual wear test of fit, comfort and mobility.

• **Have employees try on garments.** Garments that are too large and loose-fitting can be awkward and cumbersome and may present snagging and tripping hazards. Garments that are too small can bind, chafe, restrict motion and add to job stress. In both cases, the garment's wear life will be shortened and the worker's safety and health may be compromised.

Therefore, when issued protective apparel, employees should check the garments for fit, comfort, flexibility and range of motion. Both ASTM F-1154 and ANSI/ISEA 101-1996 contain a series of bending and stretching exercises that the wearer can perform to determine whether a garment fits properly and whether it will restrict work procedures in any way.

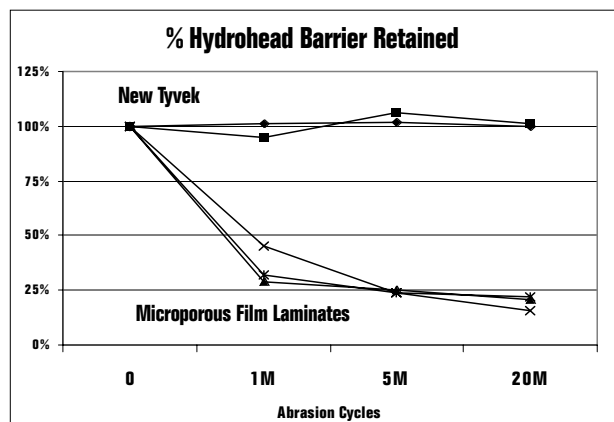
Today's Protective Fabrics: Engineered for Greater Durability

Case in Point: New Tyvek

When DuPont announced the availability of its New Tyvek fabric earlier this year, the protective apparel industry's attention focused on the greater comfort and breathability offered by the new material. However, DuPont scientists have also demonstrated that the fabric sets the standard for garment durability and wear life.

The improved fabric provides outstanding tensile and tear strength and is tougher than the original Tyvek material. It has a 25-percent better work-to-break strength, is more resistant to abrasion and retains its barrier protection better despite the rigors of the workplace. Garment comparison tests have shown that the new fabric offers two to three

FIGURE 1 Abrasion Test

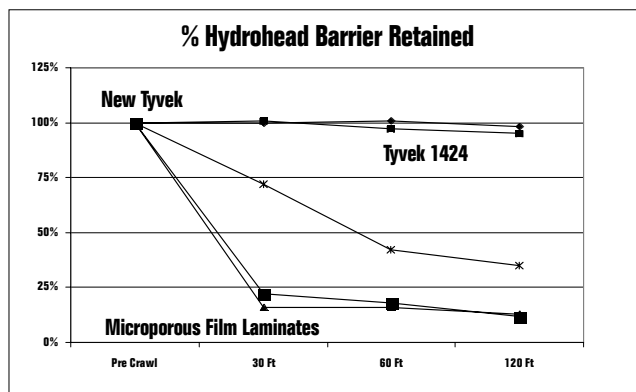


Abrasion testing illustrates the inherent durability of New Tyvek fabric compared to garment materials that rely on protective coating or film.

times the durability of other commercial barrier products that are used in protective apparel (including SMS and microporous films). When subjected to simulated abrasion conditions with real subjects, it had significantly less damage than the commercial microporous film products tested.

In a series of independent tests conducted to evaluate garment durability, 31 individuals wearing different types of protective apparel were put through a series of exercises that simulated common work tasks. Activities included crawling, ladder climbing, valve turning, box lifting and other tasks that physically abused the garments. After the test sessions were completed, each garment was inspected for rips, tears and seam defects. As Figures 1 and 2 show, New Tyvek garments retained their integrity and sustained far less damage than other types of apparel tested. This fabric is just one example of the high-performance protective

FIGURE 2 Human Crawl Test



After a crawl test, the New Tyvek garment retained 100 percent of its barrier protection; other fabrics lost more than 75 percent of their barrier protection in this test.

materials being developed by fabric and garment suppliers. Ongoing improvements in the durability of today's protective fabrics will continue to increase the wear life of safety apparel while ensuring greater protection for workers in hazardous environments. And, as the accompanying article explains, proper sizing of garments can also have a significant effect on wear life.

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•**Look for important garment construction features.** Manufacturers of high-quality garments design apparel to compensate for differences among wearers and work environments by incorporating several special construction features that enhance durability. These include:

- 1) high-strength reinforced seams that will accept stress on jobs that involve excessive stretching and bending;
- 2) bound seams (with an extra layer of fabric sewn into the seam) designed to resist added stress in high-particle and liquid-spray exposure conditions;
- 3) taped seams designed to endure stress and maintain barrier under exposure to heavy liquid splashes and vapors;
- 4) extra fabric in critical locations to allow freedom of movement and prevent stress on the garment due to stretching, bending or squatting;
- 5) special high-strength stitching in areas that will receive the most stress and abrasive wear;

6) a tail of thread at the end of each stitch line (a feature designed to prevent unraveling).

GARMENTS THAT FIT PROPERLY PROVIDE THE BEST BARRIER PERFORMANCE

Tears and holes can compromise a garment's barrier performance and put the wearer at risk. Proper sizing is important in preserving their integrity and ensuring maximum barrier performance. Apparel that fits well is less likely to snag, tear or wear through and allow penetration of hazardous materials. In addition, proper sizing ensures better interfacing with other protective equipment (sleeve-to-glove; pant-leg-to-boot; jacket-to-face-mask). And, as experienced safety professionals know, protective garments that fit well are more comfortable, easier to work in and less likely to contribute to job stress and unsafe acts.

Seasoned safety professionals trust the adage "An ounce of prevention is worth

a pound of cure." When it comes to protective apparel, the extra effort invested in size selection can multiply payback by a factor of three—through increased garment life, lower replacement costs and greater security for employees.

James P. Zeigler, Ph.D., is a research associate in the Tyvek Business at the Spruance Plant in Richmond, VA. In this position, he provides market support and product development for Tyvek protective apparel and Tychem chemical barrier fabrics. Zeigler is a member of American Society for Testing and Materials Committee F23 on Protective Clothing and National Fire Protection Assn. Technical Committee for Hazardous Materials Protective Clothing and Equipment.

For more information on the proper sizing of protective apparel and its effect on garment durability, visit www.dupontprotectiveapparel.com; call the company's fax-on-demand system at (800) 558-9329 or contact a product information specialist at (877) 797-5907.