

What is a breathable cover?

Breathable covers support efforts to minimize corrosion by removing moisture from beneath the cover. Breathable covers should prevent the penetration of liquid phase water, while allowing water vapor to diffuse outward, as shown in Figure 1. These two characteristics, waterproofing and moisture permeability, are mutually contradictory [1]. Breathability should not be confused with wicking, which is the ability of a fabric to move liquid phase water away from the surface being protected.

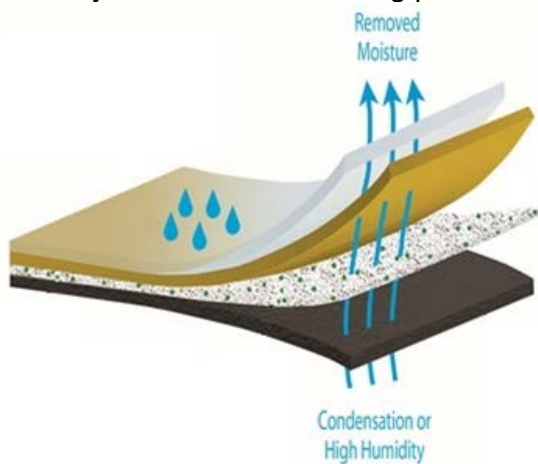


Figure 1. Breathable covers

Water transmission through uncoated fabrics is achieved via two diffusion mechanisms; vapor transmission through the inter-yarn spaces, and through individual fibers. The fiber's hydrophilic characteristics will also influence the extent of water transmission via that particular mechanism. Water transmissions may also occur via capillary transfer, which depends on fiber size, denier, wettability, and the number of capillary spaces within the fiber bundle. Tightly woven fabrics made from natural hydrophilic fibers are more efficient in transmitting water vapor than fabrics made from hydrophobic fibers of a similar construction [2]. For over 60 years it has been known that water vapor permeability decreases as the fabric thickness increases [3]. Once the water is wicked into the fiber, the importance of breathability begins.

The mechanism switches from a capillary action to gas diffusion where gas molecules diffuse into areas

of lower concentration and effuse through tiny openings. The charge along the molecule varies, and weak bonds between water vapor molecules and the membrane may form. This bond may be broken, allowing another water vapor molecule to take its place. This process continues, and water vapor molecules migrate from the side with higher relative humidity to the side with lower relative humidity [4].

Breathable fabric covers should be woven tight enough to prevent penetration of liquid phase water, but loose enough to allow a high transmission rate of water vapor, as shown in Figure 2. These fabrics should be coated with durable, breathable coatings, to enhance the life span of the fabric.

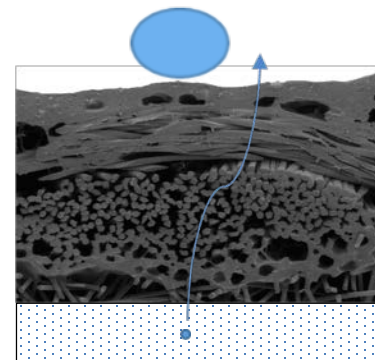


Figure 2. Small water vapor molecule moves through the cover and the large water droplet is unable to penetrate the cover¹

Anti-corrosion covers that employ breathable fabric ensure that moisture, a key corrosion prerequisite, migrates away from the assets being protected.

References

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- [2] Lomax, G. R., Design of Waterproof, Water Vapor Permeable Fabrics, *Journal of Coated Fabrics*, Vol. 51, No. 1, 1985, pp. 40-66
- [3] Whelan, M. E., MacTattie, L. E., Goodings, A. C., Turl, L. H., The Diffusion of Water Vapor Through Laminae with Particular Reference to Textile Fabrics, *Textile Research Journal*, Vol. 25, No. 3, 1955, pp. 197-223
- [4] Shekar, R. I., Yadav, A. K., Kumar, K., Tripathi, V. S., Breathable Apparel Fabrics for Defence Applications, *Man Made Textiles in India*, Vol. 46, No. 12, 2003, pp. 9-16

¹ Not to scale