



Scotchlite™

Reflective Material

Designing for Enhanced Visibility

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Consider these factors when choosing retroreflective material to enhance the visibility of your products.

Define the Human Form:

The retroreflective material on a garment may be the only component that is visible to a driver of a vehicle. When designing a product, think about how the retroreflective material alone will appear to a driver. The better the designer is able to define the human form with the retroreflective material, the more easily the driver will recognize the object as a pedestrian.^{1,2,3}

Movement Locations:

The human eye is drawn to moving objects. While a person is active, specific body parts move more than others do. Placing retroreflective material on areas of clothing, footwear, or accessories that move more as the person moves will further enhance their visibility.^{1,2,3} This is typically at the end of the limbs, but may include the shoulders or elbows on runners or the legs of bicyclists.

360° Visibility:

Pedestrians are seldom only seen at one angle to motor vehicles. Depending on the situation, people move in all directions: towards traffic, away from traffic, or perpendicular to traffic. For these reasons, placement of retroreflective material should be considered on all sides of clothing, footwear, and accessories.⁴

Amount of Retroreflective Material:

The amount of retroreflective material required to increase a pedestrian's visibility depends upon numerous, uncontrollable factors: competing background light, distance between the automobile and pedestrian, the risk level of the pedestrian-automobile interaction, and weather conditions, etc. In general, designing in more retroreflective material or devoting larger areas to retroreflective material, will increase the pedestrian's visibility.⁵

Brightness (R_A)* of the Retroreflective Material:

Using brighter retroreflective material will reduce the amount of overall retroreflective material needed to increase or maintain a pedestrian's visibility.^{5,6} For articles that will be frequently washed, or washed using harsh conditions, consider retroreflective materials that have greater wash durability to maintain the product brightness longer.

1. Owens, D. A., R. J. Antonoff, and E. L. Francis, "Biological Motion and Nighttime Pedestrian Conspicuity," *Human Factors*, Vol. 36, 1994, pp. 718-732.
2. Luoma, J., J. Schumann, and E. C. Traube, "Effects of Retroreflector Positioning on Nighttime Recognition of Pedestrians," UMTRI-95-18 The University of Michigan Transportation Research Institute, June 1995.
3. Blomberg, R. D., A. Hale, D. F. Preusser, "Experimental Evaluation of Alternative Conspicuity-Enhancement Techniques for Pedestrians and Bicyclists," *Journal of Safety Research*, Vol. 17, 1986, pp. 1-12.
4. "Pedestrian Retroreflectors, Functional and Technical Requirements," *Mörkertrafik, Night Traffic, Rapport Nr. 5*, 1982.
5. Brekke, B; *Retroreflectors and Safety Garments*, The Norwegian Research Institute of Electricity Supply, 1985.
6. Brekke, B; *The Protection of Pedestrians in Road Traffic by the Use of High Visibility Clothing*, SINTEF Energy Research: Trondheim, Norway, Sept. 1998.

*Coefficient of retroreflection (R_A, in cd/lux/m²) measured at -4° entrance angle and 0.2° observation angle.

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