

trucks are shorter in length and pass through an intersection more quickly than the average train, the motorist may only need to slow his or her vehicle to avoid a collision instead of stopping prior to reaching the intersection. Conversely, because the average train is longer than the average truck, it spends a greater amount of time in the intersection. For a motorist approaching a grade crossing, the greater amount of time the train spends in the intersection means the more likely the motorist will need to stop at the intersection in order to avoid a collision.

FRA's own research concluded that either a pattern that outlined the shape of the railroad equipment, or a vertically-oriented pattern that spaced retroreflective material uniformly over a large area of the equipments' side, was most effective. Based on the results of studies investigating truck reflectorization, the specific findings of FRA's targeted research, as well as input from the railroad industry and manufacturers of retroreflective material, FRA is proposing in this section what it believes to be the optimum placement patterns of retroreflective material on freight rolling stock. The proposed placement patterns in this section are designed to maximize the effectiveness of the material, allow retroreflectorization of a variety of freight car types with the same generally recognizable pattern, and also minimize the degradation rate of the material. In addition, other practical advantages to a standardized reflectorization pattern include the potential for volume discounts on the costs of materials and minimizing labor costs by standardizing the repair and installation of the material.

This section proposes a vertical pattern of retroreflective sheeting on the sides of freight cars, where the physical configuration of the car allows, with

strips of sheeting to be located as close to each end of the car as practicable and at equidistant intervals of not more than 10 feet. This pattern is intended to alert an approaching motorist to the approximate dimensions of the hazard (the freight car) in his or her path. In addition, because roadway lanes in the United States are typically 10 to 12 feet wide, applying strips of retroreflective sheeting at least every ten feet along the sides of freight cars, increases the likelihood of at least one reflector being in the sight path of an approaching motorist.

A vertically oriented pattern, as opposed to an outline pattern, is proposed because it contrasts with the horizontally oriented pattern of the retroreflective pattern required for truck trailers, thereby reducing the likelihood that motorists will confuse a train in a grade crossing with a truck trailer. In addition, because not all approaches to grade crossings are level, to the extent that a motor vehicle's headlights are aimed away from the retroreflective material, less light will reach the retroreflective material if it is applied horizontally and therefore less light will be returned to the driver and a train in a crossing will be more difficult to detect. Orienting the retroreflective material vertically increases the likelihood that the maximum available light from vehicle headlights will enter the retroreflective material and be returned to the motorist when the road grade is not level.

This section also proposes to require four square feet of retroreflective material on each side of the typical 50-foot freight car and provides that freight cars longer than 50 feet would require one additional foot of material for each additional ten feet in length. Although the optimum configuration of retroreflectors identified in the 1999 Volpe Report, required slightly less

retroreflective material, this configuration assumed that the material would be periodically washed. Volpe found that periodic washing of the retroreflectors could recover the intensity of the prismatic material to nearly original levels. However, because of practical concerns expressed by many members of the railroad industry (*e.g.*, increased labor costs, environmental wastewater and water usage issues), FRA does not propose to require the periodic cleaning of the retroreflective sheeting. Instead, in order to compensate for the lack of cleaning, FRA is proposing to require approximately one additional square foot of material on each side of freight rolling stock, thereby lowering the level of luminance needed.

Paragraph (a) of this section generally explains that the amount of retroreflective sheeting required to be applied to freight cars under this part is dependent on the length of the car, measured from endsill to endsill, exclusive of the draft gear. Paragraph (a)(1) proposes to require that on freight cars other than tank cars and flat cars, retroreflective sheeting be applied vertically in 4x36 inch and 4x18 inch strips along the car sides, with the bottom edge of each strip no lower than 42 inches above the top of the rail. Further, this paragraph proposes to require that either a minimum of one 4x36 inch (one square foot) strip of retroreflective material or two 4x18 inch strips, directly above each other, be applied vertically as close to each end of the car as practicable and that a minimum of one 4x18 inch strip be applied vertically at intervals of no more than every 10 feet between each end (*i.e.*, for a typical 60 foot freight car, at 10 feet, 20 feet, 30 feet, 40 feet, and 50 feet). *See* Figure 1.

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