

§ 224.105

49 CFR Ch. II (10–1–07 Edition)

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(c) *Performance.* Retroreflective sheeting applied pursuant to this part

shall meet the requirements of ASTM D 4956-04, for Type V Sheeting if metalized or Type VII Sheeting if non-metalized, except for the initial minimum values of the coefficient of retroreflection, and shall, as initially applied, meet the minimum values for the coefficient of retroreflection specified in Table 1 of this subpart.

TABLE 1 OF SUBPART B—MINIMUM COEFFICIENT OF RETROREFLECTION (R_A) (IN CANDELA/LUX/METER²) REQUIREMENT FOR RETROREFLECTIVE SHEETING (MINIMUM PHOTOMETRIC PERFORMANCE REQUIREMENTS)

| Entrance angle | Observation angle | | | |
|----------------|------------------------------|-------|------------------------------|-------|
| | 0.2 Degree | | 0.5 Degree | |
| | Yellow or fluorescent yellow | White | Yellow or fluorescent yellow | White |
| -4° | 400 | 600 | 100 | 160 |
| 30° | 220 | 350 | 45 | 75 |

(d) *Certification.* The characters “FRA-224”, constituting the manufacturer’s certification that the retroreflective sheeting conforms to the requirements of paragraphs (a) through (c) of this section, shall appear at least once on the exposed surface of each piece of sheeting in the final application. The characters shall be a minimum of three millimeters high, and shall be permanently stamped, etched, molded, or printed within the product and each certification shall be spaced no more than four inches apart.

(e) *Alternative standards.* Upon petition by a freight rolling stock owner or railroad under § 224.15, the Associate Administrator may approve an alternative technology as providing equivalent safety. Any such petition shall provide data and analysis sufficient to establish that the technology will result in conspicuity and durability at least equal to sheeting described in paragraphs (a) through (c) applied in accordance with this part and will present a recognizable visual target that is suitably consistent with freight rolling stock equipped with retroreflective sheeting meeting the

technical requirements of this part to provide the intended warning to motorists.

§ 224.105 Sheeting dimensions and quantity.

Retroreflective sheeting shall be applied along the length of each railroad freight car and locomotive side as described in § 224.106. Unless otherwise specified, retroreflective sheeting applied under this part shall be applied in strips 4 inches wide and 18 or 36 inches long, as practicable. The amount of retroreflective sheeting to be applied to each car or locomotive subject to this part is dependent on the length of the car or locomotive and the color of the sheeting. For purposes of this part, the length of a railroad freight car or locomotive is measured from endsill to endsill, exclusive of the coupler and draft gear. Each side of a railroad freight car subject to this part, including each unit of multi-unit cars, and each side of a locomotive subject to this part must be equipped with at least the minimum amount of retroreflective sheeting specified in Table 2 of this subpart.

TABLE 2 OF SUBPART B—MINIMUM QUANTITY REQUIREMENT FOR RETROREFLECTIVE SHEETING ON FREIGHT ROLLING STOCK

| Freight car or locomotive length | Minimum area of retroreflective sheeting required (per car/locomotive side)—yellow sheeting (ft ²) | Minimum area of retroreflective sheeting required (per car/locomotive side)—white sheeting (ft ²) |
|---|--|---|
| Less than 50 ft. | 3.5 | 4.0 |
| Over 50 ft. to 60 ft. | 4.0 | 5.0 |
| Over 60 ft. to 70 ft. | 4.5 | 5.5 |
| Over 70 ft. to 80 ft. | 5.0 | 6.0 |
| Over 80 ft. to 90 ft. | 5.5 | 7.0 |
| Over 90 ft. to 100 ft. ¹ | 6.0 | 7.5 |

¹ Freight cars or locomotives over 100 ft. in length must be equipped with an additional one-half a square foot of sheeting on each side for every additional 10 feet of length.

§ 224.106 Location of retroreflective sheeting.

(a) *Railroad freight cars.* The retroreflective sheeting shall be applied along the length of each railroad freight car side in the manner provided by a uniform industry standard accepted by the Associate Administrator that provides for distribution of material along the length of each car and as close as practicable to 42 inches above the top of rail. In the event such a standard is not proffered by industry or accepted by the Associate Administrator, the criteria set forth in this subpart shall apply. Retroreflective sheeting applied under this part must be located clear of appurtenances and devices such as ladders and other safety appliances, pipes, or other attachments that may obscure its visibility. Retroreflective sheeting need not be applied to discontinuous surfaces such as bolts, rivets, door hinges, or other irregularly shaped areas that may prevent the sheeting from adhering to the car sides. In addition, retroreflective sheeting need not be applied over existing or required car stencils and markings. If necessary to avoid appurtenances, discontinuous surfaces, or existing or required car markings or stencils, 4x18 and 4x36 inch strips of retroreflective material may be divided

into 4x9 inch strips and applied on either side of the appurtenance, discontinuous surface, or car markings or stencils, as practicable. Unless otherwise specified, retroreflective sheeting shall be applied along the sides of freight rolling stock at intervals not to exceed every 12 feet, as practicable. If it is not practicable to apply retroreflective sheeting every 12 feet because of existing stencils, appurtenances, or discontinuous surfaces, the sheeting shall be applied at the next smallest interval practicable.

(1) *General rule.* On railroad freight cars other than flat cars and tank cars, retroreflective sheeting shall be applied in either a vertical or horizontal pattern along the length of the car sides, with the bottom edge of the sheeting as close as practicable to 42 inches above the top of rail. Retroreflective sheeting shall not be applied below the side sill.

(i) *Vertical application.* If retroreflective sheeting is applied in a vertical pattern, at least one 4x36 inch strip or two 4x18 inch strips, one above the other, shall be applied as close to each end of the car as practicable. Between these two vertical end strips, a minimum of one 4x18 inch strip shall be applied at least every 12 feet, as practicable. See Figures 1, 2 and 3.