



## **RAILWAY EQUIPMENT REFLECTORIZATION** **RULES**

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## 1. Short Title

For ease of reference, these Rules may be referred to as the Reflectorization Rules.

## 2. Purpose and Scope

These Rules prescribe the minimum standards governing the specifications and the application of retroreflective material on railway equipment. The scope of these Rules applies to all railway companies subject to the jurisdiction of Transport Canada pursuant to the Railway Safety Act.

## 3. Definitions

“**Department**” means Transport Canada;

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“**damaged**” means scratched, broken, chipped, peeled, or delaminated to such an extent as to no longer be effective;

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“**freight car**” means a car, designed to carry freight on rail and includes a caboose and a service equipment car;

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“**locomotive**” means a rail vehicle, propelled by any energy form, other than steam intended for the propulsion and or control of freight, or service equipment;

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“**obscured**” means concealed, hidden, or covered up so all incoming light is blocked;

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“**railway company**” means a railway or railway company subject to the Railway Safety Act;

“**railway equipment**” means any locomotive, freight car, caboose or service equipment car operated by a railway company;

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“**retroreflective material**” means material as specified by the chromaticity coordinates of the American Society for Testing and Materials' (ASTM) Standard D 4956-01a for Type V Sheeting "Standard Specification for Retroreflective Sheeting for Traffic Control, as amended from time to time”, or by an equivalent standard. The words retroreflective sheeting and retroreflective material are equivalent.

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“service equipment car” means rolling stock used to house employees at work sites, a material car used for transporting railway maintenance-of-way equipment or for railway company purposes other than revenue service.

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#### 4. Applicability

These Rules apply to all Canadian-owned railway equipment operated over a public or private highway-rail grade crossing by a railway company regulated under the *Railway Safety Act* with the exception of:

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- a) Equipment operated solely on tracks, inside a non-railway installation, that are not part of the general railway system of transportation; and,
- b) Cars and locomotives that are used exclusively in passenger service or tourist excursion trains.

#### 5. Qualifications of Railway Employees

A railway company shall ensure that all employees engaged in the application, inspection or maintenance of retroreflective material are fully conversant with the requirements of these Rules and associated railway company instructions.

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#### 6. Implementation Requirements

##### 6.1 Freight Cars

All freight cars subject to these Rules must be equipped with retroreflective sheeting conforming to these Rules within seven years of the effective date of these Rules by following a railway company implementation schedule. The schedule will ensure that not less than twenty-five (25) percent of the total fleet will be equipped within the first twenty-four (24) months following the coming into force of these Rules and that not less than an additional fifteen (15) percent of the total fleet shall be completed each twelve (12) month period thereafter for the duration of the implementation period.

##### 6.2 Locomotives

All locomotives subject to these Rules must be equipped with retroreflective sheeting conforming to these Rules within four years of the effective date of these Rules by following a railway company implementation schedule. The schedule will ensure that not less than twenty-five (25) percent of the total fleet will be equipped during each 12 month period following the coming into force of these Rules.

### 6.3 Records

A record of the railway equipment that is equipped with retroreflective material must be filed with the Department annually.

## 7. Characteristics of Retroreflective Sheeting

### 7.1 Construction

Retroreflective sheeting shall consist of a smooth, flat, transparent exterior film with micro prismatic retroreflective elements embedded in or suspended beneath the film so as to form a non-exposed retroreflective optical system.

### 7.2 Colour

Retroreflective sheeting applied under these Rules must be white or yellow.

### 7.3 Performance

Retroreflective sheeting applied under these Rules shall, when initially applied, meet the minimum photometric performance requirements specified in Table 1.

**Table 1**

MINIMUM PHOTOMETRIC PERFORMANCE (COEFFICIENT OF RETROREFLECTION (RA) IN CANDELA/LUX/METER<sup>2</sup>) REQUIREMENT FOR WHITE OR YELLOW RETROREFLECTIVE SHEETING.

<b>Entrance Angle (degree)</b>	<b>Observation Angle 0.2 (degree) YELLOW</b>	<b>Observation Angle 0.2 (degree) WHITE</b>	<b>Observation Angle 0.5 (degree) YELLOW</b>	<b>Observation Angle 0.5 (degree) WHITE</b>
-4	400	600	100	160
30	220	350	45	75

#### **7.4 Certification**

The manufacturer's certification that the sheeting is a retroreflective sheeting and conforms to the requirements of Construction, Colour and Performance of subsections 7.1, 7.2, and 7.3 herein shall appear at least once on the exposed surface of each sheeting in the final application. The characters shall be a minimum of 3 mm 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.

#### **7.5 Alternative Technology**

Upon filing with the Department by a railway company, an alternative technology may be used providing it meets or exceeds an equivalent level of safety as established through a comprehensive scientific analysis. Such alternative technology will result in conspicuity and durability at least equal to sheeting described in Construction Colour and Performance of subsections 7.1, 7.2, and 7.3 herein, and be applied in accordance with these Rules so that it will present a recognizable visual target that is suitably consistent with railway equipment equipped that is retroreflective sheeting meeting the technical requirements of these Rules.

#### **7.6 Sheeting Dimensions and Quantity**

Retroreflective sheeting shall be applied along the length of each freight car and locomotive side. Retroreflective sheeting shall be applied in strips 4 inches wide and 18 or 36 inches long, unless otherwise specified. The amount of retroreflective sheeting to be applied to each car or locomotive is dependent on the length of the freight car or locomotive and the colour of the sheeting. For the purposes of these Rules, the length of a freight car or locomotive is measured from end sill to end sill. Each side of a freight car, including each unit of multi-unit cars, and each side of a locomotive must be equipped with at least the minimum amount of retroreflective sheeting specified in Table 2.

**Table 2**

## RETROREFLECTIVE SURFACE AREA PER SIDE

<b>Length of Freight Car, Service Car or Locomotive (Ft)</b>	<b>Minimum Area of YELLOW Retroreflective Sheeting Required (Sq Ft)</b>	<b>Equivalent Number of 4 x 18 in. Reflectors</b>	<b>Minimum Area of WHITE Retroreflective Sheeting Required (Sq Ft)</b>	<b>Equivalent Number of 4 x 18 in. Reflectors</b>
Less than 50	3.5	7	4	8
50 to 60	4	8	5	10
60 to 70	4.5	9	5.5	11
70 to 80	5	10	6	12
80 to 90	5.5	11	7	14
90 to 100	6	12	7.5	15
Over 100	½ sq ft for each additional 10 ft of length		½ sq ft for each additional 10 ft of length	

**7.7 Location of Retroreflective Sheeting on Railway Equipment**

Retroreflective sheeting applied 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, a 4 by 18 inch strip of retroreflective sheeting may be separated into two 4 by 9 inch strips, or a 4 by 36 inch strip may be separated into four 4 by 9 inch strips, and applied on either side of the appurtenance, discontinuous surface, or car markings or stencils.

## **8. Application of Retroreflective Sheeting**

### **8.1 Freight cars**

On freight cars, retroreflective sheeting shall be applied in either a vertical or horizontal pattern along the length of the car sides with its bottom edge as close as practicable to 42 inches above the top of the rail. The application of the retroreflective material must be in accordance with AAR Standard S-910 and Rule 66 of the AAR Field Manual. Sheeting shall not be applied below the side sill.

### **8.2 Locomotives**

Locomotives shall be equipped with at least the minimum amounts of retroreflective sheeting required by Table 2 of these Rules. Sheeting is to be spaced as uniformly as practicable along the length of the locomotive sides as close as practicable to 42 inches above top of rail.

### **8.3 Existing freight cars with retroreflective sheeting**

Freight cars previously equipped, with at least one square foot of retroreflective sheeting, uniformly distributed over the length of each side shall be considered to be in compliance until seven years after the effective date of these Rules.

### **8.4 Existing locomotives with retroreflective sheeting**

Locomotives previously equipped, with at least one square foot of retroreflective sheeting, uniformly distributed over the length of each side shall be considered to be in compliance until four years after the effective date of these Rules.

## **9. Inspection and Replacement**

### **9.1 Freight Cars**

Retroreflective sheeting on freight cars must be visually inspected for presence and condition whenever a car undergoes a single car air brake test. If at the time of inspection, or at any other time a designated railway company employee determines that more than 20 percent of the minimum amount of sheeting required on either side of a car is damaged, obscured or missing, the railway company shall promptly notify the Canadian car owner of the damaged or missing material. That sheeting shall be repaired or replaced within nine (9) months.

## 9.2 Locomotives

Retroreflective sheeting must be visually inspected for presence and condition at least once every twelve months. If more than 20 percent of the minimum amount of sheeting required on either side of a locomotive is damaged, obscured, or missing, that damaged, obscured, or missing sheeting must be repaired or replaced.

If conditions at the time of inspection are such that replacement material cannot be applied, such application must be completed not later than when the identified equipment is taken out of service for repairs or other maintenance.

## **10. Renewal**

- 10.1 Retroreflective material must be renewed within 10 years of its original application. For cars and locomotives with existing retroreflective sheeting meeting the requirements of these Rules, the renewal date must precede November 29, 2015.

## **11. Harmonization with the Federal Railroad Administration**

- 11.1 All equipment owned or leased by a Non-Canadian railway or private car owner, subject to the Federal Railroad Administration, may operate in Canada, if the equipment is in compliance with the Federal Railroad Administration CFR 49 Part 224, "Reflectorization of Rail Freight Rolling Stock" in effect on the date of the approval of the Canadian Rule.