Federal Register

Monday,
January 3, 2005

Part II

Department of Transportation

Federal Railroad Administration

49 CFR Part 224

Reflectorization of Rail Freight Rolling Stock; Final Rule

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

49 CFR Part 224

[Docket No. FRA–1999–6689, Notice No. 4]

RIN 2130–AB41

Reflectorization of Rail Freight Rolling Stock

AGENCY: Federal Railroad Administration (FRA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: FRA is issuing this final rule to mandate the reflectorization of freight rolling stock (freight cars and locomotives) to enhance the visibility of trains in order to reduce the number and severity of accidents at highway-rail grade crossings in which train visibility is a contributing factor. This rule establishes a schedule for the application of retroreflective material and prescribes standards for the construction, performance, application, inspection, and maintenance of the material.

DATES: *Effective Date:* March 4, 2005. The incorporation by reference of a certain publication listed in the rule is approved by the Director of the Federal Register as of March 4, 2005.

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SUPPLEMENTARY INFORMATION:

Background

On November 6, 2003, FRA published a notice of proposed rulemaking (NPRM) proposing to require retroreflective material on the sides of freight rolling stock (freight cars and locomotives) to enhance the visibility of trains. 68 FR 62942. The NPRM represented a partial solution to a safety problem that has long concerned FRA—the need to reduce the incidence and severity of collisions between motor vehicles and trains at highway-rail grade crossings throughout the United States, especially during conditions of darkness or reduced visibility.

As noted in the NPRM, approximately 4,000 times each year, a train and a highway vehicle collide at a highway-rail grade crossing in the United States. Approximately 23% of all highway-rail grade crossing accidents involve motor vehicles running into trains occupying grade crossings (''RIT'' accidents). Many of these RIT accidents occur during nighttime conditions (dawn, dusk, and darkness) and involve a highway vehicle striking a train behind the first two units of the consist. This suggests that a contributing factor to many RIT accidents is the difficulty motorists have in seeing a train consist at a crossing in time to stop their vehicles before reaching the crossing, particularly during periods of limited visibility, such as dawn, dusk, darkness, or during adverse weather conditions.

As explained in the NPRM, the physical characteristics of trains, in combination with the characteristics of grade crossings (*e.g.*, grade crossing configuration, type of warning devices at a crossing, rural background environment with low level ambient light, or visually complex urban background environment, etc.), and the inherent limitations of human eyesight, often make it difficult for motorists to detect a train's presence on highway-rail grade crossings, particularly during periods of limited visibility. Freight trains lack conspicuity in different environmental settings. For example, trains are typically painted a dark color and are often covered with dirt and grime which are inherent in the railroad environment. With the exception of locomotives, trains are usually unlighted and are not equipped with reflective devices. Similarly, a large percentage of crossings are not lighted. Consequently, much of the light from an approaching motor vehicle's headlights is absorbed by the freight cars, instead of being reflected back toward the motorist. In addition, the large size of freight cars also makes them difficult to detect. For instance, even if a motorist is looking for a train, if the locomotive has already passed, it is difficult to detect the freight cars because the cars often encompass the motorist's entire field of view and have the tendency to ''blend'' into the background environment, especially at night. Also, because most drivers involved in grade crossing accidents are familiar with the crossings and with roadway features at the crossings, the drivers become habituated (or preconditioned) to the crossings. Based on previous driving experiences and conditioning, a driver may not expect a train to be occupying a crossing, and without a clear auditory signal (because the locomotive has already cleared the crossing) or visual stimuli alerting the driver to a train traveling through the crossing, the driver may fail to perceive the train in time to stop. This condition is further exacerbated when a train is stopped on a crossing.

There is currently no requirement for lighting or reflective markings on freight rolling stock. However, as explained in the NPRM, reflectorization has become an indispensable tool for enhancing visibility in virtually all other modes of transportation, including air, highway, maritime, and pedestrian travel. For example, airplanes and motor vehicles are equipped with high brightness retroreflective material at key locations on the exterior surfaces to increase their conspicuity. Microprismatic corner cube retroreflectors (which have the ability to direct light rays back to the light source) are typically used on roadway signs that warn of construction or other hazardous conditions. Federal regulations require retroreflective materials on the sides and rear of large trucks to increase their conspicuity and to aid motorists in judging their proximity to these vehicles. Even regulations addressing bicycle safety have specific requirements on the use of reflective materials. Lifesaving marine equipment, such as life vests and rafts, require reflectorization; and to enhance the conspicuity of pedestrians, especially at night, retroreflective material has been incorporated into clothing and similar items.

The everyday use of reflectors indicates their acceptance to delineate potential hazards and obstructions in a vehicle's path of travel. Research specific to the railroad industry has demonstrated that reflective materials can increase the conspicuity of freight cars, thereby enhancing motorists' ability to detect the presence of trains in highway-rail grade crossings. Reflective material on rail equipment increases visibility inexpensively, and does not require a power source to produce light, but returns light produced from another source (*i.e.*, an approaching automobile's headlights). This greater visibility can help drivers avoid some accidents and reduce the severity of other accidents that are unavoidable. Accordingly, FRA, as the Federal agency responsible for ensuring that America's railroads are safe for the traveling public, and in direct response to a Congressional mandate, is issuing this final rule requiring the application of reflective material on the sides of certain rail cars and locomotives to enhance the visibility of trains in order to reduce the number and severity of

accidents at highway-rail grade crossings where train visibility is a contributing factor.

A. Statutory Authority and Congressional Mandate

FRA has broad statutory authority to regulate all areas of railroad safety. The Federal Railroad Safety Act of 1970 (Safety Act) (formerly 45 U.S.C. 421, 431 *et seq.*, now found primarily in chapter 201 of Title 49) grants the Secretary of Transportation (''Secretary'') rulemaking authority over all areas of railroad safety (49 U.S.C. 20103(a)) and confers all powers necessary to detect and penalize violations of any rail safety law. This authority was subsequently delegated to the FRA Administrator (49 CFR 1.49). (Until July 5, 1994, the Federal railroad safety statutes existed as separate acts found primarily in Title 45 of the United States Code. On that date, all of the acts were repealed, and their provisions were recodified into Title 49.)

The term ''railroad'' is defined in the Safety Act to include

all forms of non-highway ground transportation that runs on rails or electromagnetic guideways, * * * other than rapid transit operations within an urban area that are not connected to the general railroad system of transportation.

49 U.S.C. 20102. This definition makes clear that FRA has jurisdiction over (1) rapid transit operations within an urban area that are connected to the general railroad system of transportation, and (2) all freight, intercity, passenger, and commuter rail passenger operations regardless of their connection to the general railroad system of transportation or their status as a common carrier engaged in interstate commerce. FRA has issued a policy statement describing how it determines whether particular rail passenger operations are subject to FRA's jurisdiction (65 FR 42529 (July 2,2000)); the policy statement can be found in Appendix A to 49 CFR parts 209 and 211.

Pursuant to its statutory authority, FRA promulgates and enforces a comprehensive regulatory program to address railroad track, signal systems, railroad communications, rolling stock, rear-end marking devices, safety glazing, railroad accident/incident reporting, locational requirements for dispatching of U.S. rail operations, safety integration plans governing railroad consolidations, merger and acquisitions of control, operating practices, passenger train emergency preparedness, alcohol and drug testing, locomotive engineer certification, and workplace safety.

In 1994 Congress passed the Federal Railroad Safety Authorization Act of 1994, Public Law 103–440 (''Act''). The Act added section 20148 to title 49 of the United States Code. Section 20148 required the Secretary, and by delegation, FRA, to conduct a review of the Department of Transportation's (''Department'') rules with respect to the visibility of railroad cars and mandated that if the review established that enhanced railroad car visibility would likely improve safety in a cost-effective manner, the Secretary initiate a rulemaking proceeding to ''prescribe regulations requiring enhanced visibility standards for newly manufactured and remanufactured railroad cars.'' Section 20148 specifically directed the Secretary to examine the use of reflectors. Section 20148 reads as follows:

(a) REVIEW OF RULES.—The Secretary of Transportation shall conduct a review of the Department of Transportation's rules with respect to railroad car visibility. As part of this review, the Secretary shall collect relevant data from operational experience by railroads having enhanced visibility measures in service.

(b) REGULATIONS.—If the review conducted under subsection (a) establishes that enhanced railroad car visibility would likely improve safety in a cost-effective manner, the Secretary shall initiate a rulemaking proceeding to prescribe regulations requiring enhanced visibility standards for newly manufactured and remanufactured railroad cars. In such proceeding the Secretary shall consider, at a minimum—

(1) visibility of railroad cars from the perspective of nonrailroad traffic;

(2) whether certain railroad car paint colors should be prohibited or required;

(3) the use of reflective materials;

(4) the visibility of lettering on railroad cars;

(5) the effect of any enhanced visibility measures on the health and safety of train crew members; and

(6) the cost/benefit ratio of any new regulations.

(c) EXCLUSIONS.—In prescribing regulations under subsection (b), the Secretary may exclude from any specific visibility requirement any category of trains or railroad operations if the Secretary determines that such an exclusion is in the public interest and is consistent with railroad safety.

B. History of Railroad Car Conspicuity Issue

As explained in the NPRM, the term ''conspicuity,'' as applied to rail car visibility, refers to the characteristics of a rail car in its roadway setting to command the attention of approaching motorists and be recognizable to reasonably prudent motorists at sufficient distance to allow the motorists to reduce their vehicles' speed and take action to avoid collisions. As also noted in the NPRM, the issue of rail car ''conspicuity'' is not a new concept. Research dating back to the early 1950's identified the potential viability of rail car conspicuity materials such as luminous sources (lights on rail cars), self-luminous sources (phosphorescent), and reflective sources. By the 1970's, researchers had generally concluded that although luminous and reflective sources both proved effective in enhancing the visibility of trains, reflectors provided conspicuity at a greater distance and field of vision. Although the general consensus of historical research was that reflective materials could increase the conspicuity of objects to which they are attached, previous generations of reflective materials did not reflect enough light to be effective in the railroad environment and lacked the durability to survive the harsh railroad operating environment.

FRA first evaluated the use of reflective material on rail rolling stock in the early 1980s and supported a study completed in 1982 on the potential use of reflectorization to reduce nighttime accidents at highway-rail intersections. The study concluded that although the use of reflective material enhanced the visibility of trains, the reflective material was not durable enough to withstand the harsh railroad environment. It was decided that rulemaking action was not warranted at that time.

Since 1982, however, improvements in the brightness, durability, and adhesive properties of reflective material have been achieved. Specifically, a new material—microprismatic retroreflective material—was developed. Because of the technological advances in reflective materials and the creation of microprismatic retroreflective material, FRA renewed its research efforts in the early 1990s. By 1999, FRA's research had led to the conclusion that the durability and adhesive properties of the new microprismatic retroreflective material could provide adequate luminance intensity levels which could be sustained for up to 10 years with minimum maintenance. *See Safety of Highway-Railroad Grade Crossings: Freight Car Reflectorization*, DOT/FRA/ORD–98/11, John A. Volpe National Transportation Systems Center (Jan. 1999) (1999 Volpe Report).[1] A copy of the 1999 Volpe Report is in the docket

[1] A more detailed description of FRA's studies of freight car reflectorization can be found in the NPRM (*See* 68 FR 62946—62949) and, where relevant, the Section-by-Section analysis that follows in this preamble.

of this proceeding (Document No. FRA–1999–6689–17).

In order to provide an opportunity for all interested parties to share their views, concerns, and experiences with regard to rail car reflectorization, subsequent to the publication of the 1999 Volpe Report, in July 1999 FRA hosted a workshop on reflectorization of rail rolling stock. Representatives from the railroad industry, reflector manufacturing and supply companies, the National Transportation Safety Board and the National Highway Traffic Safety Administration (NHTSA), as well as other interested parties participated in the workshop. During the workshop, discussion focused on the potential effectiveness of rail car reflectorization under a variety of circumstances (*e.g.*, the potential effectiveness of reflectors during the nighttime versus the daytime, at passively protected crossings versus actively protected crossings), as well as more practical aspects of any rail car reflectorization program (*e.g.*, maintenance and cleaning requirements, when and where reflector installation would occur, and the costs involved in installing and maintaining the reflectors). A copy of the transcript of this workshop is included in the docket of this proceeding (Document No. FRA–1999–6689–7).

Recognizing that part of the review mandated by Congress included collecting relevant data from operational experience by railroads having enhanced visibility measures in service, on January 14, 2000, FRA established a public docket (Docket No. FRA–1999–6689) to provide all interested parties with a central location to both send and review relevant information concerning railcar conspicuity and to the provide a venue to gather and disseminate information on the issues. The docket in this proceeding contains several submissions from FRA, as well as comments from members of the public, local and state governments, reflective material manufacturing and supply companies, members of the railroad industry, and the regulated community. Comments submitted in response to the NPRM will be discussed in more detail below.

Because FRA's research concluded that reflectorization could enhance rail car visibility, FRA conducted a preliminary cost-benefit analysis (''Preliminary Analysis'') to determine whether reflectorization would provide a cost effective method of reducing the number of collisions at highway-rail grade crossings and the casualties and property damages which result from those collisions. The Preliminary Analysis concluded that the benefits of a uniform, nationwide freight car reflectorization program would far outweigh the costs of such a program. FRA published the results of its Preliminary Analysis in the **Federal Register** on October 26, 2001. *See* 66 FR 54326. A copy of the Preliminary Analysis is in the docket of this proceeding (Document No. FRA–1999–6689–25).

Because of the rail industry's continued interest in the issue of rail car reflectorization, FRA met with members of the regulated community on March 24, 2003, to again listen to their comments and concerns regarding reflectorization. During this meeting, participants again raised important considerations regarding many practical aspects of a potential reflectorization program (*e.g.*, a feasible schedule for the application of reflectors to rail cars, what types of reflective material would be required, reflector cleaning and maintenance responsibilities, and when and where reflectors would be applied to cars).

After careful review and consideration of all the relevant research and data, and the comments submitted in this proceeding, FRA concluded that reflectorization of rail freight rolling stock is a feasible method of enhancing rail car visibility that would improve safety in a cost-effective manner. Accordingly, FRA issued an NPRM on November 6, 2003, proposing to require the use of reflective material on the sides of certain rail cars and locomotives.

Subsequent to issuance of the NPRM, FRA held a public hearing in Washington, DC on January 27, 2004. Approximately 30 individuals representing various organizations and businesses involved in the railroad and reflector manufacturing industry participated in the hearing and their comments will be discussed in more detail below.

C. The Proposed Rule

Generally, the proposed rule required that all freight cars and locomotives that operate over a public or private highway rail grade crossing in the United States in revenue or work train service be equipped with retroreflective sheeting on both sides. The proposed rule contemplated that conforming retroreflective sheeting would be applied to freight cars on a fleet basis so that each segment of the freight car fleet would be brought into compliance within ten years, and each segment of the locomotive fleet would be brought into compliance within five years. To ensure the most efficient and cost-effective implementation of the rule, FRA proposed to require that retroreflective sheeting be applied to new freight rolling stock at the time of construction, and to existing stock when such stock was being repainted, rebuilt, or undergoing other periodic maintenance.

The proposed rule contained specific color, construction, placement, and performance requirements for the required retroreflective sheeting and also set forth a schedule for the application, inspection, and maintenance of the sheeting. Specifically, the proposed rule provided that retroreflective sheeting must meet the color and performance requirements, except for the photometric performance requirements, of American Society of Testing and Measurements' (ASTM) Standard D 4956–01, *Standard Specification for Retroreflective Sheeting for Traffic Control*, for yellow sheeting. The proposed rule set forth the minimum photometric performance requirements (*i.e.*, the minimum ''specific intensity per unit area'' or ''SIA'') that FRA determined were necessary to ensure that the yellow retroreflective sheeting would be sufficiently bright enough to attract the attention of approaching motorists early enough in the approach path so that the drivers would have time to react to avoid collisions. FRA proposed to require yellow retroreflective material, in part, because the spectral measurement of the color (approximately 550 nm) is within the peak sensitivity range of the human visual system, and accordingly, it is one of the most easily detectable colors under varying ambient light and other environmental conditions (*e.g.*, darkness, fog, haze, etc.). The performance requirements of the proposed rule were based on the material as it is initially applied. In other words, FRA proposed to require specific color, type, size, and placement requirements in order to ensure that sufficient reflectivity would be retained over time, despite the harsh railroad operating environment.

Although, as proposed, the specific amount and placement of retroreflective sheeting the rule would require on various types of freight rolling stock depended on the size of the freight car or locomotive, as well as the car type, the proposed rule generally required a vertical pattern of retoreflective material in 4x36 inch (one square foot) and 4x18 inch (one-half a square foot) strips along the entire side of freight cars and locomotives, 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. In

other words, the proposed rule required four square feet of retroreflective material on each side of the typical 50-foot freight car, and for cars longer than 50 feet, one additional square foot of material for each additional ten feet in length. With certain exceptions, the proposed rule generally required that retroreflective sheeting be applied as close as practicable to 42 inches above the top of the rail to minimize the degradation of the material due to dirt and grime accumulation. FRA proposed to require the placement of at least one reflector every 10 feet, because roadway lanes in the United States are typically 10 to 12 feet wide; thus, applying retroreflective sheeting at least every ten feet along the sides of freight cars increased the likelihood of at least one reflector being in the sight path of an approaching motorist. The relatively large-sized reflectors of 4x18 inches and 4x36 inches (one-half square foot and one square foot, respectively) were proposed to minimize the degradation rate of individual strips of retroreflective sheeting.

Recognizing that the conspicuity issues surrounding locomotives differ from the issues surrounding freight cars, the proposed rule provided a more flexible approach to the reflectorization of locomotives, specifying only that a minimum amount of retroreflective material (corresponding to the amount of material required on similarly-sized freight cars) was to be equally distributed between both sides of locomotives in a pattern recognizable to motorists.

D. Discussion of Comments

FRA received approximately 40 written comments in response to the NPRM, including comments from members of the railroad industry, trade organizations, local governments, reflective material manufacturing and supply companies, a manufacturer of a photo luminescent material, as well as members of the general public. Specifically, comments were received from the following organizations: The Association of American Railroads (AAR), the Railway Supply Institute, Inc. (RSI), the North America Freight Car Association (NAFCA), Canadian National Railway Company (CN), 3M, Avery Dennison, TTX Company (TTX), the American Petroleum Institute (API), Selecto-Flash, Inc., Canadian Pacific Railway Company (CP), Railway Technology Consulting Associates, the American Association of Private Railroad Car Owners, Inc. (AAPRCO), the American Trucking Association, Truckload Carriers Association, Availvs Corporation, and the National Association of County Engineers. Several of these commenters also provided verbal testimony at the January 2004 hearing and a few additional organizations (the American Railway Car Institute (ARC) and Wheeler Decal Corporation) also participated in the hearing. The following discussion provides an overview of the written and verbal comments FRA received in response to the NPRM. More detailed discussions of specific comments and how FRA has chosen to address these comments in the final rule can be found in the relevant Section-by-Section analysis portion of this preamble.

The majority of comments submitted were in favor of reflectorization. Several individual members of the public voiced strong support for a nationwide reflectorization program. For example, one commenter submitted a February 2004 newspaper article which described an accident in which a man was killed when he drove directly into the side of a train occupying a grade crossing in his lane of travel. Apparently, the driver did not see the train at all, as witnesses at the scene reported that he did not even apply his vehicle's brakes before striking the train. Other commenters related stories of personal tragedy in which loved ones were killed as a result of accidents involving motor vehicles running into trains occupying grade crossings. One commenter wrote of her father who ran into the side of a grain train occupying a crossing. This commenter explained that other drivers who witnessed the crash reported that they did not see the train, and that if it was not for the loud crash of her father's car, they too would have run into the train. Another commenter wrote of her 16-year old son who, in late 2003, was killed early one evening when the car he was riding in ran into the side of a train occupying a grade crossing. FRA remains deeply sympathetic for the losses suffered by these commenters. As explained in the NPRM, the goal of this rulemaking is to reduce the number of such tragedies by reducing RIT accidents. In doing so, the law requires that Federal regulations be based on an analysis of all relevant evidence and data. Accordingly, this preamble focuses on the technical and economic aspects of rail car reflectorization. FRA, however, has paid careful attention to the advice of those whose tragic personal experiences have led them to support a nationwide rail car reflectorization program.

Other commenters expressing support for a nationwide freight car reflectorization program included local and state governments, as well as organizations and businesses involved in the trucking industry. Most of these commenters pointed to the prevalence of unlighted, passively protected highway-rail grade crossings in rural communities and the particular vulnerability of these types of crossings to RIT accidents. These commenters also noted the success of reflectorization in the trucking industry, and some of them recommended a more aggressive implementation schedule than the 10-year period FRA proposed for the reflectorization of freight cars.

A few railroad industry participants expressed more reserved support for FRA's overall goal of increasing rail car visibility by requiring retroeflective markings on the sides of rail cars, but these commenters, including CP and TTX, raised important practical considerations related to the implementation of a nationwide rail car reflectorization program (*e.g.,* a feasible schedule for the application of reflectors to rail cars, reflector maintenance requirements, a viable standard pattern of application of retroreflective material to various car types, and the treatment of cars already equipped with reflective material pursuant to existing voluntary rail car reflectorization programs). Other members of the railroad industry, including AAR, NAFCA, and RSI, expressed their opposition to a Federal requirement to reflectorize freight rolling stock citing cost concerns and concerns similar to those expressed by CP and TTX regarding the practicalities of implementing such a program. In addition, AAR, as the organization that sets uniform interchange rules on behalf of the railroad industry, submitted a proposed industry standard for reflective markings. In its comments, AAR indicated that it developed this proposed industry standard in conjunction with private car owners and freight car builders. Although FRA appreciates the efforts of AAR and the other industry members who developed the proposed industry standard in response to the NPRM, because the proposed standard does not meet the minimum performance requirements FRA has determined are necessary for an effective freight rolling stock reflectorization program, FRA is unable to adopt the standard as currently written. However, FRA encourages AAR to continue to work with the industry to modify the proposed industry standard to comply with the requirements of this final rule.

A few railroad industry commenters also expressed concern regarding the inspection and maintenance requirements of proposed § 224.109. Specifically, commenters expressed

concern regarding FRA's proposed 20 percent maintenance threshold, and the use of the undefined term ''damaged'' demonstrating when maintenance would be required. Additionally, commenters expressed concern regarding when and where maintenance of reflective material would take place under the proposed rule, and a few of these commenters questioned the efficacy and practicality of FRA's proposal to require the replacement of retroreflective material on rail cars every 10 years.

Although the majority of comments FRA received in response to the NPRM addressed issues related to the reflectorization of freight cars, a few railroad industry participants expressed concern regarding FRA's proposed requirements applicable to locomotives. For example, AAR suggested that given the conspicuity issues surrounding locomotives and the fact that most locomotives are already reflectorized with company names and logos, FRA should not specify a specific pattern of application of reflective material on locomotives. AAR also expressed concern regarding FRA's proposed schedule for the reflectorization of locomotives and, along with CN, suggested that the locomotive grandfathering provision of proposed § 224.107(b)(3) was too narrow.

AAR also expressed the view that FRA's proposed rule exceeded Congress's direction in 49 U.S.C. 20148. First, AAR asserted that Congress envisioned the issuance of a reflectorization requirement only if the requirement were cost-effective. FRA agrees with this assertion, and notes that, as detailed in the NPRM, the proposed rule was based on a Preliminary Analysis of costs and benefits that demonstrated that the benefits of a nationwide rail equipment reflectorization program would far outweigh the costs of such a program. *See* 66 FR 54326 or Document No. FRA–1999–6689–25 in the docket of this proceeding. Taking into consideration comments received in response to the NPRM and the Preliminary Analysis, FRA has conducted a final Regulatory Analysis of this final rule and has again concluded that the benefits to be gained from implementation of the final rule far outweigh the costs of implementing the rule. A more detailed discussion of FRA's Regulatory Evaluation is found in the Regulatory Impact and Notices Section below.

AAR also asserted that Congress did not contemplate either a retrofit requirement (except in the case of rebuilt freight cars) or an ongoing maintenance requirement, and accordingly the proposed rule exceeded Congress's direction to FRA. FRA notes, however, that section 20148 was enacted in 1994, in the midst of FRA's reflectorizaton research program, but before FRA had reached any conclusions as to the potential efficacy of a federal rail car reflectorization program. Congress's clear intent in enacting section 20148 was that after reviewing the issue of potential enhanced visibility standards for railroad cars (specifically the potential use of reflective materials), FRA follow through by, at a minimum, requiring application of reflectors to new and remanufactured equipment if that was found to be cost-effective. Further, prior to the enactment of section 20148, FRA had the authority and the responsibility to issue standards, as necessary, covering all areas of railroad safety (49 U.S.C. 20103); and nothing in the 1994 enactment narrowed that authority. Accordingly, FRA is proceeding in accordance with its preexisting authority to address public safety. FRA is confident that it is acting in a manner consistent with Congressional guidance.

FRA also notes that limiting this final rule to the narrow scope of the 1994 mandate would fall far short of the purpose underlying the policy concern on which the mandate was based. Because rail cars may remain in service for four or even five decades, while the most optimistic estimates of the product life of current retroreflective materials are less than two decades, to reflectorize only new rail equipment and to have not even minimal maintenance standards, would not achieve the enhanced visibility of rail cars Congress contemplated in section 20148. FRA has adopted a strategy that addresses the safety need underscored by Congress without unduly burdening the industry with the principal concerns that have been raised in the past with respect to a federal regulation requiring rail car reflectorization (*e.g.*, requirement for washing of reflectors, concerns over increased liability).

RSI, an international trade association of the rail supply industry, expressed the opinion that there are better alternatives to improving safety at highway-rail grade crossings than mandating the reflectorizing of freight rolling stock. In particular, RSI recommended that FRA work with the railroad industry, the Federal Highway Administration, and the States, through the Section 130 program,[2] to identify high incident crossings, make improvements to those crossings, or work to close those crossings. RSI expressed the view that installation of grade crossing warning devices, additional street lighting at crossings, or adding stop signs at little used crossings (all crossing improvements that could be made with Section 130 funds) would provide increased levels of safety.[3] Further, RSI asserted that equipping freight cars with reflectorized tape will not stop drivers from entering highway-rail grade crossings.

FRA agrees with RSI that the installation of warning devices, installation of additional illumination and warning signs at crossings, and even the closing of certain crossings, are highly effective grade crossing safety improvements. As explained in the NPRM, FRA recognizes the existence of numerous methods other than reflectorization for reducing the occurrences of RIT accidents (*e.g.*, the elimination of highway-rail grade crossings, installation and upgrading of crossing traffic control and warning devices, crossing illumination, audible train warning devices, crossbuck reflectorization). FRA believes that each of these methods, used alone and in combination, is a viable method for mitigating collision risk at highway-rail grade crossings. FRA notes, however, that local opposition to closing crossings and the associated expenses with constructing grade separations or other alternatives to crossings often render these methods impractical, if not impossible. In addition, the expenses associated with installing crossing warning devices or upgrading existing devices often render these solutions cost prohibitive. Accordingly, FRA continues to believe that the reflectorization of freight rolling stock is an additional, feasible, and cost-effective tool for reducing and mitigating grade crossing accidents that provides unique safety benefits not obtainable with other grade crossing warning devices and safety measures. For example, traffic control devices, whether active (*e.g.*, flashing lights and gates at crossings) or passive (*e.g.*, signs and pavements markings), only provide a warning to the motorist that a train may be present. The signal delivered by reflective material on the sides of rail cars is clear and indicates to approaching motorists the actual presence and current movement of a train in or through a crossing.

[2] ''Section 130 program'' refers to the program authorized by 23 U.S.C. 130 which provides States with Federal funding to eliminate hazards at public highway-rail grade crossings.

[3] It is important to note, however, that Section 130 funds can only be spent on public grade crossing improvements. The funds are not available for private rail crossings. *See* 23 U.S.C. 130.

FRA recognizes, as did one commenter in comments submitted to the docket prior to publication of the NPRM, that reflectorization is only a partial solution. This commenter recognized the limits of any program designed to enhance the visibility of trains, including reflectorization, and explained that ''[t]he most visible train is only as safe as the motor vehicle driver who encounters it.'' FRA strongly agrees with this statement and recognizes that reflectorization will provide only a partial solution to the safety issues surrounding highway-rail grade crossings. FRA recognizes, and feels it worthy of emphasis (as we did in the NPRM), that nothing in this final rule relieves motorists from the responsibility to be alert at highway-rail grade crossings and use due diligence in operating motor vehicles safely, even during times of limited visibility.

The remaining comments submitted by various members of the railroad industry reflected a near consensus on three general issues. First, commenters expressed the view that white, not yellow, was the best color choice for retroreflective material on the sides of rail cars. Second, commenters expressed the view that FRA's proposed vertical pattern of retroreflective sheeting on the sides of freight cars was impracticable, and that a more flexible approach was necessary. Third, commenters expressed the view that the installation of retroreflective material on rail cars pursuant to the rule should not be tied to the single car air brake test. These comments are discussed below in connection with the applicable provisions of the final rule.

Section-by-Section Analysis

Section 224.1 Purpose and Scope

This section contains a formal statement of the final rule's purpose and scope. As explained in the preamble to the NPRM, FRA intends that this rule cover all aspects of reflectorization of freight rolling stock, including but not limited to, the size, color, placement, and performance standards of the retroreflective material, as well as the schedule for the application, inspection, and maintenance of the material.

Paragraph (a) states that the final rule is intended to reduce highway-rail grade crossing accidents, deaths, injuries, and property damage resulting from those accidents by enhancing the conspicuity of rail freight rolling stock in order to increase its detectability by motor vehicle operators at night and under conditions of poor visibility. Paragraph (b) explains that the final rule establishes the duties of freight rolling stock owners and railroads to apply retroreflective material to freight rolling stock, and to periodically inspect and maintain that material in order to achieve cost-effective mitigation of collision risk at highway-rail grade crossings. Paragraph (c) explains that the rule establishes a schedule for the application of retroreflective material to rail freight rolling stock and prescribes standards for the application, inspection, and maintenance of retroreflective material to rail freight rolling stock for the purpose of enhancing its detectability at highway-rail grade crossings.

Although FRA believes that this section as proposed in the NPRM made clear the agency's intent for the rule to encompass the entire subject matter of freight car reflectorization and that additional duties related to reflectorization of freight rolling stock (*e.g.*, cleaning of the material) could not be imposed on freight rolling stock owners, the AAR expressed concern in its comments that ''there could be confusion later as to whether railroads or private car owners are obliged to clean dirt and grime from freight cars.'' Accordingly, in this final rule, FRA has revised paragraph (b) of this section to specifically state that not only are freight rolling stock owners under no duty to ''install, maintain, or repair reflective material,'' except as required by the rule, but freight rolling stock owners are also under no duty to clean the material. For further discussion of dirt and grime on cars, please refer to the discussion of the term ''obscured'' in § 224.5.

As explained in the preamble to the NPRM, this final rule will not restrict freight rolling stock owners from applying retroreflective material to freight rolling stock on an accelerated schedule, nor will this rule restrict freight rolling stock owners from applying additional retroreflective material. As also explained in the NPRM, freight rolling stock owners, however, are under no duty to install, maintain, or repair reflective material except as specified in this rule.

Section 224.3 Applicability

This section, which has not changed from that proposed in the NPRM, establishes that this final rule applies, with certain exceptions, to all freight cars and locomotives that operate over a public or private highway-rail grade crossing and are used for revenue or work train service. This section specifically excludes certain operations and equipment from the rule. These include: (1) Freight railroads that operate only on track inside an installation that is not part of the general railroad system of transportation, (2) rapid transit operations within an urban area that are not connected to the general system of transportation, and (3) locomotives or passenger cars used exclusively in passenger service.

As explained in the preamble to the NPRM, FRA recognizes that both public and private grade crossings may be found on plant railroads and freight railroads that are not part of the general railroad system of transportation. Because these operations typically involve low speed vehicular traffic and the rail operations themselves are typically low speed with a small number of rail cars permitting relatively short stopping distances, it is not clear that reflectorization would be helpful in these areas. These reasons, together with FRA's historical basis for not making its regulations applicable to plant and non-general-system freight railroads, have led FRA to exclude such plant and private railroads from this rule. FRA does, of course, retain the statutory right to assert jurisdiction in this area and will do so if circumstances warrant.

As proposed in the NPRM and adopted in this final rule, paragraph (c) provides that the rule will not apply to locomotives and passenger cars used ''exclusively'' in passenger service. FRA decided to exclude locomotives and passenger cars used exclusively in passenger service from this rule because the conspicuity issues attendant to passenger service are significantly different from those of freight service. For example, the highway-rail grade crossings through which passenger trains operate are typically better protected than crossings used exclusively in freight service, many passenger cars have bright stainless steel exteriors or are painted contrasting light colors and are maintained in a much cleaner condition than freight cars, and passenger cars typically have inside lights which are visible through side windows that run the entire length of the cars. Although this final rule does not require the application of reflective material to locomotives and passenger cars used exclusively in passenger service, FRA may do so in a future rulemaking if it proves a cost-effective method of mitigating collision risk at highway-rail grade crossings.

One commenter, AAPRCO, expressed concern regarding the word ''exclusively'' in paragraph (c). AAPRCO explained that its members are owners of privately owned passenger cars and vintage locomotives, which generally run on Amtrak in passenger service. AAPRCO further explained,

however, that these cars are also occasionally moved in freight service; typically dead-head moves to a new location or to another carrier where the cars may again be used in passenger service, or a switching move from one passenger carrier to a storage location. AAPRCO expressed concern that the term ''exclusively'' in paragraph (c) of this section would cause the rule to apply to these cars and locomotives when they are occasionally moved in freight service. Further, AAPRCO explained that they do not believe ''that FRA intends for such moves to convert a passenger car or locomotive into freight rolling stock'' for purposes of the rule. AAPRCO is correct. FRA does not intend that these types of moves would convert the equipment into freight rolling stock subject to the rule. However, FRA believes § 224.3, as proposed, is clear in this regard. Section 224.3 states that, with certain exceptions, the rule applies to ''railroad freight cars and locomotives that operate over a * * * grade crossing and are used for revenue or work train service.'' As proposed in the NPRM and adopted in this final rule, ''railroad freight car'' is defined consistent with 49 CFR 215.5, which provides that a railroad freight car is ''a car designed to carry freight, or railroad personnel, by rail,'' including, for example, box cars, gondola cars, or tank cars. The passenger cars described by AAPRCO would not fall within the rule's definition of ''railroad freight car'' and accordingly, would not be subject to the rule's requirements. Further, as proposed in the NPRM and adopted in this final rule, ''locomotive'' is generally defined consistent with 49 CFR 229.5, but specifically limited to locomotives used in the transportation of freight or the operation of a work train. Accordingly, unless an AAPRCO member's locomotive is pulling freight or providing power to a work train, their locomotives will not be subject to this rule.

Section 224.5 Definitions

This section defines various terms, which for purposes of this rulemaking, have very specific meanings. This final rule retains each of the definitions proposed in the NPRM, with minor revisions to three of the proposed definitions (''flat car,'' ''obscured,'' and ''work train''). In addition, FRA has added two definitions to those proposed in order to clarify requirements of this final rule. First, in response to several commenters' concerns regarding the term ''damaged'' in proposed section 224.109, FRA has added a definition of that term. Second, FRA has defined a new term, ''unqualified retroreflective sheeting,'' which is used in § 224.107 of this final rule.

First, the definition of ''flat car'' has been modified to make it clear that spine cars, articulated, and multi-unit intermodal cars are included within this definition.

Second, the definition of ''freight rolling stock owner'' has been modified slightly to make it clear that the term is intended to refer to not only lessors of freight rolling stock, but to lessees of freight rolling stock as well. As explained in the NPRM, FRA recognizes that the majority of domestically-owned freight cars are privately owned. Because private freight car owners often contract with others to maintain their cars and may not even see their cars on a regular basis, this definition contemplates that anyone who controls the maintenance or use of freight cars by contractual agreements or otherwise, will also be responsible for compliance with this part in conjunction with the actual owners of the cars.

Third, the definition of the term ''obscured'' has been modified slightly for clarity in response to a commenter's express concern. ''Obscured'' was defined in the NPRM to mean ''concealed or hidden (*i.e.*, covered up, as where a layer of paint or dense chemical residue blocks incoming light).'' Specifically excluded from the proposed definition were ordinary accumulations of dirt, grime, or ice resulting from the normal railroad operating environment. One commenter, NAFCA, pointed out an incongruity between FRA's proposed definition of the term ''obscured'' in the text of the proposed rule and FRA's explanation of the term in the preamble. Specifically, in the preamble to the NPRM, FRA explained that the term ''obscured'' was intended to refer to situations where ''retroreflective material is covered with paint (*e.g.*, graffiti), a dense chemical residue (*e.g.*, product spilled from a tank car), or any other foreign substance, other than dirt or grime, which effectively blocks *all* incoming light.'' 68 FR 62952 (emphasis added). In its comments, NAFCA expressed the view that ''[t]he test for replacement should be as objective as possible, and ultimately should turn on whether the strip is in a condition that 'effectively blocks all incoming light', a test used by FRA to explain the purpose of the definition of 'obscured'.'' FRA agrees with this comment and accordingly, in this final rule, we have revised the definition of ''obscured'' to reflect that in order for material to be ''obscured'' under this rule, it has to be concealed or hidden to the point where all incoming light is blocked.

As explained in the NPRM, the definition of ''obscured'' was intended to reflect FRA's understanding that the harsh railroad operating environment inevitably results in dirt accumulating on the sides of freight rolling stock. The standards for retroreflective material set forth in this final rule take into account this ordinary accumulation. For example, FRA understands that the sides of coal cars will accumulate coal dust and other dirt over time due to the nature of normal railroad operations. An accumulation of coal dust or other dirt, even if it significantly darkens and dirties the retroreflective material, will not cause the material to be ''obscured'' for purposes of this rule. The standards proposed in this rule account for the effects of accumulations of dirt and grime inherent in the railroad operating environment, the aging of the reflective material, and other adverse effects of the operating environment (*e.g.*, harsh weather conditions). FRA believes that reflective material meeting the requirements of this rule when initially applied will still provide adequate reflectivity throughout the manufacturers' stated useful life despite inevitable accumulations of dirt.

Fourth, the definition of ''work train'' has been revised to make it clear that the term, for purposes of this rule, refers to non-revenue generating trains used in the maintenance and upkeep of the railroad.

In its comments to the NPRM, AAR noted that the term ''damaged'' was not defined and, therefore, it was unclear what FRA meant by the term in proposed § 224.109. NAFCA similarly noted that the term ''damaged'' in the proposed rule was undefined and, thus, ''highly subjective.'' Accordingly, both NAFCA and AAR suggested that FRA delete the term ''damaged'' from the inspection standards of § 224.109. FRA agrees that the undefined term ''damaged'' in the proposed rule needed clarification. Accordingly, in this final rule, FRA has included a definition for the term ''damaged.'' Section 224.104 defines ''damaged'' to mean ''scratched, broken, chipped, peeled, or delaminated.'' This definition is intended to be consistent with the term ''obscured,'' but recognizes the physical reality that retroreflective sheeting could be damaged to the extent that it is no longer effective, but still not be ''obscured'' as defined in this rule.

FRA has added one additional new term: ''unqualified retroreflective sheeting.'' In this final rule ''unqualified retroreflective sheeting'' is defined as ''engineering grade sheeting, super

engineering grade sheeting (enclosed lens), or high intensity type sheeting (ASTM Type I, II, III, or IV Sheeting) as described in ASTM International Standard D 4956–01a, *Standard Specification for Retroreflective Sheeting for Traffic Control.* A more detailed discussion of this new term can be found in the analysis of § 224.107 below.

As defined in the NPRM, ''freight rolling stock'' means any locomotive subject to 49 CFR part 229 used to haul or switch freight cars in revenue or work train service and any railroad freight car subject to 49 CFR part 215, including a car stenciled MW pursuant to § 215.305. FRA specifically requested comments as to what other types of rail equipment (other than locomotives subject to 49 CFR part 229) are used to haul freight cars and the feasibility of reflectorizing such equipment. FRA also specifically requested comments as to the utility and feasibility of equipping specialized maintenance of way equipment with reflective material. Although FRA received no comments in response to the first question regarding other types of rail equipment used to haul freight cars, the AAR responded to FRA's second question regarding the utility of equipping specialized maintenance of way equipment with reflective material. AAR responded by saying that specialized maintenance of way vehicles should not be subject to any reflectorization rule. Specifically, AAR noted that none of the approximately 700 collisions in the accident pool identified in FRA's Regulatory Evaluation involved specialized maintenance of way equipment and that trains with maintenance of way cars typically consist of only a few units. Thus, AAR reasoned that FRA's stated safety justification for proposing to require reflective material on freight rolling stock (*i.e.*, reducing the number and severity of grade crossing accidents where motor vehicles run into trains after the first two units of the consist) was inapplicable to specialized maintenance of way vehicles. FRA agrees with AAR's rationale in this regard, and accordingly we have retained the definition of freight rolling stock as proposed.

In order to ensure that the requirements of this part would be practicable for each type of freight car to which they would apply, FRA proposed definitions in the NPRM for ''railroad freight car,'' ''flat car,'' and ''tank car'' and then proposed specific patterns of reflector markings for each type of car based on the typical physical configuration of each car type. FRA specifically requested comments on the use of these definitions (*i.e.*, whether the proposed definitions were adequate to identify car types for purposes of the rule or whether commenters had other definitions that they would prefer). Because FRA received no comments in response to this request, FRA has adopted the definitions substantially as proposed.

Section 224.7 Waivers

This section, which has not changed from that proposed in the NPRM, explains the process for requesting a waiver from a provision of this rule. Requests for such waivers may be filed by any party affected by the final rule. In reviewing such requests, FRA conducts investigations to determine if a deviation from the general regulatory criteria is in the public interest and is consistent with railroad safety. The rules governing the FRA waiver process are found in 49 CFR part 211.

Section 224.9 Responsibility for compliance

This section, which has not changed from that proposed in the NPRM, contains the general compliance requirements. Paragraph (a) states that freight rolling stock owners (as defined in § 224.5), railroads, and (with respect to certification of material) manufacturers of retroreflective material, are primarily responsible for compliance with the rule. The responsibility of manufacturers is discussed in more detail in the analysis of § 224.103(a) below.

Paragraph (a) also clarifies FRA's position that the requirements contained in the rule are applicable to any ''person'' (as defined in the rule) that performs any function or task required by the proposed rule. Although various sections of the rule address the duties of freight rolling stock owners, railroads, and manufacturers of retroreflective material, FRA intends that any person who performs any action on behalf of any of these parties or any person who performs any action covered by the rule is required to perform that action in the same manner as required of the freight rolling stock owner, railroad, or manufacturer, or be subject to FRA enforcement action. For example, employees or agents of freight rolling stock owners, or railroad contractors who perform duties covered by this final rule would be required to perform those duties in the same manner as required of a freight rolling stock owner or railroad. Likewise, employees or agents of manufacturers of retroreflective sheeting being manufactured pursuant to this part would be required to perform those duties in the same manner as the manufacturer.

Paragraph (b) states that any person performing any function or task required by this part will be deemed to have consented to FRA inspection of the person's facilities and records to the extent necessary to ensure that the function or task is being performed in accordance with the requirements of this part. This provision is intended to put freight rolling stock owners, railroads, manufacturers, and contractors, performing functions or tasks required by this part, on notice that they are consenting to FRA's inspection for rail safety purposes of that portion of their facilities and records relevant to the function or task required by this part. Pursuant to 49 U.S.C. 20107, FRA has the statutory authority to inspect any facilities and relevant records pertaining to the performance of functions or tasks required under this part, and this provision is merely intended to make that authority clear to all persons performing such tasks or functions.

Section 224.11 Penalties

This section identifies the penalties that FRA may impose upon any person who violates any requirement of this part. These penalties are authorized by 49 U.S.C. 21301, 21302, and 21304. The penalty provision parallels penalty provisions included in numerous other safety regulations issued by FRA and has been adopted in this final rule substantially as proposed. As explained in the NPRM, essentially, any person who violates any requirement of this part or causes the violation of any such requirement will be subject to a civil penalty. As also explained in the NPRM, civil penalties may be assessed against individuals only for willful violations and each day a violation continues will constitute a separate offense. As proposed in the NPRM, the minimum civil penalty was $500 per violation, and the maximum civil penalty for a grossly negligent violation or a pattern of repeated violations that creates an imminent hazard of death or injury to persons, or causes death or injury, was $22,000. Since the date of publication of the NPRM, however, to comply with the Federal Civil Penalties Inflation Adjustment Act of 1990 (Pub. L. 101–410) (28 U.S.C. 2461, note) and the Debt Collection Improvement Act of 1996 (Pub. L. 103–134, 110 Stat. 1321–373), FRA has adjusted the minimum and maximum civil penalties applicable to each of the agency's regulations to $550 and $27,000, respectively. 69 FR 30591 (May 28, 2004). Accordingly, this final rule incorporates these revised

minimum and maximum penalty amounts. Furthermore, a person may be subject to criminal penalties under 49 U.S.C. 21311 for knowingly and willfully falsifying reports required by these regulations.[4] FRA believes that the inclusion of penalty provisions for failure to comply with the regulations is important in ensuring that compliance is achieved. This final rule includes a schedule of civil penalties as Appendix A to this part. Because the penalty schedule is a statement of agency policy, notice and comment was not required prior to its issuance. *See* 5 U.S.C. 553(b)(3)(A).

Section 224.13 Preemptive Effect

This section, which has not changed from that proposed in the NPRM, informs the public as to FRA's intention regarding the preemptive effect of the final rule. While the presence or absence of such a section does not conclusively establish the preemptive effect of a final rule, it informs the public concerning the statutory provisions which govern the preemptive effect of the rule and FRA's intentions concerning preemption.

This section points out that the preemptive effect of this rule is governed by 49 U.S.C. 20106 (''section 20106''). Section 20106 provides that all regulations prescribed by the Secretary relating to railroad safety preempt any State law, regulation, or order covering the same subject matter, except a provision necessary to eliminate or reduce an essentially local safety hazard that is not incompatible with a Federal law, regulation, or order, and that does not unreasonably burden interstate commerce. With the exception of a provision directed at an essentially local safety hazard that is not inconsistent with a Federal law, regulation, or order, and that does not unreasonably burden interstate commerce, section 20106 will preempt any State or local law or regulatory agency rule covering the same subject matter as this final rule.

The Supreme Court has consistently interpreted section 20106 to confer on the Secretary the power to preempt not only State statutes, but State common law as well. *See CSX Transp.* v. *Easterwood,* 507 U.S. 658, 664 (1993) (''[L]egal duties imposed on railroads by the common law fall within the scope of [the] broad phrases'' of section 20106.). *See also Norfolk Southern Ry. Co.* v. *Shanklin,* 529 U.S. 344 (2000). The Court has further held that Federal regulations under the Federal Railroad Safety Act will preempt common law where the regulations ''substantially subsume'' the subject matter of the relevant State law. *Easterwood,* 507 U.S. at 664.

As is evident in the language of § 224.1 as proposed and as incorporated in this final rule, FRA intends this final rule to cover the subject matter of standards for the use of retroreflective materials on freight rolling stock and the specific duties of freight rolling stock owners in this regard. FRA intends this part to preempt any State law, rule, or regulation, or common law theory of liability that might attempt to impose a duty on freight rolling stock owners pertaining to the reflectorization of freight rolling stock that is not specifically set forth in this part. For example, FRA intends to preempt any State law or common law theory of liability which might attempt to impose a duty on freight rolling stock owners to apply additional retroreflective material other than that specified in this part, to apply retroreflective material on a different schedule than that specified in this part, or to inspect or maintain retroreflective material on a more frequent basis than that specified in this part. Inference of any duties not specifically set forth in this part may cause the costs of the rule to outweigh the safety benefits of the rule in direct conflict with the Congressional mandate of 49 U.S.C. 20148 (requiring that FRA initiate a rulemaking proceeding prescribing regulations requiring enhanced visibility standards for railroad cars if such regulations would likely improve safety in a cost-effective manner).

In response to the NPRM, RSI specifically requested that FRA expressly state in the preamble to the final rule that FRA could not envision any set of circumstances where an additional State requirement could be justified under the local hazard exception contained in section 20106. Although FRA cannot envision any set of circumstances where an additional State requirement could be justified under the local hazard exception, FRA cannot anticipate every possible factual scenario that could exist. Also, it is important to note that although FRA can express its intention regarding preemption, the courts will make the final determination of preemption.

Section 224.15 Special Approval Procedures

This section contains the procedures to be followed when seeking to obtain FRA approval of alternative standards under § 224.103(e). Although FRA received no written comments in direct response to proposed § 224.15, at the January 2004 hearing one commenter, an association of industry participants (particularly car builders), expressed the view that the proposed rule's ''special approval procedures'' were too ''cumbersome and lengthy.'' This commenter further stated that ''[a] negative determination could prevent a car design from being built. If we can't apply the markers the way the rule requires, we may not be able to build the car.'' (Hearing transcript, pp. 65–66). This commenter, however, appears to have misconstrued the intent of § 224.15. As explained in the preamble to the NPRM, FRA anticipates continued technological improvements and product advances in the field of reflective and luminescent materials. Accordingly, FRA intends this section to provide a relatively quick approval process to allow the incorporation of new technology into the standards of this part, thereby making the technology available to all car owners and railroads while maintaining the same level of safety originally contemplated. FRA does not intend that this section provide a procedure for the approval of alternative reflectorization patterns. Although FRA believes that the reflectorization patterns set forth in this final rule are flexible enough to ensure that reflectors can be applied to almost any freight car or locomotive type, should it be necessary for a freight rolling stock owner to apply retroreflective material in a pattern that does not conform with the requirements of this final rule, pursuant to § 224.7 of this final rule, the owner may file for a waiver from the requirements of § 224.106. The waiver process is discussed in more detail in the analysis of § 224.7 above.

Another commenter specifically requested that the proposed rule be modified to be ''technologically neutral'' and be a performance standard that does not discriminate based on the specific technology employed. This commenter, Availvs Corporation, a manufacturer of photo luminescent material, asserted that its ''state-of-the-art photo luminescent material * * * works as well as, or better than, any retroreflective material'' in enhancing the visibility of rail equipment. Availvs noted that the company has previously demonstrated its product to FRA and that in 2003 the product was ''satisfactorily tested'' by the American Society for Testing and Materials. Because FRA does not currently have

[4] FRA notes that the criminal penalty provision was inadvertently omitted from § 224.11 of the proposed rule. However, FRA has corrected this error and has incorporated the criminal penalty provision into this final rule, consistent with its statutory authority and the penalty provisions of FRA's other existing safety regulations.

enough data to determine whether Availvs's product would meet the same performance standards contemplated in this final rule, FRA cannot revise the proposed rule to provide for the use of material other than the specified retroreflective material. However, FRA encourages Availvs to take advantage of the special approval process of § 224.15 to provide FRA the opportunity to determine whether Availvs's product would provide at least an equivalent level of safety as the retroreflective material mandated in this final rule.

FRA believes the procedures set forth in § 224.15 will speed the process for taking advantage of new technologies over that which is currently available through the waiver process. However, in order to provide an opportunity for all interested parties to provide input for use by FRA in its decision making process, as required by the Administrative Procedure Act, 5 U.S.C. 553 *et seq.* (APA), FRA believes that any special approval provision must, at a minimum, provide proper notice to the public of any significant change or action being considered by the agency with regard to the existing regulations.

Paragraph (b) sets forth the substantive and procedural requirements for petitions for special approval of alternative standards; paragraphs (c) and (d) provide opportunity for notice and public comment on any petition for special approval of an alternative standard received by FRA; and paragraph (e) describes the process FRA will follow in acting on any such petitions.

Subpart B—Application, Inspection, and Maintenance of Retroreflective Material

Section 224.101 General Requirements

This section contains the general requirement that all rail freight rolling stock subject to this part be equipped with retroreflective sheeting conforming to the requirements of this rule and the sheeting be applied, inspected, and maintained in accordance with subpart B or in accordance with an alternative standard approved under § 224.15. As explained in the preamble to the NPRM, this general requirement reflects FRA's understanding that motorists need to be given as much visual information as possible to correctly decide whether a hazard (*e.g.*, a train) exists in a vehicle's path. Specifically, devices intended to make a train conspicuous should: (1) Tell the motorist that something is there, (2) tell the motorist that what he or she sees is a train, (3) tell the motorist whether the train is on or about to cross a road in the vehicle's path, (4) aid the motorist in estimating the distance he or she is from the train, and (5) aid the motorist in estimating the speed and direction of the train's motion. FRA believes that the retroreflective sheeting required in this subpart B, applied and inspected in conformance with this part, effectively achieves these objectives.

Section 224.103 Characteristics of Retroreflective Sheeting

This section sets forth the construction, color, and performance standards for the retroreflective sheeting required by § 224.101. As was proposed in the NPRM, paragraph (a) of this section in the final rule states that retroreflective sheeting must be constructed of a smooth, flat, transparent exterior film with microprismatic elements embedded or suspended beneath the film so as to form a non-exposed retroreflective optical system.

As proposed in the NPRM, paragraph (a) of this section also required that air encapsulated sheeting be sealed around all edges. This proposed requirement was based on FRA's understanding that air encapsulated sheeting that is not sealed on all edges allows water to seep between the layers of the product and over time, due to the normal railroad operating environment, this water will freeze and expand, causing layers of the sheeting to peel. One commenter, Avery Dennison, a manufacturer of retroreflective sheeting already in common use in the railroad industry, expressed agreement with FRA's proposal to require edge sealing of air encapsulated sheeting. Specifically, Avery Dennison explained that ''the typical welds used to enclose individual cells are very thin, and inadequate for the demands placed on exposed edges.'' Other commenters, however, including 3M, another manufacturer of reflective materials already commonly used on railroad equipment, and the AAR, expressed the view that edge sealing should not be required on ''enclosed lens sheeting.'' [5] 3M explained that ''[r]etroflective sheeting that incorporates air between laminations contains internal seals that * * * prevent the penetration of water'' and that ''[o]nly the small portions of individual cells that are cut open along the edge of a piece of sheeting could be affected by water penetration.'' Further, 3M explained that the open, exposed edge of the sheeting does not affect the durability or performance of the sheeting as a whole and that air encapsulated sheeting (*i.e.,* sheeting with exposed cut edges) is routinely used on traffic signs and vehicles without edge sealing and is warranted for up to 12 years. Although 3M acknowledged that historically, many years ago, edge sealing was sometimes used, 3M indicated that given the current construction and durability of retroreflective material, it is no longer necessary, and accordingly, the company no longer manufactures, markets, or recommends edge sealing.

In light of 3M's comments and absent conclusive evidence establishing that edge sealing is necessary to maintain the integrity of air encapsulated retroreflective sheeting, in this final rule FRA is not mandating that air encapsulated retroreflective sheeting be edge sealed. As explained in detail in the NPRM, the construction, color, and performance standards set forth in this rule are designed to ensure that retroreflective material applied pursuant to this rule is durable enough to withstand the harsh railroad operating environment and maintain sufficient levels of reflectivity throughout the useful life of the material. FRA notes, however, that it is the responsibility of the retroreflective material manufacturer and the customer to determine the suitability of particular materials for use on rail car sides. FRA recognizes that many freight rolling stock owners already have extensive experience using various types of reflective materials on the sides of their equipment in specific service environments. FRA recognizes that these owners understand the harsh conditions associated with railroad operations that may affect the performance of the retroreflective material, particularly the power washing of equipment or the extensive exposure of the equipment to various harsh chemicals. Accordingly, freight rolling stock owners electing to apply air encapsulated sheeting conforming to the requirements of this rule may wish to consider specifying that the material be edge sealed in order to limit maintenance costs.

As originally proposed, paragraphs (b) and (c) of this section generally required that the retroreflective sheeting meet the color and performance requirements, except for the photometric requirements, of the American Society of Testing and Measurements' (ASTM) Standard D 4956–01, *Standard*

[5] FRA notes that 3M refers specifically to ''enclosed lens sheeting'' in its comments. FRA understands that the term ''enclosed lens sheeting'' typically refers to ''glass bead'' type sheeting and FRA notes that no glass bead type sheeting currently being manufactured is capable of meeting the photometric performance requirements of FRA's proposed specification. However, from the remainder of 3M's comments specifically referring to ''[r]etroreflective sheeting that incorporates air between laminations,'' FRA assumes that 3M is referring to air encapsulated sheeting.

Specification for Retroreflective Sheeting for Traffic Control.[6] Although FRA has retained these general requirements in this final rule, the agency has revised both paragraphs (b) and (c) in response to comments received and to ensure clarity.

In paragraph (b) of this section, the NPRM proposed to require that retroreflective sheeting applied pursuant to this rule be yellow as specified by the chromaticity coordinates of ASTM standard D 4956–01. As detailed in the NPRM, FRA proposed to require yellow retroreflective material because the spectral measurement of the color (approximately 550 nm) is within the peak sensitivity range of the human visual system and accordingly, it is one of the most easily detectable colors under varying ambient light and other environmental conditions (*e.g.*, darkness, fog, haze, etc.). In addition, the color yellow minimizes the risk of motorist confusion with the colors of other roadway hazards (*e.g.*, red and white reflectors on trucks) and is not a color prevalent in most background environments.

FRA received a number of comments suggesting that white, not yellow, was the best color choice for retroreflective material on the sides of rail cars. Generally, commenters expressed the view that white is ''brighter'' and more reflective than yellow and therefore would be the most effective in increasing the conspicuity of rail cars. For example, AAR reasoned that ''[i]t would seem that reflectivity should be the criterion since the goal is to alert the motorist that there is something ahead and the most reflective material [white material] would have the greatest chance of achieving that objective.'' Another commenter, Mr. James R. Nimz, County Engineer for Seneca County, Ohio, commented that white will always appear the brightest of all color groups; accordingly, to maximize the effectiveness of the retroreflective sheeting, Mr. Nimz recommended the use of white material. Selecto-Flash, Inc., another manufacturer of reflective sheeting already in use in the railroad environment commented that many railroads with existing voluntary reflectorization programs have long been using white material, and the AAR indicated that yellow retroreflective material is more expensive than white material. Specifically, AAR indicated that 3M informed one of their members that yellow material would cost 27% more than white. Accordingly, AAR expressed the view that it did not make sense to require car owners to spend more money for less reflectivity. FRA agrees with AAR that freight rolling stock owners should not be required to pay more money for yellow material than white material, but based on information provided to FRA from various retroreflective material manufacturers, FRA understands that the costs to the end-users of both white and yellow retroreflective material are exactly the same.

Contrary to the views expressed by these previous commenters, however, prior to FRA's publication of the NPRM, 3M submitted comments to the docket recommending, in part, the use of a high-contrast colored corner cube retroreflective material with a spectral measurement within the peak sensitivity of the human visual system (*e.g.*, yellow/green). In these comments, 3M explained that the high-contrast color would aid nighttime visibility.

As discussed in detail in the NPRM, retroreflective material is rated in terms of the reflected light per unit area as contrasted with the light striking it (''specific intensity per unit area'' or ''SIA''). Although FRA acknowledges that the SIA of white retroreflective material is greater than that of the yellow material contemplated in the NPRM, research has consistently shown that an object's perceived brightness is modified by color information. Generally, research addressing the effects of the color of retroreflective material on the brightness of the material has proven that chromatic markings (red, orange, yellow, green, blue) will appear brighter than photometrically matched achromatic (white) markings in similar environmental conditions. This effect is known as the Helmholtz-Kohlrausch effect. Josef Schumann *et al.*, The University of Michigan Transportation Research Institute, *Brightness of Colored Retroreflective Materials,* Rpt. No. UMTRI–96–33 (Nov. 1996) (citing a 1955 study by A. Chapanis and R.M. Halsey). A copy of this 1996 study is in the docket of this proceeding (Document No. FRA–1999–6689–112). The Helmholtz-Kohlrausch effect increases as excitation purity (*i.e.,* color saturation) increases. The Helmholtz-Kohlrausch effect usually results in a U-shaped function of dominant wavelength, with the minimum brightness around the dominant wavelength for yellow. *Id.*

Although research relating to the Helmholtz-Kohlrausch effect dates back to at least 1955, in the late 1990's several researchers specifically investigated whether the color of retroreflective material affected the materials' ability to enhance conspicuity. For example, in 1996 two separate research teams performed field experiments to evaluate the effect of color on the perception of retroreflective materials. One study evaluated the effect of color on the perceived ''conspicuity'' of retroreflective materials, and another study evaluated the effect of color on the perceived ''brightness'' of retroreflective material. *See* James R. Sayer *et al.,* The University of Michigan Transportation Research Institute, *Effects of Retroreflective Marking Color on Pedestrian Detection Distance,* Rpt. No. UMTRI–98–8 (Mar. 1998) (citing The University of Michigan's 1996 study by Schumann *et al.* and W.H. Venable and W.N. Hale's 1996 study titled *Color and nighttime pedestrian safety markings*). A copy of this 1998 study is in the docket of this proceeding (Document No. FRA–1999–6689–113). Both the studies cited in the 1998 study concluded that standard photometric measurements by themselves do not accurately predict the perception of colored retroreflective targets, particularly at nighttime, and that chromatic retroreflective stimuli were perceived to be brighter than photometrically matched achromatic stimuli.

As detailed in the 1996 University of Michigan study, W.H. Venable and W. N. Hale, in their 1996 study performed a field experiment based on night conspicuity judgments of chromatic versus achromatic markings and calculated a color correction factor (F_c) as the ratio of the luminance of an achromatic marking (L_a) to the luminance of any equally conspicuous chromatic marking (L_c) ($F_c = L_a/L_c$). Their results followed a U-shaped function expected from the Helmholtz-Kohlrausch effect, with higher conspicuity values (*i.e.*, higher color correction factors (F_c)) for red and blue, and the lowest value for yellow. Venable and Hale then mathematically derived F_c values for each color using two different methods: (1) Calculating F_c as the color difference from black in uniform color space, and (2) calculating F_c as recommended in ASTM International's Standard E–1501,

[6] ASTM has recently revised this standard and assigned it a new designation of D 4956–01a. Although the designation of the standard has changed, no substantive changes were made that would affect the performance of the material as contemplated by this rule. Accordingly, this final rule incorporates the latest version of the standard (D 4956–01a). Also, FRA notes that ASTM's full name was changed from ''American Society of Testing and Measurements'' to ''ASTM International'' in 2001. FRA, however, erroneously referred to ASTM International by its historical name, ''American Society of Testing and Measurements'' in the proposed rule. Accordingly, § 224.103 of this final rule reflects ASTM's correct name, ASTM International.

Standard Specification for Nighttime Photometric Performance of Retroreflective Pedestrian Markings for Visibility Enhancement (ASTM E–1501).[7] The two approaches resulted in almost identical F_c values (R^2=.99) for the different colors and the comparison of the Venable and Hale's calculated F_c values using the recommendation from ASTM E–1501 demonstrated a relatively good fit (R^2=.62). For a more detailed discussion of Venable and Hale's 1996 research, see document number FRA–1999–6689–113 in the docket of this proceeding.

The University of Michigan's 1996 study analyzing the effect of color on perceived ''brightness'' of retroreflective materials (as opposed to the Venable and Hale study which focused on the effect of color on the perceived ''conspicuity'' (*i.e.,* detectability) of retroreflective materials) yielded results similar to Venable and Hale's study. Specifically, using five chromatic stimuli and one achromatic stimulus, two levels of retroreflective power, two levels of area, and two levels of ambient illumination, Schumann employed magnitude estimation to gather subjective assessments of perceived brightness for colored retroreflective material. Similar to Venable and Hale's methodology, Schumann mathematically derived F_c values for each color tested and then compared these mathematically derived F_c values with F_c values calculated as recommended in ASTM E–1501. As did Venable and Hale, Schumann reported a very high correlation between the calculated and experimentally obtained color correction factors (R^2=0.94). Further, Schumann used the experimental color correction factors identified in Venable and Hale's 1996 study and arrived at similar results.

In 1998 researchers at the University of Michigan Transportation Research Institute conducted a nighttime field study to assess the effects of color on the detection of retroreflective markings. *See* Document No. FRA–1999–6689–113 in the docket of this proceeding. This field study again demonstrated that the color of retroreflective markings does affect the distance at which the markings can be detected. Specifically, the three chromatic retroreflective markings examined (red, yellow, and green) were detected at significantly farther distances, 7% to 10% farther than the achromatic (white) retroreflective markings and the study concluded that for white markings to be detected at the same distance as chromatic markings (*e.g.*, red, yellow, or green markings), white markings would need to have a 26% to 44% higher SIA value than the yellow markings (or the white markings would need to be significantly larger than the yellow markings). In other words, the nighttime detection of colored retroreflectors cannot be predicted from photometric measurements alone; chromaticity must also be considered. Sayer *et al.* (Document No. FRA–1999–6689–113 in the docket of this proceeding.)

As detailed in the preamble to the NPRM, FRA's own research regarding the effectiveness of freight car reflectorization yielded similar results. Specifically, FRA's research consistently found that retroreflective patterns of yellow markings were the most effective in enhancing the visibility of freight cars. *See Evaluation of Retroreflective Markings to Increase Rail Car Conspicuity,* Project Memorandum, DOT–VNTSC–RR897–PM–98–22, John A. Volpe National Transportation Systems Center (Oct. 1998) (1998 Volpe Report). Accordingly, FRA continues to believe that yellow retroreflective sheeting is the best color choice for retroreflective material on the sides of freight rolling stock. Nonetheless, FRA recognizes that white retroreflective material can perform satisfactorily. *See* 1998 and 1999 Volpe Reports.

Accordingly, recognizing that many railroads and car owners have already begun voluntary reflectorization programs using white material and that white retroreflective material has been determined to be effective in increasing the visibility of rail cars, FRA has revised paragraph (b) in this section of the final rule to allow the use of either white or yellow retroreflective material.[8]

In the NPRM, FRA specifically noted that its own research determined that fluorescent yellow retroreflective material had the highest SIA value of all materials tested and that fluorescent yellow material could be detected from a farther distance than any other material tested. However, based on our understanding that the duration of fluorescent pigments is substantially less than the typical ten-year reflector product guarantee, the agency proposed not to require the application of retroreflective material with fluorescent properties. In its comments, however, 3M, pointed out that its fluorescent yellow sheeting typically used on traffic signs is warranted for a full ten years. Further, 3M explained that the duration of fluorescent pigments is affected by the direction of the fluorescent material's exposure (presumably due to ultraviolet rays from the sun) and reasoned that because rail cars do not always face the same direction, the expected life of fluorescent yellow pigments would exceed the expected durability of the markings. Accordingly, 3M recommended that FRA require the use of fluorescent retroreflective material. Avery Dennison, on the other hand, commented that because fluorescent objects absorb ultraviolet light from the sun and then re-emit longer wavelength light, fluorescent colors are most effective in increasing daytime conspicuity. However, Avery Dennison noted that since the sun does not emit ultraviolet light at night, fluorescence stops. Accordingly, Avery Dennison reasoned that because the stated purpose of the rulemaking is to increase nighttime conspicuity, fluorescent colors would add no value to the application. Further, Avery Dennison explained that fluorescent colors are specified by their exceptionally high daytime luminance factors (Y%) and that such a specification would eliminate the use of metalized prismatic materials. Further, Avery Dennison commented that if metalized prismatic materials were eliminated from suitability under this rule, this would only allow two current conspicuity tape manufacturers to supply the market. FRA agrees with Avery Dennison on this point, and accordingly, this final rule does not require fluorescent retroreflective material. However, as noted in the preamble to the NPRM, if a fluorescent retroreflective material meets all of the requirements of this part, its use is acceptable.

Although in its comments to the NPRM, Avery Dennison expressed general agreement with FRA's proposal to require yellow retroreflective material, Avery Dennison noted one ambiguity in the proposed color requirement. Specifically, Avery Dennison pointed out that ASTM standard D 4956–01 contains three yellow color standards, all referencing the same chromaticity coordinates, but with three different daytime luminance

[7] Recognizing that a chromatic retroreflector may appear brighter than an achromatic retroreflector with the same luminance, ASTM E–1501 provides a widely-accepted methodology for calculating color correction factors which effectively account for the perceived difference in brightness between chromatic and achromatic retroreflective markings.

[8] FRA notes, however, that because chromatic markings (*e.g.,* yellow markings) generally appear brighter and more detectable than similarly-sized achromatic markings (*i.e.,* white markings), if white material is applied to rail cars under this rule, it is necessary to apply a greater quantity of the material to achieve the same effectiveness as a smaller quantity of yellow material. This ''color correction factor'' is discussed in more detail in the discussion of § 224.105 below.

factors (*i.e.,* Tables 5, 9, and 11 of the ASTM standard). Avery Dennison explained that based on the chromaticity coordinates specified in the ASTM standard, if FRA does not specify a minimum daytime luminance factor, retroreflective sheeting that appeared brown could meet the stated color requirement. Accordingly, Avery Dennison recommended that FRA adopt a minimum daytime luminance factor (Y%) of 12 for yellow sheeting. Although FRA now recognizes this ambiguity in the color requirement of the proposed rule, in this final rule FRA has modified the performance requirements contained in paragraph (c) to specify that retroreflective sheeting applied pursuant to this rule must meet the performance requirements (except for the minimum photometric performance requirements) of Type V Sheeting as defined in ASTM standard D 4956–01a. One of the performance requirements of Type V Sheeting is meeting an assigned daytime luminance factor. Specifically, Table 11 of the ASTM standard sets forth the required Y% for Type V Sheeting; the Y% for yellow Type V sheeting is 12, and the Y% for white Type V sheeting is 15. Accordingly, although FRA agrees with Avery Dennison's comment regarding the necessity of including a daytime luminance factor to ensure that only appropriately high-contrast colored sheeting meets the performance requirements of the rule, FRA has achieved this by specifying that sheeting must meet the requirements for Type V Sheeting as defined in ASTM standard D 4956–01a.

Paragraph (c), as it did in the NPRM, contains the performance standards for retroreflective sheeting applied under this part. This paragraph, however, has been modified slightly, consistent with FRA's decision to allow the use of either yellow or white retroreflective material and to clarify the performance requirements. As discussed above and explained in detail in the NPRM, this paragraph was intended to require that retroreflective sheeting applied in accordance with the rule meet all the performance requirements, except for the minimum photometric performance requirements, of ASTM standard 4956–01. The ASTM standard has been chosen as the basis for the FRA specification because FRA understands it to be the specification that manufacturers of retroreflective sheeting are following in their current manufacturing process. NHTSA's rule requiring reflectorization of large truck trailers (49 CFR 571.108) is also based on this ASTM standard (version D 4956–01).

As proposed, however, these performance requirements contained a certain amount of unintended ambiguity. Specifically, ASTM standard D 4956–01a identifies nine ''Types'' of retroreflective sheeting. As explicitly stated in the ASTM standard, ''Type designation is provided as a means for differentiating functional performance.'' ''Types'' are determined by conformance to the standard's retroreflectance, color, and durability requirements. Each ''Type'' designated by ASTM must conform to certain minimum performance standards. That is, each ''Type'' must meet certain performance standards (*i.e.,* retroreflective photometric performance, flexibility, adhesion, impact resistance, accelerated weathering, shrinkage, resistance to fungus, and specular gloss performance standards). Because no ''Type'' was specified in the performance requirements of paragraph (c) of proposed § 224.103, it was impossible for the retroreflective material manufacturing industry to determine which performance standards specified in the ASTM standard FRA intended to apply.

In this final rule, FRA has clarified these performance requirements by stating that retroreflective sheeting must conform to all the performance requirements, except the minimum photometric performance requirements, for Type V Sheeting as defined in ASTM standard D 4956–01a. Type V Sheeting, defined in the ASTM standard as ''super high-intensity retroreflective sheeting,'' is typically used for delineators. For example, Federal regulations requiring retroreflective material on the sides and rear of large trucks require retroreflective sheeting meeting the performance requirements of Type V Sheeting. Although FRA did not specify ''Type V'' sheeting in the proposed rule, FRA believes doing so now is consistent with the proposed rule because, given the photometric performance requirements contained in the NPRM, the other ASTM-defined ''Types'' of sheeting that could meet the proposed performance requirements would not be appropriate for the intended function of delineators on rail car sides.

As explained in the NPRM, because FRA is requiring that retroreflective sheeting meet the requirements of ASTM D 4956–01a for Type V Sheeting only as initially applied and is not requiring specific minimum reflectivity for vehicles in service, FRA believes that highly durable sheeting meeting the performance tests of the ASTM standard is required. It is less costly to install durable material than it would be to install less durable material but be required to regularly test its performance relative to a performance standard.

Table 1 of the final rule, as it did in the proposed rule, sets forth the specific minimum photometric performance requirements for retroreflective sheeting under this part. In addition, because the final rule permits the use of either yellow or white material (as opposed to the proposed rule which contemplated the use of only white material), FRA has inserted the minimum photometric performance requirements (*i.e.*, minimum SIA) in Table 1 specific to white material.[9] Specifically, Table 1 sets forth the minimum photometric performance requirements (*i.e.*, minimum required SIA) for both yellow and white retroreflective material at observation angles of 0.2° and 0.5° and light entrance angles of −4° and 30° based on typical grade crossing configurations and the standards set forth in ASTM D 4956–01a. These minimum photometric performance requirements for white material, like the requirements applicable to yellow material proposed in the NPRM, were developed to ensure that the retroreflective material would perform above the minimum detection threshold of 45 cd/fc/ft^2 identified in the 1999 Volpe Report as necessary to enable most motorists to detect a train in time to avoid a collision. As explained in the NPRM, FRA recognizes that in the real world railroad operating environment, the effective SIA of retroreflective materials depends on various factors (*e.g.*, grade crossing configurations and angles, ambient light conditions, vehicle headlight type and lens cleanliness, weather, and the presence and working condition of illumination and other warning devices). FRA also recognizes that the effectiveness of the retroreflective material may be reduced because of dirt and grime which inevitably accumulate on rail cars. Accordingly, as in the proposed rule, the minimum photometric performance requirements of this final rule take into account these varying factors. Specifically, as explained in the NPRM, in determining these minimum

[9] In the NPRM, FRA specifically requested comments regarding these minimum photometric performance requirements for white material. 68 FR 62955. Because FRA received no substantive comments regarding these requirements, FRA has adopted them substantially as proposed in this final rule. FRA has, however, corrected one inadvertent error in the requirements as previously published. In the NPRM, FRA erroneously referred to an observation angle of 0.53 for white material. FRA has corrected this error to maintain consistency with ASTM standard D 4956–01a in this final rule.

photometric performance requirements, FRA extrapolated test data detailed in the 1999 Volpe Report out ten years, the manufacturer's stated useful life of the material. This extrapolation demonstrated that the forecasted SIA levels remained well above the minimum detection level established in the 1999 Volpe Report. In addition, although the primary degradation in the SIA of the material occurs during the first two years as a result of ultra-violet light exposure, after which the material maintains a relatively consistent intensity throughout its useful life, FRA forecasted SIA degradation of the material due to dirt and grime accumulation exponentially. Accordingly, FRA's analysis substantially overestimates the degradation rate of the material, and even with this overestimation, the expected SIA values for 10 years remain well above the minimum detection level identified in the 1999 Volpe Report.

In response to the minimum photometric performance requirements of the proposed rule, 3M recommended that the 30° entrance angle be increased to 40° and the minimum photometric performance requirements be revised accordingly. Specifically, 3M questioned whether the 4% of crossings FRA identified with crossing angles of less than 30° assume that drivers view trains while they are on the road that crosses the track (*e.g.*, driving on a road perpendicular to the tracks). 3M pointed out that drivers are often on a roadway parallel to railroad tracks and, given the narrow entrance angularity of the proposed photometric requirements, 3M expressed the view that drivers often would not have enough time after turning off a parallel roadway to react to conspicuity markings on railcars passing on the track. Avery Dennison, on the other hand, commented that if a driver were traveling on a roadway parallel to the tracks, the driver would have to make a 90° turn, requiring braking, in order to cross the tracks. Accordingly, Avery Dennison concluded that the proposed entrance angle requirements were sufficient.

As explained in the NPRM, FRA's Grade Crossing Inventory demonstrates that approximately 80% of all crossings have crossing angles between 60° and 90°, almost 17% have crossing angles between 30° and 59°, and only 4% have crossing angles less than 30°. Accordingly, the requirements of Table 1 ensure that the retroreflectors will perform above the minimum detection threshold for the average motor vehicle at approximately 96% of all crossings.

Paragraph (d) of this section retains the certification requirement proposed in the NPRM. Specifically, manufacturers of retroreflective sheeting are responsible for compliance with the construction, color, and performance requirements of the retroreflective sheeting used to comply with this rule. Accordingly, as it did in the NPRM, this paragraph requires that manufacturers who are providing retroreflective sheeting to the railroad industry certify their products' compliance with § 224.103. Specifically, paragraph (d) requires that the characters ''FRA–224'' be permanently stamped, etched, molded, or printed, in characters at least 3 mm high, with each set of characters spaced no more than four inches apart, on each piece of retroreflective sheeting manufactured. FRA received only two comments regarding the proposed certification requirement, both from manufacturers of retroreflective sheeting. First, 3M suggested that the integrity of the self-certification system proposed needed improvement and urged FRA to require manufacturers to demonstrate compliance with the ISO 9000 Quality Systems Standard or a technically equivalent standard. Avery Dennison, on the other hand, expressed the view that the certification requirement, as proposed in the NPRM, was adequate. In support of its position, Avery Dennison noted that the proposed self-certification requirement of an indelible ''FRA–224'' mark is identical to the self-certification requirement in the Federal Motor Vehicle Safety Standards requiring retroreflective sheeting on large trucks and trailers (49 CFR 571.108). FRA notes that the manufacturer self-certification system proposed was modeled after the system utilized in the trucking industry. Also, FRA notes that the same retroreflective material manufacturers who supply material to the trucking industry will be the suppliers pursuant to this rule. Accordingly, FRA believes that the system of self-certification, as proposed, is sufficient.

Paragraph (e) of this section, which has not changed from that proposed in the NPRM, recognizes that although the rule generally requires application of retroreflective sheeting meeting the specific construction, color, and performance requirements of § 224.103(a) through (c), freight rolling stock owners may, under § 224.15, request FRA approval to use alternative standards. As discussed in the analysis of § 224.15 above, any alternative standard utilized must result in an equivalent level of safety as the sheeting described in § 224.103(a) through (c) applied in accordance with this rule.

Section 224.105 Sheeting Pattern, Dimensions and Quantity

As proposed in the NPRM, § 224.105 made the amount and placement of retroreflective sheeting required under this part dependent on the size of the car or locomotive, as well as the car type. Proposed § 224.105 also set forth specific patterns for the application of retroreflective material to various types of freight cars, as well as locomotives. This section of the final rule, however, no longer sets forth specific placement patterns for freight cars and locomotives. Instead, this section now describes the general standards for the pattern of retroreflective material application for rail cars, dimensions of individual pieces of retroreflective sheeting, and the minimum quantity of retroreflective sheeting required on each side of a freight car or locomotive. A new section, § 224.106, sets forth the more specific patterns, applicable to both freight cars and locomotives, that FRA is requiring in this final rule. Accordingly, discussion of the specific patterns of application required for freight cars and locomotives will be discussed in the analysis of new § 224.106, and the discussion in this section will focus on the general requirements of § 224.105 as adopted in this final rule.

As contemplated by the proposed rule, this section of the final rule specifies that, with certain exceptions, individual reflectors applied pursuant to this part must be 4 inches wide and 18 or 36 inches long (one-half a square foot or one square foot, respectively). FRA has retained this general requirement for relatively large-sized reflectors in order to minimize the degradation rate of individual strips of retroreflective sheeting. Section 224.105 of this final rule also provides that retroreflective sheeting must be applied along the length of freight car and locomotive sides and that the amount of retroreflective material required to be applied is, in part, dependent on the length of the car or locomotive. Table 2 of this section mandates a minimum square footage of sheeting on each car side, based on the car size and the sheeting color. If a car owner or railroad chooses to apply yellow retroreflective material, the amount of material required is consistent with the minimum amounts proposed to be required on ''cars of special construction'' in § 224.105(a)(4) of the proposed rule. As discussed in the NPRM, 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 is not requiring the periodic cleaning of the retroreflective sheeting. Instead, in order to compensate for the lack of cleaning, FRA is requiring approximately 30% more material (about 1 square foot on each side of most typically-sized freight rolling stock), thereby lowering the level of luminance needed.

As noted in the discussion of § 224.103 above, if a car owner or railroad chooses to apply white retroreflective material for purposes of meeting the enhanced visibility standards of this final rule, the owner must apply a greater quantity of the material in order to achieve the same effectiveness as the smaller quantity of yellow material required by this rule. As also noted above in the discussion of the color requirement of § 224.103, although white material has a higher SIA than yellow material, and presumably would be brighter and more reflective than yellow material, because an object's perceived brightness is modified by color information, yellow is actually more detectable, particularly at night and during other conditions of limited visibility. *See* Schumann *et al.* and Sayer *et al.* (Document Nos. FRA–1999–6689–112 and –113 in the docket of this proceeding).

As noted in the discussion of § 224.103 above, recognizing that a chromatic retroreflector may appear brighter than an achromatic retroreflector with the same luminance, ASTM E 1501 provides a widely-accepted methodology for calculating color correction factors which effectively account for the perceived differences in brightness and conspicuity between chromatic and achromatic retroreflective markings. Based on the chromaticity coordinates of their specific product colors and the methodology of ASTM E 1501,[10] manufacturers of retroreflective sheeting calculate color correction factors specific to their product colors. As a result, manufacturer-specific tables of color correction factors for retroreflective traffic control products that compensate for color have existed in the reflective material manufacturing industry for decades. Based on the color correction factors reported by a sampling of retroreflective material manufacturers already routinely supplying retroreflective material to the railroad industry and the methodology of ASTM E 1501, FRA determined that approximately 24% more white retroreflective material meeting the minimum photometric performance requirements of § 224.103 is necessary to achieve the same level of retroreflection as the amount of yellow material FRA determined to be necessary.

Section 224.106 Location of Retroreflective Sheeting

As noted in the discussion of § 224.105 above, similar to proposed § 224.105, § 224.106 of this final rule sets forth specific patterns for the application of retroreflective material to various types of freight cars, as well as locomotives. The proposed rule (in § 224.105) generally required a vertical pattern of retroreflective sheeting on the sides of freight cars, 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. FRA proposed to require that retroreflective sheeting be applied at least every 10 feet along the sides of freight cars because roadway lanes in the United States are typically 10 to 12 feet wide and accordingly, having at least one reflector every 10 feet increases the likelihood of a reflector being in the sight path of an approaching motorist. Recognizing that the conspicuity issues surrounding locomotives differ from the issues surrounding freight cars, § 224.105 of the proposed rule provided a more flexible approach to the reflectorization of locomotives, specifying only that a minimum amount of retroreflective material was to be equally distributed between both sides of locomotives in a pattern recognizable to motorists.

Railroad Freight Cars

As proposed in the NPRM, paragraph (a) of § 224.105 set forth a specific pattern of application for railroad freight cars generally (*e.g.*, box cars, gondola cars, and other similarly configured cars), tank cars, flat cars, and ''cars of special construction.'' Specifically, as proposed, paragraph (a) explained 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) proposed to require that on freight cars other than tank cars, flat cars, and ''cars of special construction,'' retroreflective sheeting be applied vertically in 4x36 inch and 4x18 inch strips along the car sides, with the bottom edge of each strip as close as practicable to 42 inches above the top of the rail. Further, paragraph (a)(1) proposed to require that either a minimum of one 4x36 inch (one square foot) strip of retroreflective material or two 4x18 inch strips, directly above the 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 equal intervals of 10 feet or less between the car ends.

Paragraphs (a)(2) and (3) of proposed § 224.105 followed the same basic pattern as paragraph (a)(1), but attempted to account for the configurational differences between various types of freight cars. Proposed paragraph (a)(2) addressed tank cars, while paragraph (a)(3) addressed flat cars. Paragraph (a)(2) proposed to require that on tank cars, retroreflective sheeting be applied vertically along the car sides and centered on the horizontal centerline of the tank, or as near as practicable. Further, proposed paragraph (a)(2) provided that if it was not practicable to safely apply the sheeting centered on the horizontal centerline of the tank, the sheeting could be applied vertically with its top edge no lower than 70 inches above the top of the rail. Similar to the pattern proposed in paragraph (a)(1), paragraph (a)(2) proposed to require 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 tank as practicable and that a minimum of one 4x18 inch strip be applied vertically at equal intervals of 10 feet or less between each end of the tank. The intent of this proposed configuration of reflective material on tank cars was that the retroreflective sheeting would be centered, as practicable, on the outermost curved areas of the tank, thereby reflecting the most light.

Recognizing the limited surface area of the sides of a typical flat car, paragraph (a)(3) of proposed § 224.105 required a minimum of two 4x18 inch strips, one next to the other, be applied vertically as close to each end of the car as practicable, with the bottom edge of each strip no lower than 30 inches above the top of the rail, as practicable. Consistent with the application pattern for other freight cars, paragraph (a)(3) further proposed to require that a minimum of one 4x18 inch strip be applied to the sides of flat cars vertically at equal intervals of ten feet or less, with

[10] *See* §§ 6.4 and 6.5 of ASTM E 1501 addressing Chromaticity Coordinates and Color Factor for Adjustment Calculations (F_c).

the bottom edges of each strip no lower than 42 inches above the top of the rail, as practicable. Because the surface area of the sides of a typical flat car is between 4 and 18 inches in height, paragraph (a)(3) provided that if vertical application of 4x18 inch strips was not feasible, sheeting could be applied vertically in three 4x6 inch strips placed horizontally along the side sill of the cars.

Paragraph (a)(4) of proposed § 224.105 recognized that not all freight cars would fit the standard configurations contemplated in paragraphs (a)(1) through (a)(3) and proposed a more flexible pattern for these ''cars of special construction.'' FRA estimated that the patterns proposed for typical freight cars, tank cars, and flat cars would be impractical to apply to approximately 1% of the fleet due to their unique physical configurations. Specifically, based on the length of a ''car of special construction,'' this paragraph proposed to require a specific amount of retroreflective material be applied to these cars in a pattern conforming ''as close as practicable'' to the standard patterns proposed in paragraphs (a)(1) through (a)(3).

The intent of the specific patterns specified in proposed § 224.105(a) was to maximize the effectiveness of the retroreflective material, allow retroreflectorization of a variety of freight car types with the same generally recognizable pattern, and also to minimize the degradation rate of the material. Specifically, as detailed in the NPRM, FRA proposed to require a vertical pattern of retroreflective material for several reasons. First, FRA's own research indicated that either a pattern that outlined the shape of the rail equipment, or a vertically-oriented pattern that spaced retroreflective material uniformly over a large area of the equipment's side was most effective in increasing the visibility of the equipment. Second, a vertically-oriented pattern contrasts with the horizontally-oriented pattern of the retroreflective material required for truck trailers, thereby reducing the likelihood that motorists will confuse a train in a grade crossing with a truck trailer. Third, because not all approaches to grade crossings are level (''humped crossings''), 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; therefore, less light will be returned to the driver, and a train in a crossing will be more difficult to detect. Accordingly, FRA reasoned that 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 is not level.

A few commenters, including the AAR and CN, expressed the view that FRA's rationale underlying the proposed vertical pattern is flawed because the ability of motorists to distinguish between trucks and rail rolling stock is not a real concern. For example, CN noted that grade crossing signage and other crossing warning devices indicate the closeness of a railroad crossing to a driver. These cues, along with the ''presence of any sort of object ahead,'' CN reasoned, ''should be enough for a prudent driver to take the necessary precautions.'' FRA notes, however, that the prevalence of unlighted, passively-protected crossings throughout the United States often makes grade crossing signage and similar warning devices difficult for motorists to detect, especially during conditions of limited visibility.

AAR asserted that the fact that there is considerable traffic on the rails that must have reflectorized material meeting highway specifications further undermines FRA's conclusion that it is important for motorists to be able to distinguish between trucks and trains in their path of travel. Further, AAR asserted that regardless of whether a motorist perceives a truck or a train ahead in his or her path of travel, the motorist must react the same way—*i.e.,* the motorist must determine whether there is any trailing traffic. Accordingly, AAR expressed the view that if a motorist mistakes railroad rolling stock for a truck, or vice versa, the mistake should be of no consequence.

In these comments, however, AAR does not consider the fact that any trailing traffic following a truck would more than likely be another reflectorized highway vehicle, or at least, a highway vehicle equipped with headlights and taillights; thus, any traffic trailing a truck would be easily detected by an approaching motorist. If a motorist perceives a truck in his or her path, but no traffic trailing the truck, he or she may only need to slow the vehicle to avoid a collision, since trucks are generally shorter than trains, normally move through intersections faster than trains, and usually do not have any hard-to-detect trailing traffic. However, given the prevalence of non-reflectorized rail cars, and the 10-year implementation period for reflectorization of rail freight rolling stock contemplated by the proposed rule and adopted in this final rule, it is highly likely that any traffic trailing a reflectorized rail car would be a non-reflectorized rail car. Thus, if a motorist perceives a reflectorized rail car in his or her lane of travel, the motorist must react differently than if he or she perceives a truck with no trailing traffic, not only because trains are generally longer than trucks and pass through intersections slower than trucks, but also because of the likelihood of hard-to-detect trailing traffic. Accordingly, FRA continues to believe it important that any rail car reflectorization pattern minimize, to the extent possible, the potential for motorist confusion between trains and trucks. However, even disregarding the issue of potential motorist confusion between reflectorized rail cars and reflectorized trucks, because research has shown that a vertically-oriented pattern spacing retroreflective material over the length of rail car sides is one of the most easily detectable patterns of retroreflective material and because a vertically-oriented pattern ensures that the maximum available light from vehicle headlights will enter the retroreflective material and be returned to an approaching motorist, FRA continues to believe that a vertical reflectorization pattern is the most effective in increasing the visibility of freight cars.

FRA recognizes, however, that AAR and several commenting railroads, many of which already have successful voluntary freight car reflectorization programs in place, noted significant practical difficulties with the vertical pattern FRA proposed. In particular, FRA received a multitude of comments asserting that the proposed vertical ''striping'' pattern was impracticable for the majority of freight cars that would be subject to the rule and that the proposed rule did not provide enough flexibility as to where retroreflectors could be applied pursuant to the rule. For example, CP, which has had a voluntary reflectorization program in place for several years, commented that although it had no objection to FRA's proposed square footage requirements, any reflectorization standard ''should provide sufficient latitude for application to various car types, particularly when applying [reflective material] to existing cars where existing stencil requirements have to be taken into account.'' More specifically, comments submitted by various members of the railroad industry consistently expressed the view that FRA's proposed pattern of vertical striping posed three major problems. First, commenters asserted that given the physical configurations of many freight cars, it would be physically

impossible to apply material in the proposed pattern on the majority of freight cars that would be subject to the rule. Second, these commenters asserted that FRA's proposed pattern would interfere with reporting marks and other stencils on freight cars, as well as bolts, rivets and other discontinuous surfaces on the face of freight cars. Third, these commenters asserted that on many cars, safety appliances would obscure or otherwise interfere with the proposed striping pattern.

At the January hearing, TTX, an owner of one of the nation's largest fleets of railcars, stated that in most cases, and particularly with regard to flat cars, it would be ''physically impossible'' to comply with FRA's proposed reflectorization pattern. Specifically, TTX noted that none of its ''conventional'' flatcar fleet has sides high enough to accommodate reflectors at 42 inches from the top of the rail; that none of its conventional flatcars could accommodate vertical reflectors at the ends; and that because of existing car markings, fasteners, and other appurtenances, few of its conventional flatcars could accommodate evenly spaced reflectors. Further, TTX noted that the same problems are even more pronounced with some of its specialized pieces of equipment (*e.g.,* centerbeam cars, bulkhead flatcars, and heavy duty flatcars) which have ''extremely narrow sills and almost no space at the ends.'' In its comments, TTX asserted that FRA should not issue a rule requiring the reflectorization of flat cars that nearly all flat cars could not meet. TTX asserted that ''[i]f there is a rule designed specifically for flatcars, it should recognize the universal low height of the cars, the fact that they have very little surface area for affixing the reflectors, and the fact that they have little vertical space at the ends.''

In response to TTX's particular concerns regarding the proposed pattern of retroreflective sheeting on flat cars, FRA notes several points worthy of clarification. First, in paragraph (a)(3) of proposed § 224.105, FRA specifically recognized the limited surface height of the sides of typical flat cars and provided that if vertical application of retroreflective sheeting was not feasible on a particular car, sheeting could be applied in 4x6 inch strips placed horizontally along the side sills. In addition, proposed paragraph (a)(3) of this section required that retroreflective sheeting be applied no lower than 30 or 42 inches above the top of the rail, ''as practicable.'' In other words, FRA intended to provide the flexibility necessary to accommodate flat cars with narrow side sills.

TTX did recognize FRA's attempt to account for the physical configurations of ''odd-shaped'' cars by providing for ''cars of special construction'' (*i.e.,* not typically-shaped freight cars, tank cars, or flat cars) in proposed paragraph (a)(4) of this section. However, TTX expressed the view that the proposed requirement that the retroreflective pattern on these ''cars of special construction'' conform as close as practicable to the standard patterns proposed for typical freight cars presented additional problems in that it would require an owner's maintenance and repair personnel to exercise their judgment in the field as to what reflector configuration would conform ''as close as practicable'' to FRA's stated standards. TTX expressed concern that, given the wide variety of existing car types and physical configurations, along with the varying car markings, stencils, and appurtenances on each different car type, it would be impossible to ensure that every physical variation of these ''cars of special construction'' was equipped with retroreflectors in a standardized way, conforming as close as practicable to FRA's stated standards. Finally, TTX expressed concern that many cars have insufficient unoccupied side surface area to meet even FRA's minimum square footage requirements for retroreflective sheeting, much less the specific location requirements.

At the January hearing, a representative of ARC (an organization of suppliers, particularly rail car builders) expressed concerns similar to TTX's, but regarding boxcars. Specifically, ARC expressed the view that even on a typical boxcar, given the stenciling required by AAR Standard S910–98, there is little room for placing vertical reflectors without interfering with the car's stenciling. Other commenters noted that the corner posts of railcars are typically less than four inches wide; thus, it would be impossible to apply four-inch wide retroreflective markings at the extreme ends of many railcars. API, along with ARC, echoed TTX's concern regarding the proposed rule's requirement for evenly spaced reflectors. Specifically, API explained that if no more than 10 feet is allowed between strips of reflective sheeting, the reflective markings will interfere with car stencils. RSI noted that placement of retroreflective sheeting, as proposed, may require the restenciling of many cars, adding significantly to the cost of application. AAR expressed similar comments and provided drawings showing how FRA's proposed vertical application pattern would purportedly interfere with existing car stenciling.

AAR also asserted that on many cars, safety appliances would interfere with the proposed vertical striping pattern and that in many cases, the proposed vertical striping pattern would require that a retroreflective strip be placed under a safety appliance (such as a handhold, grab iron, or ladder), which would interfere with the visibility of the reflectorized material. In addition, AAR asserted that maintenance of safety appliances in close proximity to reflectorized material could cause damage to the reflectorized material and that FRA's proposed vertical striping pattern did not account for potential damage caused by employees inadvertently kicking and scraping reflectorized material as they get on and off a safety appliance.

Commenters suggested a far more flexible approach in the application of retroreflective material to the sides of rail cars. For example, at the January hearing, TTX suggested that car owners simply be required to equip their cars with a certain amount of retroreflective sheeting in a generally uniform way, taking into account the particular existing structure of the car. RSI recommended that FRA allow vertical, horizontal, or a combination of both patterns; CP, CN, and AAR recommended a horizontal pattern on most car types; and API recommended a spacing of 8–12 feet between reflectors. Many commenters also endorsed AAR's proposed industry standard and suggested that FRA incorporate the standard in any final rule on reflectorization.

Although, based on its extensive research efforts, FRA continues to believe that a vertically-oriented reflective pattern, uniformly spread along the length of car sides, is the most effective in increasing the visibility of rail cars, FRA recognizes the practical concerns expressed by commenters and that in many cases, a vertical pattern of retroreflective material along the sides of freight cars is not feasible. FRA also recognizes that research has also shown that generally, a reflectorized freight car is significantly more detectable than an unreflectorized car, whether the reflective material is applied horizontally or vertically, or whether the reflective material is yellow or white. *See* 1998 and 1999 Volpe Reports. In addition, in the proposed rule, FRA did not intend that freight cars would have to be restenciled in order for retroreflective material to be applied. FRA also based the proposed rule on the belief that the pattern proposed for typical freight cars, tank cars, and flat cars would be practical to apply to approximately 99% of the

freight car fleet. Comments received in response to the NPRM, however, indicate that this belief is inaccurate. Accordingly, in this final rule, FRA has revised the required retroreflective material placement patterns applicable to freight cars to alleviate the practical concerns noted by several commenters. Section 224.106 of this final rule also specifically invites the industry to revise the industry standard proposed by AAR to meet the performance requirements of this final rule. Absent the industry's development and FRA's acceptance of an industry standard for the reflectorization of freight cars and locomotives, § 224.106 of this final rule sets forth specific patterns for the application of retroreflective material to various types of freight cars, as well as locomotives.

Generally, in this final rule FRA has revised three basic aspects of the patterns contemplated in proposed § 224.105. First, FRA has revised the required patterns to provide for flexibility in applying the sheeting around existing and required stenciling and markings, around appurtenances which may obscure the visibility of the sheeting, and around discontinuous surfaces that may prevent the sheeting from adhering to car sides. Second, FRA has revised the required patterns, where appropriate, to provide for either vertical or horizontal placement of retroreflective sheeting. Third, FRA has eliminated the need for equidistant spacing of no more than 10 feet between strips of retroreflective sheeting.

Specifically, paragraph (a) of § 224.106 of this final rule provides that retroreflective sheeting must be located clear of appurtenances and devices such as ladders and other safety appliances or attachments that may obscure its visibility. Paragraph (a) also provides that retroreflective sheeting need not be applied over existing or required car stencils or markings, nor must the sheeting 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. To accommodate cars with limited unoccupied surface space suitable for attaching reflectors, paragraph (a) specifically provides that 4x18 inch and 4x36 inch strips of sheeting may be separated into either two 4x9 inch strips, or four 4x9 inch strips, and applied on either side of the interfering appurtenances, discontinuous surfaces, or car markings or stencils. In other words, for example, if there is not sufficient room to apply a 4x18 inch reflector on the side of a car without covering existing stenciling, a car owner may apply two 4x9 inch strips of sheeting, one on either side of the stenciling, as practicable.

Similar to paragraph (a) of proposed § 224.105, paragraph (a) of § 224.106 of this final rule sets forth the specific pattern of application for railroad freight cars generally (*e.g.*, box cars, gondola cars, and other similarly configured cars), tank cars, flat cars, and ''cars of special construction.'' As applied to freight cars, other than flat cars and tank cars, paragraph (a)(1) provides for either a vertical or horizontal pattern of retroreflective material along the length of the car sides, with the bottom edge of the sheeting as close as practicable to 42 inches from the top of the rail. Although FRA recognizes that the physical configuration of some freight cars will not allow for the placement of retroreflective sheeting at, or very near to, 42 inches from the top of the rail, in order to minimize the degradation of the material and maximize the material's effectiveness, paragraph (a)(1) provides that retroreflective sheeting shall not be applied below the side sill or above 72 inches from the top of the rail. Paragraphs (a)(1)(i) and (ii) also mandate that at least one 4x36 inch strip of retroreflective sheeting, or its equivalent (one square foot), be applied to car sides as close as practicable to each end of the car, and at least one 4x18 inch strip, or its equivalent (one-half a square foot), must be placed at least every 12 feet.

Paragraph (a)(2) addresses tank cars and remains substantially the same as originally proposed. Specifically, paragraph (a)(2) requires that on tank cars, retroreflective sheeting shall be applied vertically along the car sides and centered on the horizontal centerline of the tank, or as near as practicable. If it is not practicable to safely apply the sheeting centered on the horizontal centerline of the tank, the sheet may be applied vertically with its top edge no lower than the horizontal centerline of the tank. Similar to the pattern proposed in (a)(1), paragraph (a)(2) requires 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 tank as practicable, and at least one 4x18 inch strip (one-half a square foot) must be placed at least every 12 feet between the two end strips.

As explained in the NPRM, the intent of this configuration is that the retroreflective sheeting will be centered, as practicable, on the outermost curved area of the tank, thereby reflecting the most light. The placement pattern has been revised from that originally proposed for tank cars, however, in accordance with NAFCA's suggestion to avoid applying the sheeting in the ''drip path'' of the tank. Specifically, NAFCA explained that ''[i]t is inevitable that materials loaded into tank cars will experience some spillage onto the sides of the car during the loading process'' and that ''accumulated residue from spillage on the exterior of the cars may make it difficult for [retroreflective sheeting] to adhere'' and the sheeting would quickly become obscured by loading spillage. Accordingly, FRA has revised the required pattern of retroreflective sheeting to be applied to freight cars to specifically state that sheeting shall not be applied in the spillage area directly beneath the manway used to load and unload the tank.

Paragraph (a)(3) addresses flat cars (defined to include spine cars, articulated and multi-unit articulated cars) and provides for a horizontal pattern of retroreflective material along the length of flat cars' side sills, with the bottom edge of the sheeting no lower than the bottom of the side sill and the top edge of the sheeting no higher than the top of the car deck or floor. Similar to paragraphs (a)(1) and (2) of this section, paragraph (a)(3) requires that at least one square foot of retroreflective sheeting be applied as close to each end of the car, as practicable, and at least one-half a square foot of sheeting be applied at least every 12 feet between the two end strips. Recognizing the limited surface area of the sides of a typical flat car, paragraph (a)(3) provides that the one square foot of material at each car end may be applied in two 4x18 inch strips, one above the other, or if the side sill is less than eight inches wide, the two 4x18 inch strips may be applied one next to the other. Paragraph (a)(3) has been revised from that originally proposed for flat cars, in response to AAR's and TTX's comments specific to auto rack cars. In its comments, AAR explained that a typical auto rack car is nothing more than a conventional flatcar to which a separate rack has been attached. Further, TTX explained that although it owns almost 50,000 flat cars to which racks are attached, the company owns only a few of the actual racks; railroads own the majority of racks. Accordingly, TTX noted that if FRA wants the reflectors to be attached to the rack structure (which is higher than the flat car structure and closer to FRA's preferred height above top of rail of 42 inches), FRA ''would have to order the rack owner to be responsible.'' FRA recognizes TTX's concern in this regard, and the agency has accordingly revised paragraph (a)(3)

of this section to provide that if a car has a separate rack structure, retroreflective sheeting may be applied to the flat car portion only in accordance with the requirements of this section. FRA notes, however, that if a flat car and rack attachment are owned by the same freight rolling stock owner, to minimize the likely degradation of the retroreflective material on the car (and therefore the likely maintenance costs), it may be advisable to apply retroreflective material as close to 42 inches above the top of the rail as practicable.

Paragraph (a)(4), which is substantially unchanged from the proposed rule, addresses ''cars of special construction.'' Specifically, this paragraph requires that based on the length of a ''car of special construction,'' the car be equipped with the minimum amount of retroreflective sheeting as specified in § 224.105, applied in a pattern conforming as close as practicable to the standard patterns specified in paragraphs (a)(1) through (a)(3). Both AAR and TTX expressed concern that some rail cars, regardless of their physical shape, may not have sufficient unoccupied surface area to accommodate the minimum reflector area required under this rule. Accordingly, both AAR and TTX recommended that these ''cars of special construction'' that cannot accommodate the minimum square footage of sheeting required by the rule be equipped with at least three reflectors on each car side, each no less than 4x18 inches. FRA, however, does not believe that creating a blanket rule allowing certain freight cars to be equipped with three strips of retroreflective sheeting amounting to one and a half square feet of material is an effective way of increasing the conspicuity of freight cars. FRA notes, however, that if a freight car has insufficient unoccupied surface area to accommodate the minimum reflector area required under this rule, pursuant to § 224.7 of this final rule, the owner of the freight car may file for a waiver from the minimum requirements of § 224.105. The waiver process is discussed in more detail in the analysis of § 224.7 above.

Locomotives

As proposed in the NPRM, paragraph (b) of § 224.105 addressed the reflectorization pattern of locomotives. As explained in the NPRM, FRA recognizes that the conspicuity issues surrounding locomotives differ from the issues surrounding freight cars. For example, the physical configuration of locomotives is obviously quite different from the configuration of most freight cars; locomotives are often painted brighter colors than freight cars; locomotives owned by major railroads and used in road service are cleaned on a more frequent basis; and company logos are often displayed on the sides of locomotives in reflective materials. In addition, locomotives are equipped with light sources on the front and ''ditch'' lights on the sides. However, in modern railroad operations, locomotives are often embedded in train consists providing ''distributed power'' to the consists. In these instances, however, locomotives are typically operated without their front or side lights illuminated, and accordingly present the same conspicuity issues attendant to freight cars. Consequently, based on the rationale that some pattern of retroreflective material recognizable to motorists is necessary to facilitate motorists' recognition of locomotives in grade crossings, in paragraph (b) of proposed § 224.105, FRA proposed to allow any pattern of reflectorization on locomotives that divided the amount of retroreflective sheeting equally between both sides of a locomotive, provided a certain minimum amount of sheeting was applied to each locomotive side, and provided that the sheeting was applied in a ''pattern recognizable to motorists.'' Paragraph (b)(3) of proposed § 224.105 further provided that application of material horizontally along the sill or side walkway of a locomotive would be considered a ''pattern recognizable to motorists.''

In response to this proposal, AAR commented that the requirement that retroreflective material be applied to locomotives in a ''pattern recognizable to motorists'' was ''too vague to be meaningful.'' Further, citing the fact that railroads already typically reflectorize their locomotives with names and symbols, AAR noted that requiring retroreflective sheeting to be uniformly applied along locomotive sides ''would mean that reflective material would have to be used in addition to the names and symbols depicted on the locomotives, rather than as part of the names and symbols.'' Accordingly, AAR recommended that both of these proposed criteria be deleted and that FRA merely require that a minimum amount of retroreflective sheeting be equally distributed between the sides of locomotives.

Paragraph (b) of proposed § 224.103 reflected FRA's understanding that an effective pattern of locomotive reflectorization requires that the approximate length of the locomotive be defined by the reflective material. As detailed in the NPRM, research has consistently demonstrated that reflective material distribution patterns that either outline the shape of rail equipment, or that space the material over a large area of the equipment sides, are the most effective in increasing rail equipment visibility thereby enabling a motorist to distinguish a piece of rail equipment in his or her path from other potential obstacles. In addition, FRA notes that the reflectorized logos and symbols commonly found on locomotives are often applied so high on the locomotive sides that light from the headlights of approaching motor vehicles will, in most instances, not even reach the material; thus, the reflectorized logos and symbols will be ineffective in aiding approaching motorists to detect the presence of the locomotive. Accordingly, FRA continues to believe that for reflective material to effectively increase the visibility of locomotives to approaching motorists, it is necessary to spread the reflective material along the length of the locomotive sides, at a reasonable height. Thus, in this final rule, although FRA has removed the proposed language requiring the pattern of retroreflective material application on locomotive sides be a ''pattern recognizable to motorists,'' FRA has retained the general requirement that retroreflective material be spread along the length of locomotive sides, and FRA has further required that the material be applied as close as practicable to 42 inches above the top of the rail. FRA notes that most locomotives already reflectorized in the course of voluntary reflectorization programs are equipped with not only reflectorized logos and symbols, but also with reflective material applied along the length of the locomotive sides at platform height, exactly the pattern contemplated by this final rule.

Section 224.107 Implementation Schedule

As proposed in the NPRM, this section required that all freight cars subject to this part be equipped with retroreflective sheeting conforming to this part within ten years of the effective date of the final rule, and similarly, that all locomotives subject to this part be equipped within five years. Generally, FRA proposed that retroreflective sheeting be applied to new freight rolling stock at the time of construction and to existing stock when such stock was being repainted, rebuilt, or undergoing other periodic maintenance. As an alternative to this schedule, FRA proposed a more flexible approach of allowing freight car owners to designate, in individualized implementation plans, a schedule for the reflectorization of

their freight car fleets, provided they meet certain milestones designed to ensure that the entire fleet of domestically owned freight cars would be equipped with retroreflective sheeting within ten years.

Although the majority of commenters did not express disagreement with FRA's general proposal to implement a reflectorization requirement over a 10-year period, a few commenters expressed the view that the five-year implementation period proposed for the reflectorization of locomotives and the ten-year implementation period proposed for the reflectorization of freight cars was too long. One commenter, noting that the trucking industry implemented a reflectorization requirement in only two to three years, asserted that the proposed five- and ten-year implementation periods were ''unnecessarily long'' and that during the implementation period, because some rail cars will be equipped with reflectors while others will not be, ''[i]t is likely that some drivers will mistake unmarked cars in the crossing as a gap in the train.'' Although FRA understands the concerns of this commenter, FRA believes that, given the unique characteristics of the railroad industry, the five- and ten-year implementation periods are necessary to cost-effectively reflectorize the entire fleet of freight rolling stock subject to this rule. Accordingly, in this final rule, FRA has retained the general requirement that all freight cars subject to this rule be equipped with retroreflective sheeting within ten years, and that all locomotives subject to this part be equipped within five years.

Railroad Freight Cars

Newly constructed cars: Paragraph (a)(1) of proposed § 224.107 required that retroreflective sheeting be applied to newly manufactured rail cars at the time of the cars' construction. This proposed requirement was intended to ensure that newly manufactured rail cars are equipped with the proper retroreflective material before being placed in service. In this final rule, FRA has clarified this intent by specifying in paragraph (a)(1) of this section that retroreflective sheeting must be applied to newly manufactured cars before the cars are placed in service.

Existing cars without retroreflective sheeting: Paragraph (a)(2)(i) of proposed § 224.107 required that retroreflective sheeting be applied to existing unreflectorized freight cars when either (1) the car was being repainted or rebuilt, or (2) the car underwent its first single car air brake test (SCABT) (required under 49 CFR 232.305) after the effective date of the rule, whichever occurred first. FRA proposed this ''default'' schedule of retroreflective sheeting application in an attempt to achieve the most efficient and cost-effective implementation of the rule. FRA reasoned that by providing for the application of retroreflective sheeting when cars are out of service for regularly scheduled maintenance, the entire U.S. fleet of freight cars could be reflectorized well within the ten-year implementation period and would not be required to incur any additional downtime outside of the normal maintenance cycle for the purpose of reflectorization.

Paragraph (a)(2)(ii) of this section in the proposed rule provided that a freight car owner could elect not to follow the default schedule of paragraph (a)(2)(i), if the owner submitted a Fleet Reflectorization Implementation Plan (FRIP) to FRA within 60 days of the final rule's effective date. As proposed, the FRIP was required to (1) set forth the car numbers constituting the fleet subject to this part; (2) indicate when the identified cars were scheduled to be reflectorized; (3) contain an affirmation that at least 20% of the total fleet would be equipped with conforming retroreflective sheeting within 24 months after the effective date of the final rule; and (4) contain an affirmation that not less than an additional ten percent of the total fleet would be completed annually thereafter for the duration of the 10-year implementation period. Absent identification of a car in a FRIP, the proposed rule intended to require that conforming retroreflective sheeting be applied to that car at the time of its first SCABT after the effective date of the final rule.

Although a few commenters addressed FRA's proposal to require the application of reflectors when a freight car is being repainted or rebuilt, most commenters expressed the view that the initial installation of reflectors should not be required at the time of the SCABT. These commenters noted that at least one retroreflective material manufacturer recommends against the application of retroreflective material to rail cars under conditions of extreme temperature. Specifically, 3M's ''Application Instructions for 3M Diamond Grade Conspicuity Markings on Rail Cars'' notes that retroreflective material should not be applied when air and application surface temperatures are below 45 °F or above 100 °F. Accordingly, several commenters noted that this temperature restriction would be a major obstacle in applying the retroreflective material at the time of the SCABT in the many locations throughout the United States at which the SCABT is routinely performed at outdoor or unheated locations in temperatures above or below these minimum and maximum recommended temperatures. For example, the AAR notes that in Bangor, Maine; Minneapolis, Minnesota; and North Platte, Nebraska, the average low temperature is below 50 °F for eight or more months of the year, while in these same cities the average high temperature is below 50 °F for at least four months. Similarly, CP noted that almost 3,000 (43%) of all SCABTs performed in 2003 in the company's St. Paul service area were performed when monthly average temperatures, both high and low, were below 50 °F. Accordingly, CP concluded that given the temperature constraints, ''it would often be impossible to apply [retroreflective] material at a repair track'' and instead, cars would have to be sent to a repair facility. At the January hearing, Mr. James Hart, a representative of ARC, testified that ARC's member companies have had several years of experience in applying reflective material to new rail cars (presumably because of the various voluntary reflectorization programs already underway in the rail industry). Based on these years of experience, Mr. Hart indicated that Institute members have determined that reflective material adheres best when applied in temperatures of at least 60 °F, and even better, when applied at temperatures over 70 °F.

At the January hearing, NAFCA also expressed the view that the single car air brake test is not the appropriate time for the initial application of retroreflective material to freight cars. Specifically, NAFCA commented that ''the body surface condition, temperature, and preparation environment on railroad repair or RIP tracks is not optimal, potentially resulting in reduced life of the reflective material,'' and therefore leading to increased costs for the car owner. Mr. Hart, of ARC, echoed NAFCA's concerns by explaining that the cleanliness of the surface to which one applies retroreflective material is critical. Mr. Hart explained that various surfaces (*e.g.*, aluminum cars versus steel cars, etc.) have different preparation requirements. For example, Mr. Hart explained that in applying reflective materials to freight cars with aluminum surfaces, the outside surface must be etched with acid to remove the outer coating enabling the material to adhere to the car sides. Mr. Hart further explained that ''application techniques and skills must be acquired'' and that if

the material is not applied properly, it will not appropriately adhere to the surface. In its comments, AAR also noted that because FRA's proposed rule provided for approval of alternative standards, it would be ''impossible'' for SCABT facilities to be equipped to install retroreflective material pursuant to the variety of reflectorization programs that could be in place.

As an alternative to requiring that retroreflective material be installed at the time of the SCABT, several commenters, including AAR, CP, and CN, recommended a more flexible schedule whereby all owners of freight cars would be required to install the retroreflective material on their freight car fleets in accordance with the schedule FRA proposed for FRIPs. These commenters further suggested that all freight car owners be required to report annually to FRA the status of their compliance with the FRIP schedule, not report in advance which cars were planned to be reflectorized in each particular year as the proposed rule would require. Specifically, AAR asserted that allowing all car owners to reflectorize their freight car fleets in accordance with the proposed FRIP schedule and report compliance annually would yield several advantages over the system proposed in the NPRM. For example, AAR asserted that such a program would enable car owners to (1) take weather conditions into account in scheduling cars for reflectorization; (2) account for the planned retirement of freight cars and scheduled repainting; and (3) have sufficient flexibility to change which cars would be reflectorized in a given year.

Although FRA continues to believe that the schedule set forth in § 224.107(a)(2)(i) of the proposed rule is the most efficient and cost-effective method of implementing a nationwide reflectorization program, FRA recognizes the practical issues commenters raised regarding application of retroreflective material to rail cars at the time of the SCABT. FRA, however, does not believe that requiring all freight car owners to develop and implement individualized reflectorization plans would be an efficient method of implementing a nationwide reflectorization program. Accordingly, FRA has revised the proposed ''default'' schedule of § 224.107(a)(2)(i) to allow car owners and railroads a certain amount of flexibility as to when to apply retroreflective material to existing non-reflectorized freight cars. Specifically, this final rule requires that retroreflective sheeting be applied to existing non-reflectorized freight cars when, after May 31, 2005, the cars are (1) repainted or rebuilt, or (2) within nine months after the car first undergoes a SCABT as prescribed by 49 CFR 232.305, whichever occurs first. FRA believes that most every freight car will be taken out of service at some time at least once every nine months for either regularly scheduled maintenance or other necessary repairs. Allowing nine months after the SCABT to apply retroreflective material allows car owners and railroads to apply retroreflective material while a car is out of service for these other reasons (and while the car is at an appropriate repair facility), thereby eliminating the need to take a car out of service for the particular purpose of applying retroreflective material.

In paragraph (a)(2)(ii) of § 224.107 of this final rule FRA has retained the proposed rule's more flexible option of allowing freight car owners to effectively ''opt-out'' of the default schedule of § 224.107(a)(2)(i) and develop and implement their own schedule for reflectorization, provided certain milestones are met. In response to the concerns expressed by several commenters regarding the proposed information to be required in FRIPs, however, FRA has streamlined the reporting requirements for car owners who elect to follow this alternative and provided additional time from that proposed for car owners to develop and submit to FRA their individualized reflectorization plans. Specifically, in this final rule paragraph (a)(2)(ii) of § 224.107 provides that a freight car owner may elect not to follow paragraph (a)(2)(i)'s schedule if, by July 1, 2005, the owner submits to FRA an initial Reflectorization Implementation Compliance Report (Compliance Report). The Compliance Report must, at a minimum, (1) indicate how many freight cars subject to the final rule are in the owner's fleet at the time the Compliance Report is being prepared, and (2) contain the owner's certification that all freight cars in the identified fleet will be equipped with the appropriate retroreflective sheeting in conformance with the schedule set forth in Table 3 of the rule. Although FRA intends the schedule in Table 3 of this final rule to be consistent with that of the proposed rule, FRA has revised the language slightly to clarify FRA's intent. As proposed, § 224.107(a)(2)(ii) required that after the initial two years of the implementation period, at least an additional 10% of each owner's freight car fleet be reflectorized each year, until upon expiration of the 10-year implementation period, 100% of all domestically-owned freight cars would be equipped with retroreflective sheeting. In other words, as proposed, even if a car owner had reflectorized 70% of its car fleet by the end of year three, by the end of year four, the car owner would need to reflectorize at least another 10% of its fleet, and by the end of year five, the car owner would need to reflectorize at least another 10% of its fleet. In this scenario, because the car owner reflectorized ahead of schedule in the first three years, to comply with the proposed schedule, the owner would have to complete the reflectorization of its entire freight car fleet by the end of year six. This was not FRA's intent. Accordingly, FRA has revised the schedule for application for retroreflective material pursuant to this alternative schedule by setting forth a more general requirement that car owners meet certain minimum percentage milestones each year throughout the 10-year implementation period. For example, § 224.107(a)(2)(ii) of this final rule requires that as of May 31, 2007 (approximately two years after the effective date of this rule), owners reflectorizing their freight car fleets pursuant to this alternative schedule must have reflectorized at least 20% of their total fleet; by May 31, 2008 (approximately three years after the effective date of this rule), owners must have reflectorized at least 30% of their total fleet; by May 31, 2009 (approximately four years after the effective date of this rule), owners must have reflectorized at least 40% of their total fleet, until at the end of the 10-year implementation period (*i.e.*, May 31, 2015), 100% of the entire domestically owned freight car fleet is equipped with retroreflective material in accordance with the rule.

If a freight car owner elects the procedures of paragraph (a)(2)(ii) and submits a Compliance Report to FRA, the owner is thereafter responsible for meeting the percentage requirements of paragraph (a)(2)(ii) (Table 3) and the owner is responsible for submitting an updated Compliance Report to FRA by July 1st of each year throughout the 10-year implementation period. In keeping with the requirements of the Paperwork Reduction Act and the Government Paperwork Elimination Act, FRA anticipates providing car owners with the option of submitting Compliance Reports to FRA electronically.

If an owner fails to meet any of the minimum milestones set forth in Table 3 of this final rule, the car owner must report the failure in writing to FRA's Associate Administrator for Safety. Thereafter, the owner will be required to

comply with the schedule set forth in paragraph (a)(2)(i) and the owner must take any additional action necessary to bring cars under his or her ownership or control into compliance. In other words, if an owner fails to meet the minimum milestones set forth in Table 3 of this final rule, once this failure is identified, the owner will be required to equip each of the freight cars in the fleet subject to this rule with retroreflective sheeting within nine months of the cars' next SCABT (as required by § 224.107(a)(2)(i)) occurring after the end of the reporting period in which the failure occurred. The car owner, however, remains responsible for ensuring that each freight car in his or her fleet subject to this rule is equipped with retroreflective sheeting conforming to this rule by the end of the 10-year implementation period (*i.e.*, by May 31, 2015).

Existing cars already equipped with retroreflective sheeting as of publication date of final rule: Recognizing the voluntary efforts already underway by many railroads and car owners to reflectorize their freight car fleets, paragraph (a)(3) of proposed § 224.107 provided that freight cars equipped with at least one square foot of retroreflective material, uniformly distributed over the length of each car side, will be considered in compliance with this rule for ten years from the effective date of the final rule, provided that the sheeting was not engineering grade, super engineering grade (enclosed lens), or glass bead encapsulated type sheeting. As explained in the NPRM, FRA proposed a minimum requirement of one square foot of retroreflective sheeting per car side under this section because based on the information provided to FRA to date, it appears that one square foot per side is the minimum amount currently utilized in existing voluntary reflectorization programs. If these car owners were required to replace the retroreflective materials that they voluntarily installed to improve safety, it would have the effect of penalizing owners that demonstrated an extra level of safety consciousness. This would have the unintended effect of discouraging car owners from exploring innovative approaches to improving safety. As also explained in the NPRM, FRA proposed to exclude all engineering grade and glass bead encapsulated type retroreflective sheeting because such sheeting does not meet the minimum photometric performance requirements of § 224.103. Accordingly, as proposed, freight cars already equipped with engineering grade, super engineering grade, or glass bead encapsulated type retroreflective sheeting, or any other reflective material that is not retroreflective, would have to be brought into compliance with this part in accordance with § 224.107(a)(2). Because FRA received no comments directly related to this proposed freight car grandfathering provision, FRA has retained this provision substantially as proposed. The term ''unqualified retroreflective sheeting'' is discussed in more detail in the analysis of §§ 224.5 and 224.107 of this final rule.

Locomotives

Newly constructed locomotives: Paragraph (b)(1) of proposed § 224.107 required that retroreflective sheeting be applied to newly manufactured locomotives at the time of the locomotives' construction. This proposed requirement was intended to ensure that newly manufactured locomotives are equipped with the proper retroreflective material before being placed in service. In this final rule, we have clarified this intent by specifying in paragraph (b)(1) of this section that retroreflective sheeting must be applied to newly manufactured locomotives before the locomotives are placed in service.

Existing locomotives without retroreflective sheeting: Paragraph (b)(2) proposed to require that retroreflective sheeting be applied to existing unreflectorized locomotives (*i.e.*, locomotives that, as of the date of publication of the final rule, are not equipped with at least one square foot of retroreflective sheeting on each side) no later than the first biennial inspection performed pursuant to 49 CFR 229.29 occurring after the effective date of the final rule. Similar to the schedule FRA proposed for the application of retroreflective material to freight cars, FRA proposed this ''default'' schedule for locomotives in an attempt to achieve the most efficient and cost-effective implementation of a nationwide reflectorization program. FRA reasoned that by providing for the application of retroreflective sheeting when a locomotive is already out of service for the required biennial inspection, the entire U.S. locomotive fleet could be reflectorized well within the five-year implementation period and that locomotives would not incur any additional out of service time for the purpose of reflectorization.

In response to the proposed schedule for the reflectorization of locomotives, AAR noted that FRA's proposal to require existing non-reflectorized locomotives to be equipped with retroreflective material at the first biennial inspection after the effective date of the final rule, would effectively require that the entire locomotive fleet be equipped within two years. AAR, citing the fact that FRA's stated safety justification for requiring reflectorization rests on the number of grade crossing accidents involving motor vehicles striking trains after the first two units of train consists (*i.e.*, motor vehicles striking freight cars, not locomotives), asserted that ''[t]here is no safety justification for requiring locomotives to be reflectorized within two years when freight car owners are given ten years.'' Accordingly, AAR recommended that FRA require 40 percent of an owner's locomotive fleet be equipped with retroreflective sheeting within the first two years following the effective date of the final rule and 20 percent annually for the following three years.

As indicated by FRA's discussion of proposed § 224.107 in the NPRM (68 FR 62960), FRA's intent in the proposed rule was to ensure that the entire fleet of domestically-owned locomotives subject to this rule would be equipped with conforming retroreflective sheeting within five years of the effective date of the final rule. For practical reasons, however, FRA proposed to require that retroreflective sheeting be applied to locomotives at the time of the biennial inspection (*e.g.*, locomotives are already out of service for the inspection and located at an appropriate facility where application of retroreflective sheeting is feasible). FRA, however, is not opposed to allowing locomotive owners flexibility in deciding when to apply retroreflective material to existing non-reflectorized locomotives, provided owners inform FRA of their plan and agree to meet certain milestones designed to ensure that the entire domestically-owned locomotive fleet will be equipped with retroreflective material within five years. Accordingly, although this final rule retains the ''default'' schedule of proposed § 224.107(b)(2) (requiring that retroreflective sheeting be applied to existing non-reflectorized locomotives at the time of the first biennial inspection after the effective date of the rule), paragraph (b)(2)(ii) of § 224.107 in this final rule has been revised in a similar manner to paragraph (a)(2)(ii)'s freight car provision. Specifically, paragraph (b)(2)(ii) provides that locomotive owners may effectively ''opt-out'' of the default schedule of paragraph (b)(2)(i) and develop and implement their own schedule for reflectorization of their locomotive fleet, provided certain milestones are met. Paragraph (b)(2)(ii) now provides that a

locomotive owner may elect not to follow paragraph (b)(2)(i)'s schedule, if by July 1, 2005, the owner submits to FRA a Compliance Report that, at a minimum, (1) indicates how many locomotives subject to the final rule are in the owner's fleet at the time the Compliance Report is being prepared, and (2) contains the owner's certification that all locomotives in the identified fleet will be equipped with retroreflective sheeting in conformance with the schedule set forth in Table 4 of the rule. Table 4 requires that as of May 31, 2007 (approximately two years after the effective date of this rule), locomotive owners choosing to apply retroreflective material pursuant to this alternative schedule must have reflectorized at least 40% of their total locomotive fleet; by May 31, 2008 (approximately three years after the effective date of this rule), owners must have reflectorized 60% of their total locomotive fleet; by May 31, 2009 (approximately four years after the effective date of this rule), locomotive owners must have reflectorized 80% of their total locomotive fleet, until at the end of the five-year implementation period (*i.e.*, by May 31, 2010), 100% of the entire domestically-owned locomotive fleet is equipped with retroreflective material in accordance with the rule.

If a locomotive owner elects the procedures of paragraph (b)(2)(ii) and submits a Compliance Report to FRA, the owner is thereafter responsible for compliance with the plan and the owner is responsible for submitting an updated Compliance Report to FRA by July 1st of each year thereafter for the duration of the five-year implementation period. In keeping with the requirements of the Paperwork Reduction Act and the Government Paperwork Elimination Act, FRA anticipates providing locomotive owners with the option of submitting Compliance Reports to FRA electronically.

If a locomotive owner fails to meet any of the minimum milestones set forth in Table 4 of this final rule, the locomotive owner must report the failure in writing to FRA's Associate Administrator for Safety. Thereafter, the owner will be required to comply with the schedule set forth in paragraph (b)(2)(i) and the owner must take any additional action necessary to bring locomotives under his or her ownership or control into compliance. In other words, if an owner fails to meet any of the minimum milestones set forth in Table 4 of this final rule, once this failure is identified, the owner will be required to equip each of the locomotives in the fleet subject to this rule with retroreflective sheeting at the locomotive's next biennial inspection performed pursuant to 49 CFR 229.29 occurring after the end of the reporting period in which the failure occurred. The locomotive owner, however, remains responsible for ensuring that each freight car in his or her fleet subject to this rule is equipped with retroreflective sheeting conforming to this rule by the end of the five-year implementation period (*i.e.*, by May 31, 2010).

Existing locomotives already equipped with retroreflective sheeting as of the publication date of the final rule: Again, recognizing the voluntary efforts already underway by many locomotive owners to reflectorize their locomotive fleets, paragraph (b)(3) of proposed § 224.107 provided that locomotives equipped with at least one square foot of retroreflective sheeting, uniformly distributed over the length of each locomotive side, would be considered in compliance with this rule for five years from the effective date of the final rule, provided that the sheeting was not engineering grade, super engineering grade (enclosed lens), or glass bead encapsulated type sheeting. As explained in the NPRM, FRA proposed a minimum requirement of one square foot of retroreflective sheeting per locomotive side because based on the information provided to FRA to date, it appears that one square foot per side is the minimum amount currently utilized in existing voluntary reflectorization programs. If these locomotive owners were required to replace the retroreflective materials that they voluntarily installed to improve safety, it would have the effect of penalizing owners that demonstrated an extra level of safety consciousness and discouraging these owners from exploring innovative approaches to improving safety in the future. As also explained in the NPRM, FRA proposed to exclude all engineering grade and glass bead encapsulated type retroreflective sheeting because such sheeting does not meet the minimum photometric performance requirements of § 224.103. Accordingly, as proposed, locomotives already equipped with engineering grade, super engineering grade, or glass bead encapsulated type retroreflective sheeting, or any other reflective material that is not retroreflective, would have to be brought into compliance with this part in accordance with § 224.107(a)(2).

A few commenters, including AAR and CN, expressed the view that FRA's proposed locomotive grandfathering provision was too limited because it only encompassed ''diamond-grade'' material.[11] Specifically, CN noted that its fleet of locomotives in service in the United States, both new and recently repainted, is equipped with yellow stripes of ''high-intensity grade'' retroreflective material, approximately six inches wide, along the entire length of the locomotive side sills. Further, CN noted that on a typical seventy foot locomotive, this equates to approximately 32–35 square feet of retroreflective material per side. CN questioned FRA's rationale for excluding locomotives equipped with over 30 times the amount of required material from the grandfathering provision merely because the material is a different grade than that contemplated by FRA's proposal. Accordingly, CN recommended that the proposed rule's grandfathering provision for locomotives be revised to include locomotives with ''large areas of reflective material of lower grade spread along the entire length'' of the locomotive.

As explained above, FRA proposed to exclude all engineering grade and glass bead encapsulated type retroreflective sheeting from the grandfathering provision because the sheeting does not meet the minimum photometric performance requirements of the proposed rule. As detailed in the NPRM, however, FRA notes that research has consistently demonstrated that the larger the reflector area, the smaller the required SIA of the reflector. In other words, a larger amount of less-reflective material (material with a lower SIA) can be just as effective as a smaller amount of more-reflective material (material with a higher SIA). Based on the photometric performance requirements of engineering grade and glass bead encapsulated type retroreflective sheeting set forth in ASTM standard D 4956–01a, FRA estimates that approximately three square feet of these types of sheeting are necessary to achieve the effectiveness of one square foot of sheeting conforming to the minimum photometric performance requirements of this final rule.

[11] FRA notes that the term ''diamond-grade'' is a brand name referring to particular retroreflective products manufactured by 3M. FRA understands that ''diamond-grade'' is not a generic term referring to specific ASTM sheeting ''Types,'' nor is ''diamond-grade'' an accurate shorthand for the group of three categories of retroreflective sheeting that FRA specifically proposed to exclude from the locomotive grandfathering provision of § 224.107(b)(2) (*i.e.,* engineering grade, super engineering grade, or glass bead encapsulated sheeting). Nonetheless, FRA interprets AAR's and DN's comments as asserting that FRA's proposal to specifically exclude engineering grade, super engineering grade, and glass bead encapsulated sheeting from the locomotive grandfathering provision as too narrow.

Accordingly, paragraph (b)(3) of § 224.107 of this final rule has been revised to provide that locomotives equipped with at least three square feet of ''unqualified retroreflective sheeting'' will be considered in compliance with this rule through May 31, 2015 (approximately ten years from the effective date of the final rule).[12] As discussed in the analysis of § 224.5 above, the term ''unqualified retroreflective sheeting'' has been defined to include all engineering grade and glass bead encapsulated type retroreflective material (*i.e.*, the material FRA previously excluded from the FRA's proposed locomotive grandfathering provision), as well as ''high-intensity'' type sheeting as described in ASTM standard D 4956–01a (*i.e.*, ASTM Type I, II, III, or IV).[13]

Although this final rule requires that most railroads equip all their locomotives subject to this rule with conforming retroreflective sheeting within five years of the effective date of the rule, paragraph (b)(4) of § 224.107, which has not changed from that proposed in the NPRM, provides that certain small railroads may take an additional five years to bring their locomotive fleets into compliance with the rule. Specifically, paragraph (b)(4) provides that railroads with fewer than 400,000 annual employee work hours that do not share locomotive power with a railroad with 400,000 or more annual employee work hours may take up to ten years to bring their locomotive fleets into compliance with the rule. This alternate compliance date is intended to apply only to a limited number of small railroads whose operations would justify the continued use of unreflectorized locomotives (*i.e.*, those small railroad operations that do not typically involve locomotives providing ''distributed power'' or otherwise moving unilluminated in the middle of train consists).

[12] FRA notes that it has revised the grandfather provision of § 224.107(b)(3) to provide that locomotives grandfathered under the final rule will be considerred in compliance with the rule for ten years, consistent with the grandfather provision of § 224.107(a)(3) for freight cars.

[13] FRA notes that the proposed rule did not specifically exclude ''high-intensity'' type retroreflective sheeting (ASTM Type IV sheeting), but because high-intensity type sheeting, like all engineering grade sheeting and glass bead encapsulated type sheeting, will not meet the minimum photometric performance standards of this rule, it is necessary for locomotives to be equipped with more than one square foot of ''high-intensity'' material in order to achieve the effectiveness of one square foot of sheeting conforming to the minimum photometric performance requirements of this rule.

Section 224.109 Inspection, Repair, and Replacement

As it did in the NPRM, this section of the final rule sets forth the requirements for the periodic inspection and maintenance of retroreflective material on freight rolling stock. Paragraph (a) of proposed § 224.109 required that retroreflective sheeting on freight cars subject to this part be visually inspected for presence and condition whenever a car underwent a single car air brake test required under 49 CFR 232.305. Likewise, paragraph (b) of proposed § 224.109 required that retroreflective sheeting on locomotives subject to this part be visually inspected for presence and condition whenever the locomotive underwent an annual inspection required under 49 CFR 229.27. Both paragraphs (a) and (b) proposed that, if, upon inspection, more than 20 percent of the amount of sheeting required on either side of the car or locomotive under § 224.105 is found to be ''damaged, obscured, or missing,'' that ''damaged, obscured, or missing'' sheeting must be replaced.

A few commenters, including AAR, NAFCA, and RSI, noted that the term ''damaged'' was not defined in the proposed rule. These commenters indicated that FRA's intent in including the undefined term ''damaged'' as a maintenance standard in § 224.109 was unclear and that the term itself only added confusion to the inspection requirement. Accordingly, these commenters recommended that the term ''damaged'' be deleted from the rule. FRA recognizes the concerns of these commenters regarding the undefined term. Nonetheless, FRA believes that the term ''damaged'' is necessary to accurately describe a situation in which maintenance of retroreflective material would be required. Accordingly, as discussed in the analysis of § 224.5 above, FRA has included a definition for the term ''damaged'' in this final rule.

Commenters also noted that there may be circumstances in which retroreflective material is damaged or obscured, but the material can be repaired instead of replaced. FRA agrees with commenters on this point, and the agency has accordingly revised § 224.109 to allow for the repair or replacement, as appropriate, of material requiring maintenance.

Several commenters also expressed the view that although it is appropriate to require that retroreflective material be inspected at the SCABT, for the same reasons that it is not appropriate to require the installation of retroreflective material at the SCABT (detailed in the discussion of § 224.107 above), it is also not appropriate to require that maintenance be performed on the retroreflective material at the SCABT. Accordingly, AAR recommended that car owners be afforded nine months after the SCABT in which to perform any necessary maintenance on retroreflective material. NAFCA, on the other hand, asserted that car owners should be allowed at least 12 months after the SCABT to correct any identified deficiencies in retroreflective material. In support of its recommendation, NAFCA noted that private car operators (shippers) typically obligate themselves to acquire and ship commodities as much as a year in advance. NAFCA also noted that unlike the typical railroads, private car operators seldom size excess capacity into their fleets. Notwithstanding NAFCA's comments, as explained in the discussion of § 224.107 above, FRA believes that almost every freight car will be taken out of service at least once every nine months for either regularly scheduled maintenance or other necessary repairs. Allowing nine months after the SCABT to repair or replace any retroreflective material requiring maintenance under this rule allows car owners and railroads to apply the material while a car is out of service for these other reasons (and while the car is at an appropriate repair facility), therefore eliminating the need to take a car out of service for the particular purpose of repairing or replacing retroreflective material in need of maintenance. Accordingly, § 224.109 of this final rule retains the proposed rule's requirement that retroreflective sheeting on freight cars be visually inspected for presence and condition whenever a car undergoes a SCABT. FRA has revised this section to require the railroad or contractor performing the SCABT to inspect the car for presence and condition of the required retroreflective material. If the inspecting railroad or contractor determines that maintenance is necessary under this rule, the railroad or contractor is required to promptly notify the car owner of the missing, damaged, or obscured sheeting, and car owners are afforded nine months from the date they are notified of the defective condition of the material to properly repair or replace the material.

A few commenters also asserted that the 20% maintenance threshold of proposed § 224.109 was impractical and arbitrary. These commenters suggested that a 50% maintenance threshold would be more appropriate. For example, RSI commented that the 20 percent standard ''is too hard to judge

in a railroad environment'' and NAFCA commented that the 20 percent maintenance threshold ''may result in a greater degree of car reflectorization than is necessary to accomplish the purpose'' of the rule. Further, AAR, in its comments, noted that at the January 2004 hearing, a representative of FRA stated that in order to account for the effects of dirt and damage, the proposed rule required twice the amount of material than research demonstrated was necessary to provide adequate reflectorization. (*See* Hearing Transcript, p. 124). FRA realizes, however, that the hearing officer inadvertently misstated the exact technical requirements of the rule in this regard. As noted in the discussion of § 224.106 above and detailed in the NPRM (68 FR at 62956), FRA's proposed rule required only approximately 30% more material (about 1 additional square foot on each side of most typically-sized freight rolling stock). By requiring 30% more retroreflective material than necessary, if less than 20% of that material is damaged, obscured, or missing, the remaining reflective material could still provide sufficient reflectivity, even if further damage occurred before maintenance was performed on the material. If maintenance was not performed until 50% of the retroreflective material is damaged, obscured, or missing, it would be necessary to repair or replace the material immediately or else the reflective material would fail to meet even the minimum performance requirements of this rule. Accordingly, this final rule retains the proposed 20% maintenance threshold.

Section 224.111 Renewal

As proposed in the NPRM, this section of the final rule requires that all retroreflective sheeting required under this part be replaced with new conforming sheeting, regardless of its condition, no later than ten years after the date of initial installation. As explained in the NPRM, this 10-year renewal period is based on most manufacturers' stated useful life of retroreflective material. As noted in the NPRM, however, FRA will monitor the retroreflective qualities of various fleet segments over time and may extend the ten-year interval, if warranted. One commenter, RSI, responded to the proposed renewal period by expressing the view that given the typical 50-year life of a freight car, it is not practical to require the replacement of the tape every ten years. Specifically, RSI asserted that ''[t]he cost of removing the old tape, preparing the surface, and replacing the tape was not included in FRA's cost analysis. * * * Different cars may require different technologies to remove the tape adding to the costs associated with the NPRM.'' As proposed and as noted in § 224.107 of this final rule, it is not necessary to remove old reflective material when applying new retroreflective material pursuant to this part, thus the costs for the re-application of material after the initial ten-year implementation of this rule will be no greater than the original application.

AAR, however, noted one ambiguity in § 224.111 as proposed. Specifically, AAR noted that proposed § 224.107(a)(3) provided that a car with complying retroreflective sheeting would be considered in compliance with this rule for ten years and similarly, proposed § 224.107(b)(3) provided that locomotives already equipped with reflectorization material meeting FRA's grandfathering requirements would be considered in compliance with this rule for five years. AAR noted, however, that because proposed § 224.111 provided that retroreflective sheeting must be replaced ten years after the date of initial installation, the section could be read as taking precedence over proposed §§ 224.107(a)(3) and (b)(3), thereby requiring the application of retroreflective material to freight rolling stock already equipped with reflective sheeting as of the effective date of the final rule prior to the expiration of a ten-year period. FRA agrees with AAR's concern in this regard and because FRA does not intend that § 224.111 take precedence over §§ 224.107(a)(3) and (b)(3), FRA has revised § 224.111 to make clear that the effective date of the final rule will be considered the initial date of installation for freight cars and locomotives covered by §§ 224.107(a)(3) and (b)(3).

Regulatory Impact and Notices

A. Executive Order 12866 and DOT Regulatory Policies and Procedures

The FRA has conducted a Regulatory Analysis of this final rule in accordance with Executive Order 12866. This document estimates the costs and consequences of the rule as well as its anticipated economic and safety benefits. A copy of this document has been placed in the docket for this rulemaking. Following is a summary of the findings.

The FRA's analysis examines the potential for reflective material to cost-effectively reduce fatalities and injuries due to motorists not seeing trains. Over the past ten years, an average of 23 percent of reported grade crossing accidents involved a motor vehicle striking the side of a train that was occupying the crossing (known as ''run-into-train'' or RIT accidents).

There are currently no requirements for lighting or for reflective markings on the sides of freight cars. Research, however, has established that reflectors on the sides of rail cars can make trains more visible to motorists. Reflective tape increases the conspicuity of freight cars so motorists can identify them and better judge their speed and distance. This greater visibility will help drivers avoid some accidents and reduce the severity of other accidents that are unavoidable.

The primary source of societal benefits from freight car reflectorization would result from the avoidance of a portion of the fatalities, injuries, and property damage that result from RIT accidents. Benefits were calculated in terms of the decline in the probability of certain accidents. These calculations were based on 1999–2002 RIT accidents as reported in the FRA's Rail Accident/Incident Reporting System (''RAIRS'') database. The FRA specifically used recent data to account for changes in crossing characteristics, including the upgrading of crossing warning devices. The following table shows the number of accidents, fatalities, and injuries resulting from the applicable RIT accidents:

REFLECTORIZATION BENEFIT POOL

[RIT accident subset]

	1999–2002	Annual Average
Accidents	782	195.5
Fatalities:	85	21.25
Injuries	348	87

The table below presents the estimated twenty-year monetary costs associated with complying with the requirements contained in this final rule, at a discount rate of 7%. In addition to the costs associated with reflectorizing the fleet of freight railcars, the FRA has included the costs associated with reflectorizing the approximately 20% of the locomotive fleet that has not already been treated with reflective materials.

TOTAL TWENTY-YEAR COSTS (NPV, 7%)

Installation on new or re-painted railcars	$52,862,702
Maintenance on preexisting reflectorized railcars	1,995,895
Maintenance on newly reflectorized cars	3,539,885
Reapplication on older cars ..	14,762,187

TOTAL TWENTY-YEAR COSTS (NPV, 7%)—Continued

Installation and maintenance on locomotive fleet	1,375,161
Total Costs	74,535,830

Taking into consideration the material, installation, and maintenance costs, FRA's analysis determines that over a 20-year period, the discounted cost to reflectorize the entire freight railroad fleet would be about $74.5 million.

The FRA recognizes that the effectiveness of retroreflectors and, therefore, the benefits to be gained from their use, will vary by circumstances (*e.g.* nighttime versus daytime conditions, clear versus cloudy weather, presence of other warning devices at the crossings, train speed and length, etc.). Thus, the forecasting of the benefits that would likely result from reflectorization requires the exercise of judgment and necessarily includes subjective elements. Accordingly, the FRA employed three completely separate approaches to the estimation of benefits. Benefit estimates were based on varying effectiveness rates derived from (1) Subjective estimates of reflector effectiveness by internal FRA grade crossing experts, (2) a signal detection model consisting of an analysis of the statistical probability of different potential severities of hazard or injury and based on both laboratory experiments and data from FRA's RAIRS database, and (3) previous studies analyzing the effectiveness of reflective materials on large trucks. The FRA estimates the twenty-year discounted benefits of a railcar reflectorization program (discounted at a rate of 7%), in terms of avoided casualties and property damage, to be in the range of $202 million, $151 million, or $220 million, depending on the method employed. In addition, the twenty-year discounted benefits of reflectorizing the 20% of the locomotive fleet that is not already reflectorized is approximately $837,749.53.

TOTAL TWENTY-YEAR SAFETY BENEFITS MONETIZED (NPV, 7%)

Grade Crossing Expert Benefits	$202,072,296
Signal Detection Theory	151,422,826
NHTSA Study.	223,137,643

Accordingly, the FRA concludes that the reflectorization of railroad freight equipment is a cost-effective way to reduce the number of accidents at highway-rail grade crossings as well as the resultant casualties and property damages.

B. Regulatory Flexibility Act of 1980 and Executive Order 13272

The Regulatory Flexibility Act of 1980 (5 U.S.C. 601–612) requires a review of final rules to assess their impact on small entities unless the Secretary certifies that a final rule will not have a significant economic impact on a substantial number of small entities. FRA has conducted a regulatory flexibility analysis of this final rule's impact on small entities, and the assessment has been placed in the public docket for this proceeding. FRA's analysis concluded that this final rule would not have a significant economic impact on a substantial number of small entities, and accordingly, FRA certifies that this rule will not have a significant economic impact on a substantial number of small entities.

C. Paperwork Reduction Act of 1995

The information collection requirements in this final rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 *et seq*. The sections that contain the new information collection requirements and the estimated time to fulfill each requirement are as follows:

CFR section	Respondent universe	Total annual responses	Average time per response	Total annual burden hours	Total annual burden cost ($)
224.7—Waivers	685 Railroads/Car Owners	10 petitions	1 hour	20	740
224.15—Special Approval Procedures—Petitions.	3 Manufacturers	10 petitions	40 hours	400	20,560
—Public Comment	3 Manufacturers/Railroads	5 comments	1 hour	5	185
224.107—Implementation Schedule: Freight Cars.					
—Existing Freight Cars w/o Retroreflective Sheeting.	685 Railroads/Car Owners	400 Reports/Forms	15 minutes	100	3,700
—Updated Reflectorization Compliance Reports.	685 Railroads/Car Owners	400 Reports/Forms	20 hours	8,000	296,000
—Failure Reports	685 Railroads/Car Owners	5 Failure Reports	2 hours	10	370
—Existing Cars with Retroreflective Sheeting.	685 Railroads/Car Owners	172 Reports/Forms	20 hours	3,440	127,280
Implementation Schedule: Locomotives					
—Existing Locomotives w/o Retroreflective Sheeting.	685 Railroads/Car Owners	35 Reports/Forms	15 minutes	9	333
—Updated Reflectorization Compliance Reports.	685 Railroads/Car Owners	35 Reports/Forms	3 hours	105	3,885
—Failure Reports	685 Railroads/Car Owners	1 Failure Report	2 hours	2	74
—Existing Locomotives with Retroreflective Sheeting.	685 Railroads/Car Owners	617 Reports/Forms	4 hours	2,468	91,316
224.109—Inspection, Repair, Replacement—Freight Cars.	AAR + 300 Car Shops	240,000 Notifications	10 minutes	40,000	1,560,000
—Locomotives: Records of Restriction.	22,800 Locomotives	4,560 records	3 minutes	228	10,488

All estimates include the time for reviewing instructions; searching existing data sources; gathering or maintaining the needed data; and reviewing the information. For information or a copy of the paperwork package submitted to OMB, contact Robert Brogan at 202–493–6292.

OMB is required to make a decision concerning the collection of information requirements contained in this interim final rule between 30 and 60 days after

publication of this document in the **Federal Register**.

FRA cannot impose a penalty on persons for violating information collection requirements which do not display a current OMB control number, if required. FRA intends to obtain current OMB control numbers for any new information collection requirements resulting from this rulemaking action prior to the effective date of this final rule. The OMB control number, when assigned, will be announced by separate notice in the **Federal Register**.

D. Federalism Implications

Executive Order 13132, entitled ''Federalism,'' issued on August 4, 1999, requires that each agency ''in a separately identified portion of the preamble to the regulation as it is to be issued in the **Federal Register**, provide to the Director of the Office of Management and Budget a federalism summary impact statement, which consists of a description of the extent of the agency's prior consultation with State and local officials, a summary of the nature of their concerns and the agency's position supporting the need to issue the regulation, and a statement of the extent to which the concerns of State and local officials have been met.'' FRA believes it is in compliance with Executive Order 13132. This final rule will not have a substantial effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. This final rule will not have federalism implications that impose substantial direct compliance costs on State and local governments.

In addition, FRA notes that the public docket in this proceeding has been open for over four years. Virtually all comments received from State and local governments support a federal reflectorization requirement.

Under 49 U.S.C. 20106, issuance of this regulation preempts any State law, rule, regulation, order, or standard covering the same subject matter, except a provision to eliminate or reduce an essentially local safety hazard, that is not incompatible with Federal law or regulation and does not unreasonably burden interstate commerce. (*See* discussion in the section-by-section analysis of § 224.13).

E. Environmental Impact

FRA has evaluated this final rule in accordance with its ''Procedures for Considering Environmental Impacts'' (FRA's Procedures) (64 FR 28545, May 26, 1999) as required by the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*), other environmental statutes, Executive Orders, and related regulatory requirements. FRA has determined that this final rule is not a major FRA action (requiring the preparation of an environmental impact statement or environmental assessment) because it is categorically excluded from detailed environmental review pursuant to section 4(c) of FRA's Procedures. 64 FR 28547, May 26, 1999. Section 4(c) of FRA's Procedures identifies twenty classes of FRA actions that are categorically excluded from the requirements for conducting a detailed environmental review. FRA further considered this final rule in accordance with section 4(c) and (e) of FRA's Procedures to determine if extraordinary circumstances exist with respect to this final rule that might trigger the need for a more detailed environmental review. After conducting this review, FRA has determined that extraordinary circumstances do not exist that might trigger the need for a more detailed environmental review. As a result, FRA finds that this regulation is not a major Federal action significantly affecting the quality of the human environment.

F. Unfunded Mandates Reform Act of 1995

Pursuant to Section 201 of the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4, 2 U.S.C. 1531), each Federal agency ''shall, unless otherwise prohibited by law, assess the effects of Federal regulatory actions on State, local, and tribal governments, and the private sector (other than to the extent that such regulations incorporate requirements specifically set forth in law).'' Section 202 of the Act (2 U.S.C. 1532) further requires that ''before promulgating any general notice of proposed rulemaking that is likely to result in the promulgation of any rule that includes any Federal mandate that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $120,700,000 or more (as adjusted for inflation) in any 1 year, and before promulgating any final rule for which a general notice of proposed rulemaking was published, the agency shall prepare a written statement'' detailing the effect on State, local, and tribal governments and the private sector. This proposed rule will not result in the expenditure, in the aggregate, of $120,700,000 or more in any one year, and thus preparation of such a statement is not required.

G. Energy Impact

Executive Order 13211 requires Federal agencies to prepare a Statement of Energy Effects for any ''significant energy action.'' 66 FR 28355, May 22, 2001. Under the Executive Order, a ''significant energy action'' is defined as any action by an agency (normally published in the **Federal Register**) that promulgates or is expected to lead to the promulgation of a final rule or regulation, including notices of inquiry, advance notices of proposed rulemaking, and notices of proposed rulemaking: (1)(i) That is a significant regulatory action under Executive Order 12866 or any successor order, and (ii) that is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) that is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action. FRA has evaluated this final rule in accordance with Executive Order 13211. FRA has determined that this final rule is not likely to have a significant adverse effect on the supply, distribution, or use of energy. Consequently, FRA has determined that this regulatory action is not a ''significant energy action'' within the meaning of Executive Order 13211.

H. Privacy Act

Anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, *etc.*). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78) or you may visit *http://dms.dot.gov.*

List of Subjects in 49 CFR Part 224

Incorporation by reference, Penalties, Railroad locomotive safety, Railroad safety, and Reporting and recordkeeping requirements.

The Rule

■ In consideration of the foregoing, FRA amends chapter II, subtitle B, of title 49, Code of Federal Regulations to add part 224 as follows:

PART 224—REFLECTORIZATION OF RAIL FREIGHT ROLLING STOCK

Subpart A—General

Sec.

Authority: 49 U.S.C. 20103, 20107, 20148 and 21301; 28 U.S.C. 2461; and 49 CFR 1.49.

Subpart A—General

§ 224.1 Purpose and scope.

(a) The purpose of this part is to reduce highway-rail grade crossing accidents and deaths, injuries, and property damage resulting from those accidents, by enhancing the conspicuity of rail freight rolling stock so as to increase its detectability by motor vehicle operators at night and under conditions of poor visibility.

(b) In order to achieve cost-effective mitigation of collision risk at highway-rail grade crossings, this part establishes the duties of freight rolling stock owners (including those who manage maintenance of freight rolling stock, supply freight rolling stock for transportation, or offer freight rolling stock in transportation) and railroads to progressively apply retroreflective material to freight rolling stock, and to periodically inspect and maintain that material. Freight rolling stock owners, however, are under no duty to install, clean or otherwise maintain, or repair reflective material except as specified in this part.

(c) This part establishes a schedule for the application of retroreflective material to rail freight rolling stock and prescribes standards for the application, inspection, and maintenance of retroreflective material to rail freight rolling stock for the purpose of enhancing its detectability at highway-rail grade crossings. This part does not restrict a freight rolling stock owner or railroad from applying retroreflective material to freight rolling stock for other purposes if not inconsistent with the recognizable pattern required by this part.

§ 224.3 Applicability.

This part applies to all railroad freight cars and locomotives that operate over a public or private highway-rail grade crossing and are used for revenue or work train service, except:

(a) Freight rolling stock that operates only on track inside an installation that is not part of the general railroad system of transportation;

(b) Rapid transit operations in an urban area that are not connected to the general railroad system of transportation; or

(c) Locomotives and passenger cars used exclusively in passenger service.

§ 224.5 Definitions.

Administrator means the Administrator of the Federal Railroad Administration or the Administrator's delegate.

Associate Administrator means the Associate Administrator for Safety, Federal Railroad Administration, or the Associate Administrator's delegate.

Damaged means scratched, broken, chipped, peeled, or delaminated.

Flat car means a car having a flat floor or deck on the underframe with no sides, ends or roof (including spine cars, articulated and mult-unit intermodal cars).

Freight rolling stock means:

(1) Any locomotive subject to part 229 of this chapter used to haul or switch freight cars (whether in revenue or work train service); and

(2) Any railroad freight car subject to part 215 of this chapter (including a car stenciled MW pursuant to § 215.305).

Freight rolling stock owner means any person who owns freight rolling stock, is a lessee of freight rolling stock, manages the maintenance or use of freight rolling stock on behalf of an owner or one or more lessors or lessees, or otherwise controls the maintenance or use of freight rolling stock.

Locomotive has the meaning assigned by § 229.5 of this chapter, but for purposes of this part applies only to a locomotive used in the transportation of freight or the operation of a work train.

Obscured means concealed or hidden (*i.e.*, covered up, as where a layer of paint or dense chemical residue blocks all incoming light); this term does not refer to ordinary accumulations of dirt, grime, or ice resulting from the normal railroad operating environment.

Person means an entity of any type covered under 1 U.S.C. 1, including but not limited to the following: A railroad; a manager, supervisor, official, or other employee or agent of a railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track or facilities; any independent contractor providing goods or services to a railroad; and any employee of such an owner, manufacturer, lessor, lessee, or independent contractor.

Railroad means all forms of non-highway ground transportation that run on rails or electromagnetic guideways, including high speed ground transportation systems that connect metropolitan areas, without regard to whether they use new technologies not associated with traditional railroads.

Railroad freight car has the meaning assigned by § 215.5 of this chapter.

Tank car means a rail car, the body of which consists of a tank for transporting liquids.

Unqualified retroreflective sheeting means engineering grade sheeting, super engineering grade sheeting (enclosed lens) or high-intensity type sheeting (ASTM Type I, II, III, or IV Sheeting) as described in ASTM International Standard D–4956–01a, ''Standard Specification for Retroreflective Sheeting for Traffic Control.''

Work train means a non-revenue service train used for the maintenance and upkeep service of the railroad.

§ 224.7 Waivers.

(a) Any person subject to a requirement of this part may petition the Administrator for a waiver of compliance with such requirement. The filing of such a petition does not affect that person's responsibility for compliance with that requirement while the petition is being considered.

(b) Each petition for waiver under this section shall be filed in the manner and contain the information required by part 211 of this chapter.

(c) If the Administrator finds that a waiver of compliance is in the public interest and is consistent with railroad safety, the Administrator may grant the waiver subject to any conditions that the Administrator deems necessary.

§ 224.9 Responsibility for compliance.

(a) Freight rolling stock owners, railroads, and (with respect to certification of material) manufacturers of retroreflective material, are primarily responsible for compliance with this part. However, any person that performs any function or task required by this part (including any employee, agent, or contractor of the aforementioned), must perform that function in accordance with this part.

(b) Any person performing any function or task required by this part shall be deemed to have consented to FRA inspection of the person's facilities and records to the extent necessary to determine whether the function or task is being performed in accordance with the requirements of this part.

§ 224.11 Penalties.

(a) Any person (including but not limited to a railroad; any manager,

supervisor, official, or other employee or agent of a railroad; any owner, manufacturer, lessor, or lessee of railroad equipment, track, or facilities; and any employee of such owner, manufacturer, lessor, lessee, or independent contractor) who violates any requirement of this part or causes the violation of any such requirement is subject to a civil penalty of at least $550, but not more than $11,000 per violation, except that: Penalties may be assessed against individuals only for willful violations, and, where a grossly negligent violation or a pattern of repeated violations has created an imminent hazard of death or injury to persons, or has caused death or injury, a penalty not to exceed $27,000 per violation may be assessed. Each day a violation continues shall constitute a separate offense. Appendix A to this part contains a schedule of civil penalty amounts used in connection with this part.

(b) Any person who knowingly and willfully falsifies a record or report required by this part is subject to criminal penalties under 49 U.S.C. 21311.

§ 224.13 Preemptive effect.

Under 49 U.S.C. 20106, issuance of this part preempts any State law, rule, regulation, or order covering the same subject matter, except an additional or more stringent law, rule, regulation, or order that is necessary to eliminate or reduce an essentially local safety hazard; that is not incompatible with a law, rule, regulation, or order of the United States Government; and that does not unreasonably burden interstate commerce.

§ 224.15 Special approval procedures.

(a) *General.* The following procedures govern consideration and action upon requests for special approval of alternative standards under § 224.103(e).

(b) *Petitions.* (1) Each petition for special approval of an alternative standard shall contain—

(i) The name, title, address, and telephone number of the primary person to be contacted with regard to the petition;

(ii) The alternative proposed, in detail, to be substituted for the particular requirements of this part; and

(iii) Appropriate data and analysis establishing that the alternative will provide at least an equivalent level of safety and meet the requirements of § 224.103(e).

(2) Three copies of each petition for special approval of an alternative standard shall be submitted to the Docket Clerk, Office of Chief Counsel, Federal Railroad Administration, RCC–10, Mail Stop 10, 1120 Vermont Ave., NW., Washington, DC 20590.

(c) *Notice.* FRA will publish a notice in the **Federal Register** concerning each petition under paragraph (b) of this section.

(d) *Public comment.* FRA will provide a period of not less than 30 days from the date of publication of the notice in the **Federal Register** during which any person may comment on the petition.

(1) Each comment shall set forth specifically the basis upon which it is made, and contain a concise statement of the interest of the commenter in the proceeding.

(2) Each comment shall be submitted to the DOT Central Docket Management System, Nassif Building, Room Pl–401, 400 Seventh Street, SW., Washington, DC 20590, and shall contain the assigned docket number which appears in the **Federal Register** for that proceeding. Such submission may be in written or electronic form consistent with the standards and requirements established by the Central Docket Management System and posted on its Web site at *http://dms.dot.gov.*

(3) In the event FRA determines that it requires additional information to appropriately consider the petition, FRA will conduct a hearing on the petition in accordance with the procedures provided in § 211.25 of this chapter.

(e) *Disposition of petitions.* (1) If FRA finds that the petition complies with the requirements of this section and that the proposed alternative standard is acceptable or changes are justified, or both, the petition will be granted, normally within 90 days of its receipt. The Associate Administrator may determine the applicability of other technical requirements of this part when rendering a decision on the petition. If the petition is neither granted nor denied within 90 days, the petition remains pending for decision. FRA may attach special conditions to the approval of the petition. Following the approval of a petition, FRA may reopen consideration of the petition for cause stated.

(2) If FRA finds that the petition does not comply with the requirements of this section, or that the proposed alternative standard is not acceptable or that the proposed changes are not justified, or both, the petition will be denied, normally within 90 days of its receipt.

(3) When FRA grants or denies a petition, or reopens consideration of a petition, written notice is sent to the petitioner and other interested parties and a copy of the notice is placed in the electronic docket of the proceeding.

Subpart B—Application, Inspection, and Maintenance of Retroreflective Material

§ 224.101 General requirements.

All rail freight rolling stock subject to this part shall be equipped with retroreflective sheeting that conforms to the requirements of this part. Notwithstanding any other provision of this chapter, the application, inspection, and maintenance of that sheeting shall be conducted in accordance with this subpart or in accordance with an alternative standard providing at least an equivalent level of safety after special approval of FRA under § 224.15.

§ 224.103 Characteristics of retroreflective sheeting.

(a) *Construction.* Retroreflective sheeting applied pursuant to this part shall consist of a smooth, flat, transparent exterior film with microprismatic retroreflective elements embedded in or suspended beneath the film so as to form a non-exposed retroreflective optical system.

(b) *Color.* Retroreflective sheeting applied pursuant to this part shall be yellow or white as specified by the chromaticity coordinates of ASTM International's Standard D 4956–01a, ''Standard Specification for Retroreflective Sheeting for Traffic Control.'' The Director of the Federal Register approves the incorporation by reference of this standard in this section in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. You may obtain a copy of the incorporated standard from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428–2959. You may inspect a copy of the incorporated standard at the Federal Railroad Administration, Docket Clerk, 1120 Vermont Ave., NW., Suite 7000, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202–741–6030, or go to *http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.*

(c) *Performance.* Retroreflective sheeting applied pursuant to this part shall meet the requirements of ASTM D 4956–01a, for Type V Sheeting, except for the photometric requirements, and shall, as initially applied, meet the minimum photometric performance requirements specified in Table 1 of this subpart.

TABLE 1 OF SUBPART B.—MINIMUM PHOTOMETRIC PERFORMANCE (COEFFICIENT OF RETROREFLECTION (R_A) IN CANDELA/LUX/METER^2) REQUIREMENT FOR RETROREFLECTIVE SHEETING

Entrance angle	Observation angle			
	0.2 Degree		0.5 Degree	
	Yellow	White	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) of this section 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 that meets 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. Retroreflective sheeting applied under this part 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 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
50 ft. to 60 ft	4	5
Over 60 ft. to 70 ft	4.5	5.5
Over 70 ft. to 80 ft	5	6
Over 80 ft. to 90 ft	5.5	7
Over 90 ft. to 100 ft[1]	6	7.5

[1] Freight cars or locomotives over 100 ft. in length must be equipped with an additional one-half 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 approved 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 an industry standard is not proffered, or is not approved 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, a 4x18 inch strip of retroreflective sheeting may be separated into two 4x9 inch strips, or a 4x36 inch strip may be separated into four 4x9 inch strips, and applied on either side of the appurtenance, discontinuous surface, or car markings or stencils.

(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. *See* Figures 1, 2, and 3.

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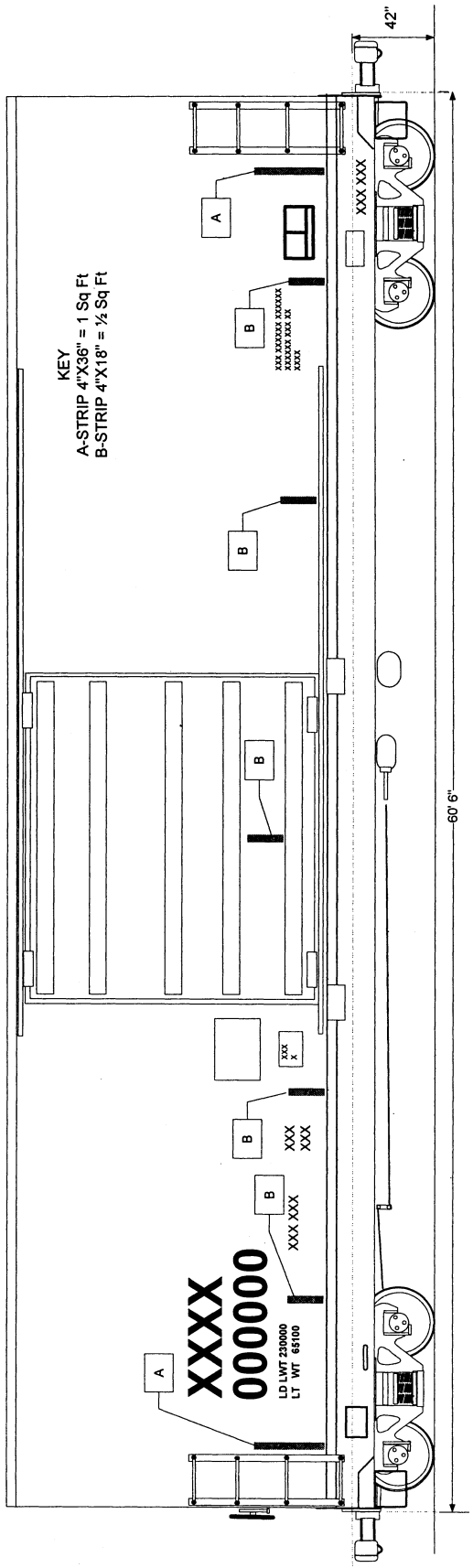

Figure 1
Yellow vertical reflective sheeting (4.5 sq. ft.) pattern applied to a typical 60' 6" Box Car (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow)

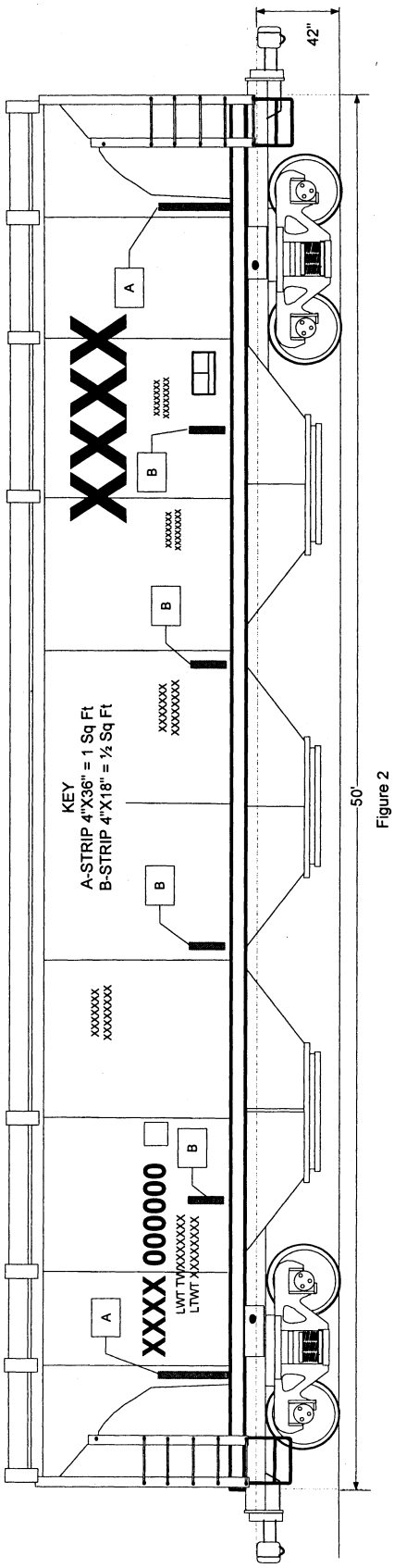

Figure 2
Yellow vertical reflective sheeting (4.0 sq. ft.) pattern applied to a typical 50 feet Covered Hopper Car (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow)

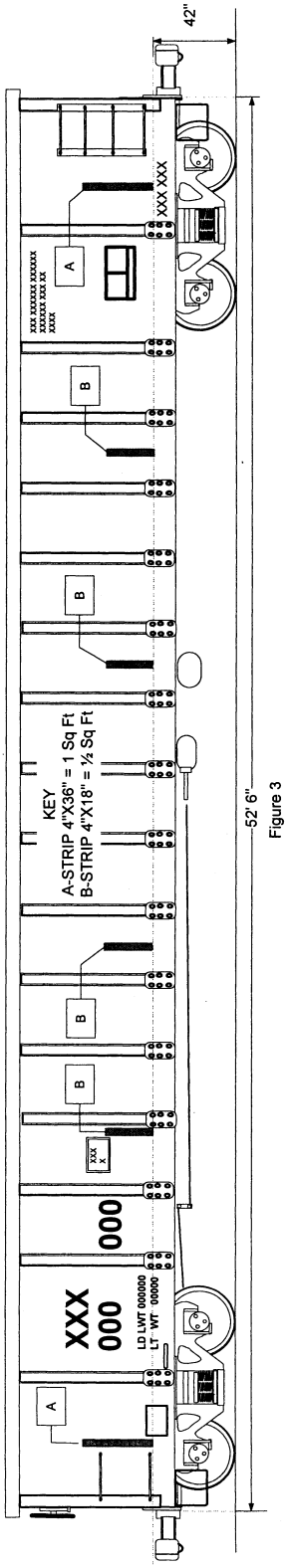

Figure 3
Yellow vertical reflective sheeting (4.0 sq. ft.) pattern applied to a typical 52' 6" Gondola Car (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow

(ii) *Horizontal application.* If retroreflective sheeting is applied in a horizontal pattern, at least two 4x18 inch strips, one above the other, shall be applied as close to each end of the car as practicable. Between these two end strips, a minimum of one 4x18 inch strip shall be applied at least every 12 feet. *See* Figures 4, 5, and 6.

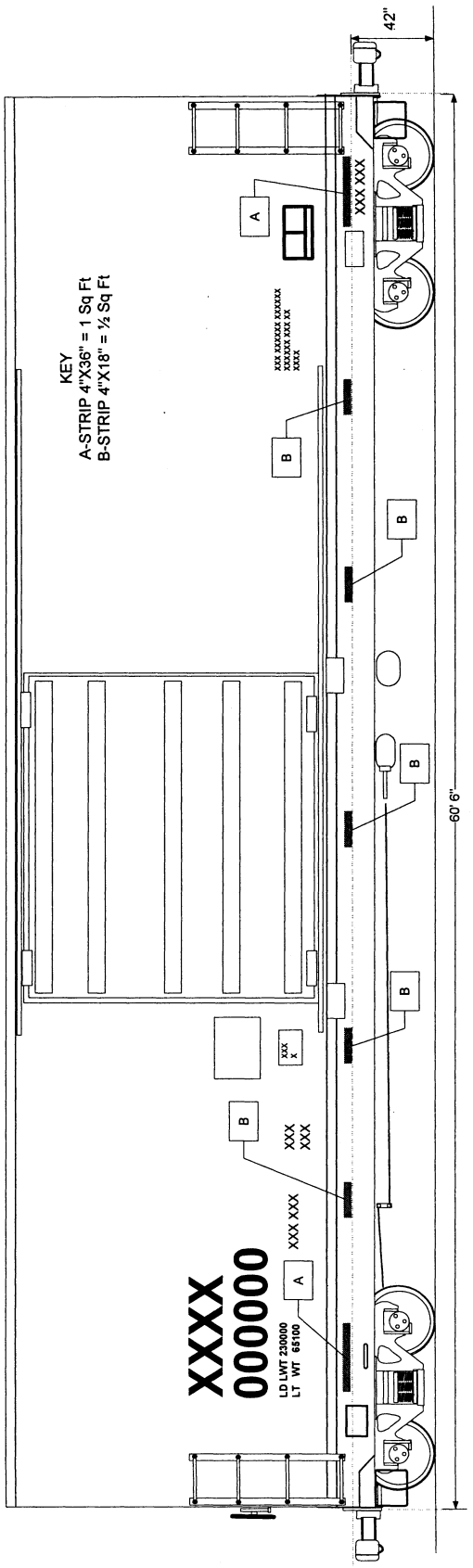

Figure 4
Alternate Pattern
Yellow horizontal reflective sheeting (4.5 sq. ft.) pattern applied to a typical 60' 6" Box Car (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow)

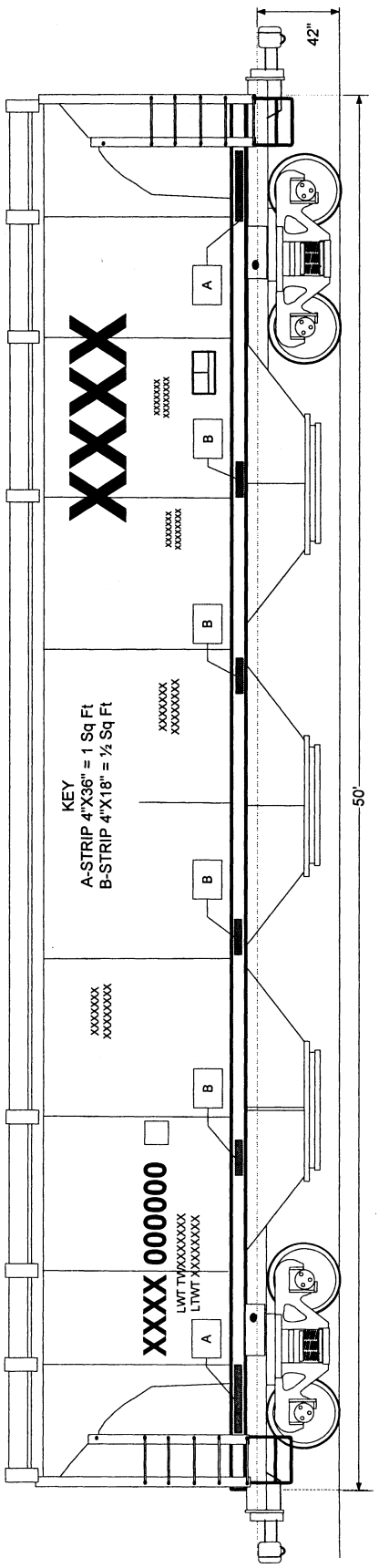

Figure 5
Alternate Pattern
Yellow horizontal reflective sheeting (4.0 sq. ft.) pattern applied to a typical 50 feet Covered Hopper Car (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow)

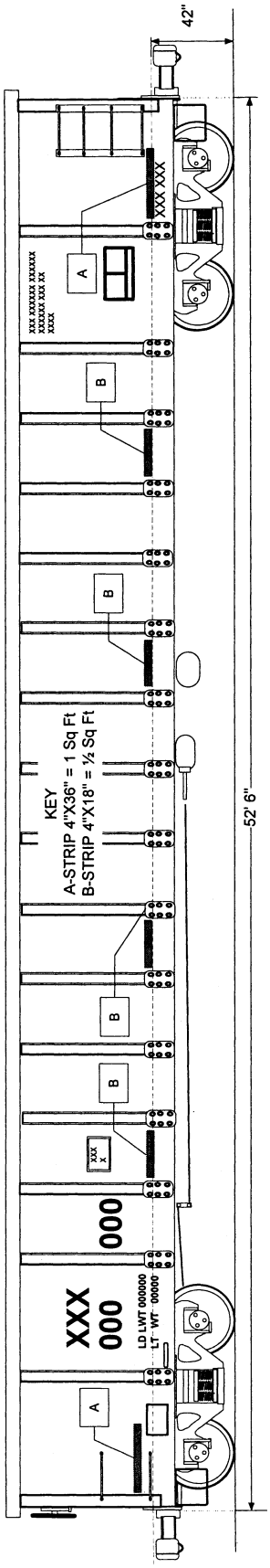

Figure 6
Alternate Pattern
Yellow horizontal reflective sheeting (4.0 sq. ft.) pattern applied to a typical 52' 6" Gondola Car (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow

(2) *Tank cars.* On tank cars, retroreflective sheeting shall be applied vertically to each car side and centered on the horizontal centerline of the tank, or as near as practicable. If it is not practicable to safely apply the sheeting centered vertically about the horizontal centerline of the tank, the sheeting may be applied vertically with its top edge no higher than the horizontal centerline of the tank. A minimum of either 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 end strips, a minimum of one 4x18 inch strip shall be applied at least every 12 feet. Retroreflective sheeting applied under this part shall not be located in the spillage area directly beneath the manway used to load and unload the tank. *See* Figures 7 and 8.

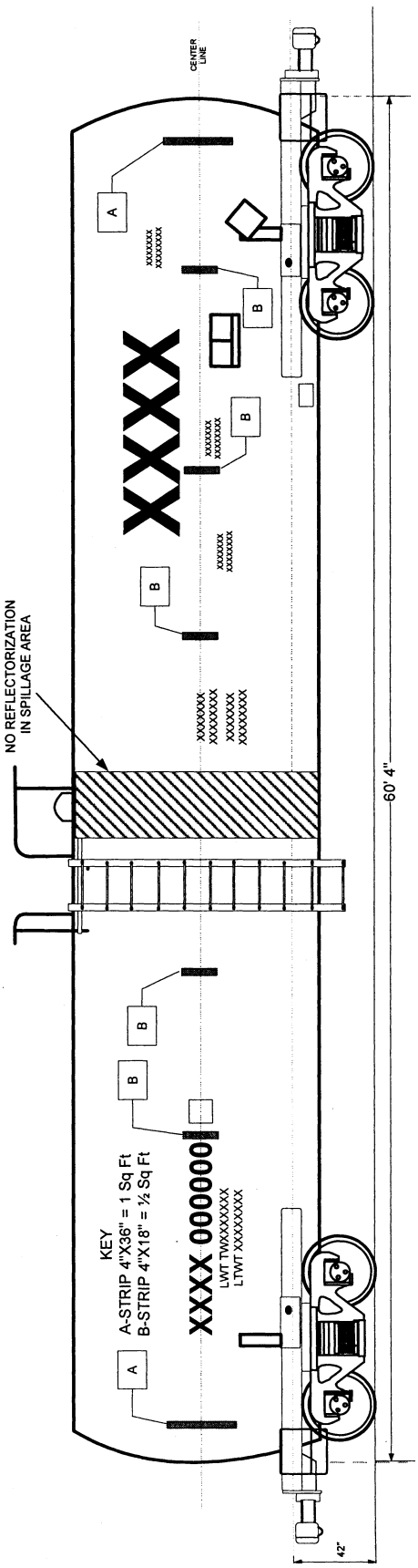

Figure 7
Yellow vertical reflective sheeting (4.5 sq. ft.) pattern applied to a typical Tank Car between 60' and 70' (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow)

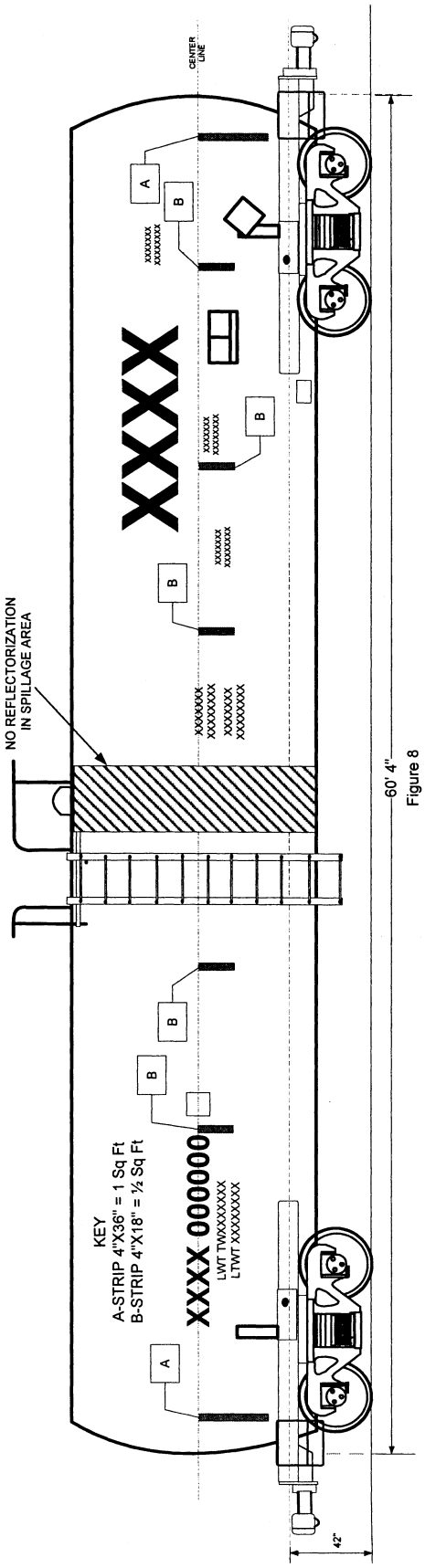

Figure 8
Yellow vertical reflective sheeting (4.5 sq. ft.) pattern applied to a typical Tank Car between 60' and 70' (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow)

(3) *Flat cars.* On flat cars, retroreflective sheeting shall be applied in a horizontal pattern along the length of the side sill with the bottom edge of the sheeting no lower than the bottom of the side sill and the top edge of the sheeting no higher than the top of the car deck or floor. At least two 4x18 inch strips, one above the other, shall be applied as close to each end of the car as practicable. If the side sill is less than 8 inches wide, the two 4x18 inch strips may be applied one next to the other, dividing the strips into nine inch segments as necessary in accordance with paragraph (a) of this section. Between the two end strips, a minimum of one 4x18 inch strip shall be applied at least every 12 feet. *See* Figure 4. If a car has a separate rack structure, retroreflective sheeting may be applied to the flatcar portion only in accordance with the requirements of this section.

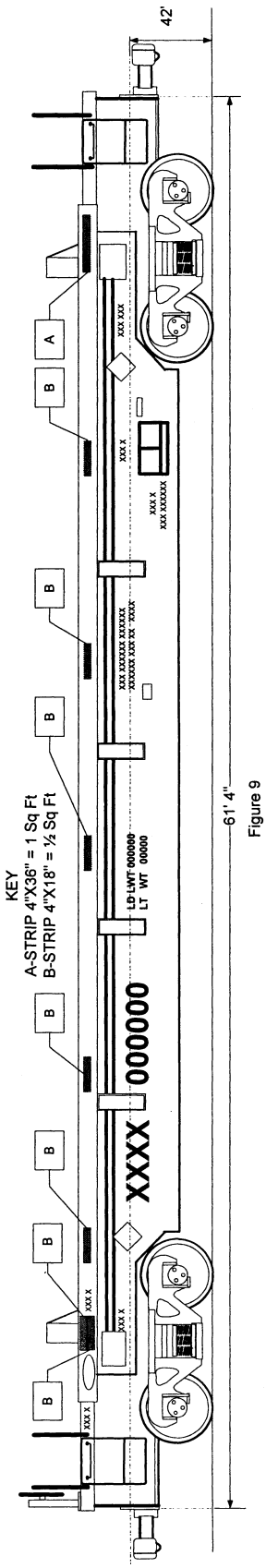

Figure 9
Yellow horizontal reflective sheeting (4.5 sq. ft.) pattern applied to a typical Flat Car (additional sheeting required per 49 CFR 224.105 if white sheeting is applied in lieu of yellow)

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(4) *Cars of special construction.* This paragraph applies to any car the design of which is not compatible with the patterns of application otherwise provided in this section. Retroreflective sheeting shall conform as closely as practicable to the requirements of paragraphs (a)(1) through (a)(3) of this section and shall have the minimum amount of sheeting described in § 224.105 distributed along the length of each car side.

(b) *Locomotives:* Locomotives subject to this part shall be equipped with at least the minimum amounts of retroreflective sheeting required by § 224.105 spaced as uniformly as practicable along the length of the locomotive sides as close as practicable to 42 inches from the top of the rail.

§ 224.107 Implementation schedule.

(a) *Railroad freight cars.* All railroad freight cars subject to this part must be equipped with retroreflective sheeting conforming to this part by May 31, 2015. If a car already has reflective material applied that does not meet the standards of this part, it is not necessary to remove the material unless its placement interferes with the placement of the sheeting required by this part.

(1) *New cars.* Retroreflective sheeting conforming to this part must be applied to all cars constructed after May 31, 2005, before the cars are placed in service.

(2) *Existing cars without retroreflective sheeting.*

(i) If, as of January 3, 2005, a car subject to this part is not equipped on each side with at least one square foot of retroreflective sheeting as specified in paragraph (a)(3) of this section, retroreflective sheeting conforming to this part must be applied to the car at the earliest of the following two occasions occurring after May 31, 2005 or in accordance with paragraph (a)(2)(ii) of this section:

(A) When the car is repainted or rebuilt; or

(B) Within nine months (270 calendar days) after the car first undergoes a single car air brake test as prescribed by § 232.305 of this chapter.

(ii) A freight rolling stock owner may elect not to follow the schedule in paragraph (a)(2)(i) of this section if, not later than July 1, 2005, the freight rolling stock owner submits to FRA a completed Reflectorization Implementation Compliance Report certifying that the cars in the owner's fleet subject to this part will be equipped with retroreflective sheeting as required by this part in accordance with the schedule specified in Table 3 of this subpart. *See* Appendix B of this part for Reflectorization Implementation Compliance Report form.

TABLE 3 OF SUBPART B.—ALTERNATIVE SCHEDULE FOR APPLICATION OF RETROREFLECTIVE MATERIAL TO FREIGHT CARS PER § 224.107(a)(2)(ii).

(A) [1]	(B) (percent)
May 31, 2007	20
May 31, 2008	30
May 31, 2009	40
May 31, 2010	50
May 31, 2011	60
May 31, 2012	70
May 31, 2013	80
May 31, 2014	90
May 31, 2015	100

[1] Column (A) indicates the date by which the minimum percentage of an owner's freight cars specified in column (B) must be equipped with retroreflective sheeting conforming to this part.

(A) Thereafter, the designated fleet shall be equipped with retroreflective sheeting according to the schedule specified in Table 3 of this subpart;

(B) No later than July 1, 2007, the freight rolling stock owner shall submit to FRA an updated Reflectorization Implementation Compliance Report showing which cars of the fleet subject to this part were equipped with retroreflective sheeting as required by this part during the initial 24-month implementation period. Thereafter, updated Reflectorization Implementation Compliance Reports shall be submitted annually, no later than July 1 of each year, for the duration of the 10-year implementation period. *See* Appendix B of this part.

(C) If, following the conclusion of the initial 24-month period or any 12-month period thereafter, the percentage requirements of this section have not been met—

(*1*) The freight rolling stock owner shall be considered in violation of this part;

(*2*) The freight rolling stock owner shall, within 60 days after the close of the period, report the failure in writing to the Associate Administrator;

(*3*) The requirements of paragraph (a)(2)(i) of this section shall apply to all railroad freight cars subject to this part in the freight rolling stock owner's fleet; and

(*4*) The fleet owner shall take such additional action as may be necessary to achieve future compliance.

(D) Cars to be retired shall be included in the fleet total until they are retired.

(3) *Existing cars with retroreflective sheeting.* If as of January 3, 2005, a car is equipped on each side with at least one square foot of retroreflective sheeting, uniformly distributed over the length of each side, that car shall be considered in compliance with this part through May 31, 2015, provided the sheeting is not unqualified retroreflective sheeting, and provided the freight rolling stock owner files a completed Reflectorization Implementation Compliance Report with FRA no later than July 1, 2005, identifying the cars already so equipped. *See* Appendix B of this part for Reflectorization Implementation Compliance Report form.

(b) *Locomotives.* Except as provided in paragraph (b)(4) of this section, all locomotives subject to this part must be equipped with conforming retroreflective sheeting by May 31, 2010. If a locomotive already has reflective material applied that does not meet the standards of this part, it is not necessary to remove the material unless its placement interferes with the placement of the sheeting required by this part.

(1) *New locomotives.* Retroreflective sheeting conforming to this part must be applied to all locomotives constructed after May 31, 2005, before the locomotives are placed in service.

(2) *Existing locomotives without retroreflective sheeting.* (i) If as of January 3, 2005 a locomotive subject to this part is not equipped with the minimum amount of retroreflective sheeting specified in paragraph (b)(3) of this section, retroreflective sheeting conforming to this part must be applied to the locomotive not later than the first biennial inspection performed pursuant to § 229.29 of this chapter occurring after May 31, 2005.

(ii) A freight rolling stock owner may elect not to follow the schedule in paragraph (b)(2)(i) of this section, if not later than July 1, 2005, the freight rolling stock owner submits to FRA a Reflectorization Implementation Compliance Report certifying that the locomotives in the owner's fleet subject to this part will be equipped with retroreflective sheeting as required by this part in accordance with the schedule specified in Table 4 of this subpart. *See* Appendix B of this part.

TABLE 4 OF SUBPART B.—ALTERNATIVE SCHEDULE FOR APPLICATION OF RETROREFLECTIVE MATERIAL TO LOCOMOTIVES PER § 224.107(b)(2)(ii).

(A) [1]	(B) (percent)
May 31, 2007	40
May 31, 2008	60

TABLE 4 OF SUBPART B.—ALTERNATIVE SCHEDULE FOR APPLICATION OF RETROREFLECTIVE MATERIAL TO LOCOMOTIVES PER § 224.107(b)(2)(ii).—Continued

(A) [1]	(B) (percent)
May 31, 2009	80
May 31, 2010	100

[1] Column (A) indicates the date by which the minimum percentage of an owner's locomotives specified in column (B) must be equipped with retroreflective sheeting conforming to this part.

(A) Thereafter, the designated locomotive fleet shall be equipped with retroreflective sheeting according to the requirements of this paragraph (b)(2)(ii);

(B) No later than July 1, 2007, the freight rolling stock owner shall submit to FRA an updated Reflectorization Implementation Compliance Report showing which locomotives of the fleet subject to this part were equipped with retroreflective sheeting as required by this part during the initial 24 month implementation period. Thereafter, updated Reflectorization Implementation Compliance Reports shall be submitted annually, no later than July 1 of each year, for the duration of the 5-year implementation period. *See* Appendix B of this part.

(C) If, following the conclusion of the initial 24-month period or any 12-month period thereafter, the percentage requirements of this section have not been met—

(*1*) The freight rolling stock owner shall be considered in violation of this part;

(*2*) The freight rolling stock owner shall, within 60 days after the close of the period, report the failure in writing to the Associate Administrator;

(*3*) The requirements of paragraph (b)(2)(i) of this section shall apply to all locomotives subject to this part in the freight rolling stock owner's fleet; and

(*4*) The fleet owner shall take such additional action as may be necessary to achieve future compliance.

(D) Locomotives to be retired shall be included in the fleet total until they are retired.

(3) *Existing locomotives with retroreflective sheeting.* If as of January 3, 2005, a locomotive is equipped on each side with at least one square foot of retroreflective sheeting, that locomotive shall be considered in compliance with this part through May 31, 2015, provided the existing material is not unqualified retroreflective sheeting, and provided the freight rolling stock owner files a Reflectorization Implementation Compliance Report with FRA no later than July 1, 2005, identifying the locomotives already so equipped. *See* Appendix B of this part. If, as of January 3, 2005, a locomotive is equipped with unqualified retroreflective sheeting, the locomotive will be considered in compliance with this part through May 31, 2015, provided the locomotive is equipped with a minimum of 3 square feet of retroreflective material on each side and provided the freight rolling stock owner files a Reflectorization Implementation Compliance Report with FRA no later than July 1, 2005, identifying the locomotives already so equipped. *See* Appendix B of this part.

(4) Each railroad that has fewer than 400,000 annual employee work hours, and does not share locomotive power with another railroad with 400,000 or more annual employee work hours, may bring its locomotive fleet into compliance according to the following schedule: fifty percent of the railroad's locomotives must be retrofitted pursuant to § 224.106(b) within five years of the effective date of this part and one hundred percent must be retrofitted pursuant to § 224.106(b) within 10 years of the effective date of this part. If a railroad with fewer than 400,000 annual employee work hours shares locomotive power with a railroad with 400,000 or more annual employee work hours, the smaller railroad must comply with the requirements of paragraphs (b)(2) and (3) of this section.

§ 224.109 Inspection, repair, and replacement.

(a) *Railroad freight cars.* Retroreflective sheeting on railroad freight cars subject to this part must be visually inspected for presence and condition whenever a car undergoes a single car air brake test required under § 232.305 of this chapter. If at the time of inspection more than 20 percent of the amount of sheeting required under § 224.105 on either side of a car is damaged, obscured, or missing, the inspecting railroad or contractor shall promptly notify the car owner of the damaged, obscured, or missing sheeting. The inspecting railroad or contractor shall retain a written or electronic copy of each such notification made for at least two years from the date of the notice and shall make these records available for inspection and copying by the FRA upon request. Any car owner notified of a defect under this section shall have nine months (270 calendar days) from the date of notification to repair or replace the damaged, obscured, or missing sheeting.

(b) *Locomotives.* Retroreflective sheeting must be visually inspected for presence and condition when the locomotive receives the annual inspection required under § 229.27 of this chapter. If at the time of inspection more than 20 percent of the amount of sheeting required under § 224.105 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 adequate repairs cannot be made, replacement material can not be applied, or if sufficient replacement material is not available, such application may be completed at the next forward location where conditions permit, provided a record of the defect is maintained in the locomotive cab or in a secure and accessible electronic database to which FRA is provided access on request.

§ 224.111 Renewal.

Regardless of condition, retroreflective sheeting required under this part must be replaced with new sheeting no later than ten years after the date of initial installation. For purposes of this section, May 31, 2005 shall be considered the initial date of installation for freight cars and locomotives covered by § 224.107(a)(3) or 224.107(b)(3).

Appendix A to Part 224—Schedule of Civil Penalties [1]

Subpart B—Application, Inspection, and Maintenance of Retroreflective Material

[1] A penalty may be assessed against an individual only for a willful violation. The Administrator reserves the right to assess a penalty of up to $27,000 for any violation where circumstances warrant. *See* 49 CFR part 209, Appendix A.

Section	Violation ($)	Willful violation ($)
§ 224.103 Characteristics of retroreflective sheeting:		
(a)–(d) Retroreflective sheeting applied does not meet the requirements of § 224.103	2,500	5,000
§ 224.105 Sheeting dimensions and quantity:		
Failure to apply minimum amount of retroreflective sheeting in accordance with Table 2	2,500	5,000
Applying retroreflective sheeting of wrong dimensions	2,500	5,000
§ 224.106 Location of retroreflective sheeting:		
(a), (b) Applying retroreflective sheeting in nonconforming pattern	2,000	4,000
§ 224.107 Implementation schedule:		
(a)(1), (b)(1) Failure to apply retroreflective sheeting to new freight car or locomotive before equipment placed in service	5,000	7,500
(a)(2), (b)(2), (b)(4) Failure to apply retroreflective sheeting to existing freight car or locomotive in accordance with minumum schedule of paragraphs (a)(2), (b)(2), or (b)(4)	5,000	7,500
§ 224.109 Inspection, repair, and replacement:		
(a) Failure to perform inspection	5,000	7,500
Failure to properly notify car owner of defect	2,500	5,000
Failure to retain written notification of defect for two years	1,500	2,500
Failure to repair defect after notification	5,000	7,500
(b) Failure to perform inspection	5,000	7,500
Failure to repair defect	5,000	7,500

Appendix B to Part 224—Reflectorization Implementation Compliance Report

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OMB No. 2130-xxxx

REFLECTORIZATION IMPLEMENTATION COMPLIANCE REPORT

Instructions for completing form:

If submitting this form to FRA as an initial Reflectorization Implementation Compliance Report in accordance with 49 CFR 224.107(a)(2)(ii) and/or (b)(2)(ii), complete Parts I, II, III and IV. If submitting this form in accordance with 49 CFR 224.107(a)(3) and/or (b)(3), complete Parts I, II, III, IV, and V.

If this form is being submitted to FRA as an updated Reflectorization Implementation Compliance Report required by 49 CFR 224.107(a)(2)(ii)(B) or (b)(2)(ii)(B), complete Parts I, II, III, and V. In Part V, report the car/locomotive number(s) identifying each freight car and locomotive equipped with retroreflective sheeting conforming to 49 CFR Part 224 during this reporting period

Part I: Identification	
Railroad or Car Owner:	
Railroad or Car Owner Reporting Code:	

Preparer Information:	
Name:	Title:
Address:	Phone:
	Fax:
	Email:

Part II: Type of Submission

☐ Initial Submission

☐ Updated Compliance Report

Part III: Identification of freight rolling stock fleet subject to 49 CFR Part 224

A. How many freight cars in your fleet are subject to 49 CFR part 224? _____

B. How many locomotives in your fleet are subject to 49 CFR part 224? _____

Part IV: Certification (Complete only if Part II: Type of Submission is Initial Submission)

By filing this Reflectorization Implementation Compliance Report and any accompanying documents or electronic files with FRA, the undersigned Freight Rolling Stock Owner is electing to follow the alternative schedules for equipping its freight rolling stock with reflective material as set forth in 49 CFR §§224.107(a)(2)(ii) and/or (b)(2)(ii). By completing, executing, and filing this Compliance Report with FRA, the undersigned Freight Rolling Stock Owner is certifying that its entire fleet of freight rolling stock subject to 49 CFR Part 224 (Part 224) will be equipped with retroreflective sheeting conforming to the requirements of Part 224 in accordance with the schedules set forth in 49 CFR §224.107(a)(2)(ii) and/or (b)(2)(ii). Failure to meet the minimum requirements of Part 224 may result in the assessment of civil penalties or other enforcement action by FRA.

Signature of Corporate Officer/Car owner:	Date:
Name:	
Title:	

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OMB No. 2130-xxxx

Part V: Identification of rail freight rolling stock conforming to 49 CFR Part 224

	Type (check one):				Type (check one):		
Reapplied[a]	Locomotive	Freight Car	Identification Number:	Reapplied[a]	Locomotive	Freight Car	Identification Number:
☐	☐	☐	________	☐	☐	☐	________
☐	☐	☐	________	☐	☐	☐	________
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a. Check if freight car/locomotive was reported in Part V of a previous Reflectorization Implementation Compliance Report as conforming to 49 CFR Part 224, but 100% of the retroreflective sheeting on the car/locomotive was replaced with sheeting conforming to Part 224 in this reporting period.

Public reporting burden for this information collection is estimated to average eight hours per response. This estimate included time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this collection of information is 2130-XXXX.

Form FRA F6180.113 11/03

Issued in Washington, DC on December 22, 2004.

Betty Monro,

Acting Administrator, Federal Railroad Administration.

[FR Doc. 04–28407 Filed 12–30–04; 8:45 am]

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