Management, at 202–501–3822 or by email at *travelpolicy@gsa.gov.* Please cite Notice of GSA Bulletin FTR 25–02.

SUPPLEMENTARY INFORMATION:

Background

Federal agencies authorize relocation entitlements to those individuals listed at FTR § 302–1.1 and those assigned under the Government Employees Training Act (GETA) (5 U.S.C. chapter 41) which must be used within one year. Some agencies will authorize a househunting trip (HHT) to assist employees to seek permanent housing, while some employees are occupying temporary housing and have household goods in storage beyond the authorized timeframe of 150 to 180 days depending on the type of relocation. The FTR limits the timeframe to complete the relocation, household goods temporary storage, and the type of per diem for HHT. Hurricane/Tropical Storm/Post-tropical Cyclone Helene and Hurricane Milton have affected locations in Alabama, Florida, Georgia, North Carolina, South Carolina, Tennessee, and Virginia, which has resulted in various travel-related disruptions to relocating employees. Accordingly, FTR Bulletin 25–02, Waiver of certain provisions of FTR Chapter 302 for official relocation travel to locations in Alabama, Florida, Georgia, North Carolina, South Carolina, Tennessee, and Virginia, impacted by Hurricane/Tropical Storm/Post-tropical Cyclone Helene, Hurricane Milton, or both, allows agencies to determine whether to implement waivers of time limits established by the FTR for completion of all aspects of relocation and temporary storage of HHGs, as well as the limitation for HHTs to be reimbursed at the standard CONUS rate.

GSA Bulletin FTR 25–02 can be viewed at *https://www.gsa.gov/ftrbulletins.*

Mehul Parekh,

Acting Associate Administrator, Office of Government-wide Policy.

[FR Doc. 2024–25361 Filed 10–29–24; 8:45 am]

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DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA–2024–0061]

RIN 2127–AL36

Federal Motor Vehicle Safety Standards; Anti-Ejection Glazing for Bus Portals; Bus Emergency Exits and Window Retention and Release

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: This final rule establishes Federal Motor Vehicle Safety Standard (FMVSS) No. 217a, ''Anti-ejection glazing for bus portals; Mandatory applicability beginning October 30, 2027,'' to drive the installation of advanced glazing in over-the-road buses (motorcoaches) and other large buses to reduce passenger and driver ejections. This final rule, issued pursuant to the Moving Ahead for Progress in the 21st Century Act (MAP–21), specifies impactor tests of the glazing material of side and roof windows. The impactor and impact speed simulate the loading from an average size unrestrained adult male impacting a window on the opposite side of a large bus in a rollover.

DATES:

Effective date: December 30, 2024.

Compliance date: The compliance date for FMVSS No. 217a and the amendments to FMVSS No. 217 is October 30, 2027. Optional early compliance with the standards is permitted.

Reconsideration date: If you wish to petition for reconsideration of this rule, your petition must be received by December 16, 2024.

ADDRESSES: Petitions for reconsideration of this final rule must refer to the docket and notice number set forth above and be submitted to the Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue SE, Washington, DC 20590. Note that all petitions received will be posted without change to *https://www.regulations.gov,* including any personal information provided.

Docket: For access to the docket to read background documents or comments received, go to *https://www.regulations.gov* at any time or to 1200 New Jersey Avenue SE, West Building, Room W12–140, Washington, DC 20590, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. Telephone: (202) 366–9826.

Privacy Act: The petition will be placed in the docket. Anyone is able to search the electronic form of all documents 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 *https://www.transportation.gov/individuals/privacy/privacy-act-system-records-notices.*

Confidential Business Information: If you wish to submit any information under a claim of confidentiality, you should submit three copies of your complete submission, including the information you claim to be confidential business information, to the Chief Counsel, NHTSA, at the address given under **FOR FURTHER INFORMATION CONTACT**. In addition, you should submit two copies, from which you have deleted the claimed confidential business information, to Docket Management at the address given above. When you send a submission containing information claimed to be confidential business information, you should include a cover letter setting forth the information specified in our confidential business information regulation (49 CFR part 512).

FOR FURTHER INFORMATION CONTACT: For technical issues, you may contact Mr. Dow Shelnutt, Office of Crashworthiness Standards, Telephone: (202) 366–8779, Facsimile: (202) 493–2739. For legal issues, you may contact Mr. Matthew Filpi, Office of the Chief Counsel, Telephone: (202) 366–2992, Facsimile: (202) 366–3820. The mailing address of these officials is: The National Highway Traffic Safety Administration, 1200 New Jersey Avenue SE, Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

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I. Executive Summary

In 2007, NHTSA published a comprehensive plan on possible improvements in motorcoach safety.[1] NHTSA's motorcoach safety plan identified four specific areas to most expeditiously achieve our goals: requiring seat belts (minimizing passenger and driver ejection from the motorcoach), improved roof strength, emergency evacuation, and fire safety. This final rule is another step in the agency's efforts to improve over-the-road bus (OTRB [2]) and large bus [3] safety. This final rule establishes a new FMVSS, FMVSS No. 217a, ''Anti-Ejection Glazing for Bus Portals; Mandatory applicability beginning October 30, 2027,'' to mitigate partial and complete ejection of passengers from windows on the side and roof of motorcoaches and large buses and to ensure that emergency exits remain operable after a rollover crash.

This final rule fulfills a statutory mandate in the Motorcoach Enhanced Safety Act of 2012 (Motorcoach Enhanced Safety Act), which was incorporated and passed as part of MAP–21. The Motorcoach Enhanced Safety Act required the DOT to prescribe regulations that address passenger ejection in motorcoaches.[4] Additionally, MAP–21 required DOT to consider requiring advanced glazing standards for motorcoach portals.

The Motorcoach Enhanced Safety Act emphasizes anti-ejection safety countermeasures, particularly advanced glazing. Section 32703(b)(2) of MAP–21 directs the Secretary to consider requiring advanced glazing standards for each motorcoach portal and to consider other portal improvements to prevent partial and complete ejection of motorcoach passengers, including children. Section 32703(b)(2) also states that in prescribing such standards, the Secretary shall consider the impact of such standards on the use of motorcoach portals as a means of emergency egress. MAP–21 requires NHTSA to adopt a final rule if NHTSA determines that such standards meet the requirements and considerations in subsections (a) and (b) of section 30111 of the National Traffic and Motor Vehicle Safety Act.[5] As discussed in this final rule, NHTSA has made such a determination regarding an FMVSS for motorcoaches and certain large buses.

The May 6, 2016, Notice of Proposed Rulemaking (NPRM) [6] was among the rulemakings issued pursuant to NHTSA's 2007 Approach to Motorcoach Safety and DOT's Departmental Motorcoach Safety Action Plan.[7] Both of these agency documents recognized that there was work to be done in protecting the public from death and serious injury in OTRB and large bus crashes. Although there are relatively few OTRB and large bus crashes when compared to other vehicle types, OTRB and large bus crashes tend to be serious when they do occur because they generally carry large numbers of passengers. Since producing these safety plans, NHTSA has promulgated several final rules targeted at protecting OTRB and large bus passengers. These final rules include a requirement that all seats on OTRBs and large buses be equipped with seat belts, a requirement that all OTRBs and large buses be equipped with electronic stability control, and requirements for improved structural integrity of OTRBs and large buses. This final rule is designed to work in tandem with these other requirements to further improve OTRB and large bus occupant safety.

While the agency's previous rulemakings in this area are expected to improve OTRB and large bus safety, passenger ejection in OTRB and large bus crashes remains a concern. Although seat belts are now required on OTRBs and large buses, not all states require that passengers wear seat belts on OTRBs and the agency believes seat belt use is generally low among large bus passengers. Additionally, while the structural integrity requirements enhance occupant safety by providing a ''survival space'' in a rollover, they do not mitigate glazing breakage during the crash, which would create ejection portals. This final rule is designed to ensure window glazing remains intact during a crash and windows do not open, even if a passenger is thrown against the glazing during the crash.

To accomplish this safety objective, the new FMVSS No. 217a specifies certain benchmarks that OTRB and large bus window glazing must meet when it is contacted by an impactor projected at the window at a specified speed. In the adopted test, a 26 kilogram (kg) (57 pound (lb)) impactor is propelled from inside a test vehicle toward the window glazing at 21.6 kilometers per hour (km/h) (13.4 miles per hour (mph)). Each side window and glass panel/window on the roof would be subject to any one of three impacts, as selected by NHTSA in a compliance test: (a) an impact near a latching mechanism, discrete attachment point, or (for windows without latches) the center of the lower window edge of an intact window; (b) an impact at the center of the daylight opening [8] of an intact window; and (c) an impact at the center of the daylight opening of a pre-broken glazing. The windows would have to prevent passage of a 102-millimeter (mm) (4 inch) diameter sphere both during and after the impact. Additionally, emergency exits are required to remain operable after each impactor test. The impactor and impact speed simulate the loading from an average size unrestrained adult male thrown from one side of a large bus and impacting a window on the opposite side of the bus in a rollover.

These requirements would ensure that glazing is securely bonded to window frames, no potential ejection portals are created due to breaking of the glass, the windows remain closed when impacted, and emergency exits remain operable after the crash. The test with the pre-broken glazing would encourage the installation of advanced glazing. The requirement would also help ensure the advanced glazing reasonably retains occupants within the structural sidewall of the bus in a crash.

[1] Docket No. NHTSA–2007–28793, NHTSA's Approach to Motorcoach Safety.

[2] An over-the-road bus is characterized by an elevated passenger deck located over a baggage compartment.

[3] Generally, certain buses with a gross vehicle weight rating (GVWR) greater than 26,000 pounds (lb) (11,793.4 kilograms (kg)).

[4] In section 32702(6) of MAP–21, a motorcoach is defined as an over-the-road bus, not including transit buses or school buses.

[5] MAP–21, section 32703(b) and (b)(1).

[6] 81 FR 27904.

[7] In 2009, DOT also issued a Motorcoach Safety Action Plan that addressed additional factors, such as driver fatigue and operator maintenance schedules. An update to the Departmental plan was issued in December 2012 *https://www.fmcsa.dot.gov/sites/fmcsa.dot.gov/files/docs/Motorcoach-Safety-Action-Plan-2012.pdf.*

[8] Center of daylight opening is the center of the total unobstructed window opening that would result from the removal of the glazing.

The requirements in FMVSS No. 217a apply to OTRBs and all new large buses, with limited exceptions. The standard does not apply to school buses, prison buses, buses with perimeter seating, or transit buses that are not OTRBs. The FMVSS No. 217a requirements generally apply to those buses that are also required to meet the rollover structural integrity requirements of FMVSS No. 227, ''Bus rollover structural integrity.'' School bus derivative buses that meet the school bus roof crush requirements of FMVSS No. 220, ''School bus rollover protection,'' instead of FMVSS No. 227, would also need to meet FMVSS No. 217a.

This final rule adds a new requirement to FMVSS No. 217, ''Bus emergency exits and window retention and release,'' that emergency exit window latches may not protrude more than 1 inch into the window opening when the window is open to minimize the potential for the latch protrusions to hinder the emergency egress of passengers. This requirement applies to all new buses that are currently subject to FMVSS No. 217, including new school buses.

NHTSA has decided not to require existing large buses to meet the requirements adopted today for new buses. Most of the commenters did not support a retrofitting requirement. Upgraded window glazing on older buses without the requisite improved structural integrity in accordance with FMVSS No. 227 may not mitigate occupant ejections because the advanced glazing could simply pop out of the portal due to excessive structural deformation in a crash. The agency has also decided not to require retrofitting of buses with improved latch designs and window glazing materials. NHTSA believes it is not practical to retrofit improved latch systems on windows of existing buses because of the unique condition (including pre-existing damage or deformation) of each existing window structure and latching mechanism.

NHTSA estimates that this rulemaking will be cost beneficial. The agency estimates the annual cost of this rule to be $0.96 million and annual undiscounted equivalent lives saved [9] to be between 0.37 and 1.91. The main contributor to the cost of this rule is estimated as the material costs for manufacturers to upgrade their window units from a tempered/tempered double-glazed window unit to, at minimum, a laminated/tempered double-glazed window unit. This improvement in window unit construction would not result in a considerable weight change. As outlined in the Final Regulatory Evaluation (FRE), NHTSA projects that the rule would cost between $0.50 million to $4.30 million per equivalent life saved (Table 1). The net benefit/cost impact ranges from a net benefit of $1.92 million to $18.44 million (Table 2).

TABLE 1—NET COST TO SOCIETY PER EQUIVALENT LIFE SAVED

[In millions of 2022 dollars]

	15% belt use rate			90% belt use rate		
	Undiscounted	3%	7%	Undiscounted	3%	7%
Material Costs	$0.96	$0.96	$0.96	$0.96	$0.96	$0.96
Equivalent Lives Saved [A B]	1.9191	1.5064	1.1491	0.374	0.2936	0.2240
Cost per Equivalent Life Saved	$0.50	$0.64	$0.84	$2.58	$3.28	$4.30

Notes:
A—These values from the FRE account for serious injuries (MAIS 3–5) by utilizing a relative injury factor.
B—MAIS = Maximum AIS, AIS = Abbreviated Injury Scale, MAIS 0 = No Injury, MAIS 1 = Minor, MAIS 2 = Moderate, MAIS 3 = Serious, MAIS 4 = Severe, MAIS 5 = Critical, MAIS 6 = Maximum (untreatable)

TABLE 2—ANNUALIZED NET BENEFITS

[In millions of 2022 dollars]

	15% belt use rate			90% belt use rate		
	Undiscounted	3%	7%	Undiscounted	3%	7%
Benefits from comprehensive costs avoided	$24.72	$19.40	$14.80	$4.82	$3.78	$2.88
Material costs	0.96	0.96	0.96	0.96	0.96	0.96
Net benefits	23.75	18.44	13.84	3.85	2.82	1.92

II. Background

Since the early 2000s, NHTSA has made a concerted effort to improve OTRB safety. These types of buses often carry children and the elderly, which are two of the most vulnerable groups in motor vehicle crashes. Although transportation via OTRBs is generally a safe form of travel, the agency decided to better protect the public against unreasonable risk of death or injury in high-occupancy vehicles through a series of rulemakings. In many cases, crashes involving OTRBs result in rollovers, which can significantly damage the vehicle and create ejection portals that allow part or all of an occupant's body to be ejected from the vehicle during a crash.

The agency has promulgated regulations that significantly reduce the risk that passengers will be ejected from OTRBs in the event of a rollover crash.[10] This final rule represents yet another effort to significantly mitigate the risk of serious injury or death resulting from occupant ejection in OTRB crashes. It is the third rule targeted at minimizing the risk of ejection from OTRBs during a crash that the agency has promulgated over the past fifteen years. With this final rule, the agency will have taken yet another large stride in improving the safety of OTRBs, which means safer transportation for a significant number of children, the elderly, and lower

[9] For details concerning equivalent lives saved, reference the FRE docketed with this final rule.

[10] 78 FR 70415 (Nov. 25, 2013); 80 FR 36049 (Jun 23, 2015); 86 FR 74270 (Dec 29, 2021).

income individuals. What follows in this background section is a brief summary of NHTSA's efforts in the recent past to improve OTRB safety, as well as a discussion about how the proposal and this final rule were developed.

a. NHTSA's Approach to Motorcoach Safety

In 2007, NHTSA undertook a comprehensive review of motorcoach safety issues and the course of action that the agency could pursue to address them. The agency considered various prevention, mitigation, and evacuation approaches in developing the plan. The agency considered issues such as: cost and duration of testing, development, and data analysis; likelihood that the effort would lead to the desired and successful conclusion; target population and possible benefits that might be realized; and anticipated cost of implementing the ensuing requirements into the bus fleet. The results were published as ''NHTSA's Approach to Motorcoach Safety.'' This document outlined four critical areas that the agency believed significantly contributed to fatalities and serious injuries associated with motorcoaches: (1) passenger ejection, (2) rollover structural integrity, (3) emergency egress, and (4) fire safety. This was the first of two documents that the Department produced on motorcoach safety.

b. U.S. DOT Motorcoach Safety Action Plan

In 2009, DOT issued a Departmental Motorcoach Safety Action Plan, which outlined a department-wide strategy to enhance motorcoach safety. In addition to the four priority action items specified in NHTSA's 2007 ''NHTSA's Approach to Motorcoach Safety,'' the DOT plan identified other strategies the Department would pursue to enhance motorcoach safety, such as issuing rules regarding electronic stability control systems, event data recorders, and programs addressing driver fatigue and operator maintenance.

c. Congressional Action: MAP–21 and the Motorcoach Enhanced Safety Act

On July 6, 2012, President Obama signed MAP–21, which incorporated the Motorcoach Enhanced Safety Act in Subtitle G. The Motorcoach Enhanced Safety Act included a number of mandates, including requirements that DOT issue the following regulations, among others: a requirement that seat belts be installed in motorcoaches, a requirement mandating improved roof strength and crush resistance standards, and requirements that mitigate the likelihood of occupant ejection from motorcoaches in the event of a crash.

As described in more detail below, NHTSA has issued several regulations over the past fifteen years that have improved motorcoach safety and satisfied Congress's statutory mandates in the Motorcoach Enhanced Safety Act. This final rule contributes to the agency's effort to further satisfy Congress's mandate to create anti-ejection safety countermeasures and fits with NHTSA's other motorcoach related rulemakings described below.

d. NHTSA's 2013 Motorcoach Seat Belt Final Rule

On November 25, 2013, NHTSA published a final rule (''seat belt final rule'') that amended FMVSS No. 208, ''Occupant crash protection,'' to require that all new OTRBs as well as new buses with a gross vehicle weight rating (GVWR) greater than 11,793 kg (26,000 lb) have lap/shoulder seat belts for each passenger seating position. This rule fulfilled the mandated rulemaking in the Motorcoach Enhanced Safety Act, which directed DOT to ''prescribe regulations requiring safety belts to be installed in motorcoaches at each designated seating position.'' In addition to satisfying the seat belt mandate in the Motorcoach Enhanced Safety Act, this rule was also the agency's first step toward satisfying another mandate in the Motorcoach Enhanced Safety Act, which directed the Secretary to issue regulations that mitigate the risk of ejection from motorcoaches. At the time, NHTSA estimated that seat belts, when used, would be 77 percent effective in preventing fatal injuries in motorcoach rollover crashes, primarily by preventing ejection.

The agency remains confident that the seat belt requirement is effective in mitigating ejection risk in crashes involving OTRBs and other large buses. However, seat belt usage rates by motorcoach occupants are uncertain. As an agency, NHTSA has the authority to mandate that OTRBs and other large buses have seat belts installed at each passenger designated seating position, but the agency does not have the authority to mandate usage of seat belts by passengers.[11] The agency recognized at the time that the seat belt rule would not completely mitigate the risk of ejection, and the agency also recognized that there would be additional risks to belted passengers in OTRB and other large bus rollover crashes due to the lack of structural integrity requirements for those vehicles.

e. NHTSA's 2021 Motorcoach Structural Integrity Final Rule

On December 29, 2021, NHTSA promulgated a final rule (''structural integrity final rule'') that established FMVSS No. 227, ''Bus rollover structural integrity.''[12] This new standard requires that buses provide a ''survival space'' in a rollover test to protect occupants from significant collapse of the bus structure around them. Additionally, the new standard requires that emergency exits remain closed during the rollover test. FMVSS No. 227 provides two significant safety benefits: (1) it protects occupants—belted and unbelted—from being harmed due to significant deformation of the bus structure or large falling objects such as luggage racks; and (2) it protects belted and unbelted occupants by minimizing the risk that emergency exits become ejection portals that passengers could be partially or completely ejected through.

The structural integrity final rule satisfies the mandate in the Motorcoach Enhanced Safety Act that required the Secretary of Transportation to issue a regulation improving roof strength and crush resistance standards. Additionally, like the seat belt rule, the structural integrity final rule also contributes to satisfying the ejection mitigation mandate in the Motorcoach Enhanced Safety Act.

Although the promulgation of FMVSS No. 227 is expected to improve safety outcomes in large bus rollover crashes when it goes into effect, the agency understands that occupants will still be at risk of ejection due to potential breakage of window glazing on large buses. Without a requirement that window glazing and latches on buses meet certain performance criteria, occupants could still be thrown against the window, break the window in the process, and be ejected through the broken window. This type of ejection is what spurred the agency to initiate this advanced glazing rulemaking.

NHTSA's strategy has been first to seek improvements to the rollover structural integrity of motorcoaches (roof strength and crush resistance) and then to pursue measures that would drive use of advanced glazing. This ordered approach is based on findings from a NHTSA funded study[13] that

[11] Laws requiring the use of seat belts in passenger vehicles are set by states.

[12] 86 FR 74270 (Dec. 29, 2021); Partial grant of petitions for reconsideration, 88 FR 77523 (Nov. 13, 2023).

[13] Motor Coach Glazing Retention Test Development for Occupant Impact During a

found the integrity of the bus structure has a profound impact on the effectiveness of glazing as an anti-ejection safety countermeasure. Without a threshold standard for bus structural integrity, a twisting motion of a bus in a rollover could simply pop out any advanced glazing used in the windows and negate the potential benefits of the glazing in mitigating occupant ejection.

f. Data and Safety Need for Strengthening Motorcoach Window Glazing

Overview of Window Glazing

In the context of motor vehicles, ''glazing'' is a general term used to describe the material used in vehicle windows. The glazing in motor vehicles typically consists of either glass, which can be tempered or laminated, or transparent plastics, such as acrylic or polycarbonate.

The agency expects that manufacturers will often use laminated glass to meet the new requirements adopted in this final rule. A single pane of laminated glass contains two glass layers held together by an interlayer, typically made of polyvinyl butyral (PVB). The PVB interlayer retains a strong bond with the outer layers of glass so that in the event the glass breaks or cracks, large shards of sharp glass do not become free and risk cutting or seriously injuring people. Laminated glass may crack or splinter upon impact with the ground, but it can still provide a barrier to retain passengers within the bus if the glazing is retained within the window frame, the PVB interlayer is not excessively torn or punctured, and the window latch remains closed.

Tempered glass is also often used for windows on vehicles and buses. Several OTRB manufacturers currently use tempered glass as their glazing of choice for windows. Tempered glass is processed with controlled thermal or chemical treatments. These treatments strengthen the glass and create balanced internal stresses so that when the glass does break, it breaks or crumbles into smaller granular chunks instead of large, jagged shards. Tempered glass is stronger than laminated glass, but an occupant impacting the window during a rollover event and the bus impact with the ground can potentially shatter tempered glass, causing the glazing to vacate the window frame and creating an ejection portal.

In most passenger cars, a single layer of glazing is used for the windows or windshield. However, multiple layers of glazing are often used in the side windows of buses.[14] For example, a bus may have a double-glazed tempered/tempered side window, which means within one window frame, there is an interior-side pane of tempered glass and an exterior-side pane of tempered glass with an air gap in between the two. This setup is a type of ''double-glazed'' window because there are two layers of glazing in the window frame. Based on NHTSA's research and industry feedback from the NPRM, the most common type of glazing used in motorcoach side windows is a double-glazed tempered/tempered window unit.

Under section 32702 of MAP–21, ''advanced glazing'' means glazing installed in a portal on the side or the roof of a motorcoach that is designed to be highly resistant to partial or complete occupant ejection in all types of motor vehicle crashes. This rulemaking puts in place a series of performance tests to prevent partial and complete ejection of bus occupants. These tests, described below in this preamble, include striking the unbroken and broken glazing with an impactor and measuring both the excursion distance of the impactor during impact and any resulting openings in the glazing after the impact.

Data and Safety Need

There were 73 OTRB and 38 large bus fatal crashes in the 14-year period from 2006 through 2019. Among these 111 OTRB and large bus crashes, 52 were rollovers, 53 were frontal crashes, and 6 were side crashes. The anti-ejection glazing requirements in this final rule are expected to reduce ejections in all of these crash types. Of the 73 OTRBs involved in fatal crashes, 88 percent had a GVWR greater than 11,793 kg (26,000 lb).

NHTSA analyzed data from the agency's Fatality Analysis Reporting System (FARS) from 2006 through 2019 to analyze fatal bus crashes within the United States. During this period there were 111 fatal crashes involving all OTRBs regardless of GVWR and other applicable non-OTRBs with a GVWR greater than 11,793 kg (26,000 lb), resulting in a total of 284 occupant fatalities (an average of 20.3 total occupant fatalities per year). Tables 3 and 4 show the breakdown of the number of crashes and fatalities by bus body type, GVWR, and crash type, respectively. Fatalities resulting from other events such as fires or occupants jumping from a bus were not included.

The OTRB and large bus fatalities were further categorized into two groups representing drivers and passengers. Passenger fatalities were significantly higher than driver fatalities, accounting for 84 percent of the total fatalities, and were particularly prevalent in the OTRB category. Rollover events accounted for 66 percent of all passenger fatalities (compared to 20 percent of driver fatalities). Rollover events are also the deadliest crash type, with 166 total fatalities in 52 crashes, resulting in 3.2 fatalities per crash.

TABLE 3—OTRB & LARGE BUS FATAL CRASHES

[FARS 2006–2019]

	Rollover	Front	Side	Total
Over-the-road Bus	40	30	3	73
Large Bus GVWR >11,793 kg	12	23	3	38
Total	52	53	6	111

Rollover (Martec Study), Final Report published on August 2006, Docket No. NHTSA–2002–11876–15.

[14] OTRB manufacturers generally use this type of window for thermal and sound insulation purposes. Having an ''air gap'' between the window panes acts as a thermal barrier, making it easier to keep the bus a comfortable temperature. The air gap also prevents vibrations from passing through as easily, resulting in a quieter ride for occupants.

TABLE 4—OTRB & LARGE BUS OCCUPANT FATALITIES IN CRASHES

[FARS 2006–2019]

Crash type	OTRB		Large Bus GVWR >11,793 kg		Total		
	Driver	Passenger	Driver	Passenger	Driver	Passenger	All
Rollover	7	134	2	23	9	157	166
Front	23	39	13	26	36	65	101
Side	1	9	0	7	1	16	17
Total	31	182	15	56	46	238	284

Occupant fatalities were further broken down based on ejection (Table 5) and ejection path. Occupant ejection is highly correlated with fatality. For all OTRB and large bus occupant fatalities, 39 percent were associated with ejection.[15] Additionally, 71 percent of ejected occupant fatalities occurred in rollover crashes, highlighting the importance of ejection mitigation in rollover crashes. Rollovers remain the largest cause of occupant fatalities, for both ejected and non-ejected passengers, in OTRB and large bus crashes. However, anti-ejection glazing will help prevent occupant ejection in all crash types. During frontal impacts and side impacts, occupants are still at risk of ejection, as shown in Table 5. Any impact where the side windows break presents a risk of at least partial ejection for passengers. Partial ejection from a vehicle carries the additional risk of entrapment, as the partially ejected body part can be pinned under the bus, which can cause serious injury and prevent the immediate extraction of the passenger from the crash scene. Bus side windows can shatter upon impact even from frontal crashes, as evidenced during NHTSA's 35 mph frontal crash test of a 2000 Motor Coach Industries motorcoach in 2009.[16]

TABLE 5—OTRB & LARGE BUS OCCUPANT FATALITIES BY EJECTION STATUS

[FARS 2006–2019]

Crash type	OTRB		Large Bus GVWR > 11,793 kg		Total	
	Eject	No Eject	Eject	No Eject	Eject	No Eject
Rollover	70	71	9	16	79	87
Front	21	41	6	33	27	74
Side	5	5	1	6	6	11
Total	96	117	16	55	112	172

The aforementioned data show that crashes involving ejections present a high risk of death to the occupants of these buses. The majority of fatalities occur in rollovers, and approximately 48 percent of rollover occupant fatalities are associated with ejection.

In nearly all the OTRB and large bus fatal rollover events discussed above, there was a significant amount of structural damage to the roof and side structure of the vehicles, as well as open window portals.[17] This is a prime example of why this final rule works in tandem with the structural integrity final rule. The structural integrity final rule will ensure that the structure of the bus does not cause harm to occupants or create ejection portals via emergency exits, and this final rule will take the final step of increasing use of advanced glazing that prevents partial or complete ejection of motorcoach passengers and further ensures the integrity of glazing mounting.

g. The 2016 NPRM

NPRM Proposals

On May 6, 2016, NHTSA published an NPRM that proposed the establishment of FMVSS No. 217a, with the goal of reducing the potential for occupant ejection in a crash. The NPRM proposed a new dynamic impact test that would be used to drive the installation of advanced glazing in high-occupancy buses. In this test, a 26 kg (57 lb) impactor would be propelled from inside a test vehicle toward a window glazing at 21.6 km/h (13.4 mph). The impactor and impact speed were chosen because they represent what the impact force would be from an average-sized unrestrained adult male striking the window on the opposite side of a large bus in a rollover. Each side window, rear window, and glazing panel/window on the roof would be subject to one of three impacts, as selected by NHTSA in a compliance test: (a) an impact near a latching mechanism of an intact window; (b) an impact at the center of the daylight opening of an intact window; and (c) an impact at the center of the daylight opening of a pre-broken window. The window would need to prevent passage of a 102 mm (4 inch) diameter sphere both during and after the impact to pass the test. In the proposed tests, the agency would assess the window during the impact by determining whether any part of the window passes a reference plane defined during a pre-test set up procedure. Furthermore, in the proposed test for the pre-broken glazing, the maximum displacement of the impactor at the center of the daylight opening of subject windows would be limited to 175 mm (6.9 inches).

[15] Ejection data include both complete and partial ejections.

[16] *See https://www.nhtsa.gov/research-data/research-testing-databases#/vehicle/6934.*

[17] *See* NTSB report HAB–16/01 for September 21, 2014, OTRB rollover crash near Red Lion Delaware; *see also* NTSB report HAR–18/03 for May 14, 2016, OTRB rollover crash near Laredo Texas.

In the NPRM, NHTSA also proposed to limit the protrusions of emergency exit latches into the openings of windows to ensure they do not unduly hinder emergency egress. This proposal was supported by a recommendation from the National Transportation Safety Board (NTSB), which had submitted a letter to NHTSA describing a crash (''Gray Summit crash'') [18] where occupants' clothing was caught on a window latch as they were trying to egress the vehicle. A detailed description of the Gray Summit crash can be found in the NPRM for this final rule. The NPRM proposed a limit that would set the maximum protrusion of a window latch into emergency exit openings of windows at 1 inch when the emergency exit window is open.

The NPRM proposed to apply the advanced glazing requirements to: (a) all new OTRBs (regardless of GVWR); and (b) all new buses other than OTRBs with a GVWR greater than 11,793 kg (26,000 lb), with the exception of school buses, prison buses, transit buses, and perimeter seating buses. For the applicable bus types, the proposed applicable windows included bus side and rear windows, and windows/glazing panels on the roof of the vehicle with a minimum dimension measured through the center of its area of 279 mm (11 inches) or greater. The NPRM proposed a different applicability for the emergency exit window latch protrusion requirement—the NPRM proposed that this requirement would apply to buses covered by the new FMVSS No. 217a as well as all buses subject to FMVSS No. 217, ''Bus emergency exits and window retention and release.'' [19]

Martec Study

As discussed in the NPRM, in 2003, NHTSA and Transport Canada entered into a joint program that focused on improving glazing and window retention on OTRBs to prevent occupant ejection.[20] This program is referenced in the NPRM and the sections below as the ''Martec study,'' and the data gathered from the study is the basis for many of the proposals being adopted as part of this final rule. For the purposes of the NPRM, the agency used this study to develop a test procedure that realistically represented the impact loads from an unrestrained occupant onto motorcoach glazing during a rollover event.

III. NHTSA's Statutory Authority

NHTSA is issuing this final rule pursuant to and in accordance with its authority under the National Traffic and Motor Vehicle Safety Act and the relevant provisions of MAP–21.

a. National Traffic and Motor Vehicle Safety Act (Safety Act)

Under 49 United States Code (U.S.C.) Chapter 301, Motor Vehicle Safety (49 U.S.C. 30101 *et seq.*), the Secretary of Transportation is responsible for prescribing motor vehicle safety standards that are practicable, meet the need for motor vehicle safety, and are stated in objective terms (section 30111(a)). ''Motor vehicle safety'' is defined in the Safety Act (section 30102(a)(8)) as ''the performance of a motor vehicle or motor vehicle equipment in a way that protects the public against unreasonable risk of accidents occurring because of the design, construction, or performance of a motor vehicle, and against unreasonable risk of death or injury in an accident, and includes nonoperational safety of a motor vehicle.'' ''Motor vehicle safety standard'' means a minimum standard for motor vehicle or motor vehicle equipment performance (section 30102(a)(9)). When prescribing such standards, the Secretary must consider all relevant available motor vehicle safety information (section 30111(b)(1)). The Secretary must also consider whether a proposed standard is reasonable, practicable, and appropriate for the particular type of motor vehicle or motor vehicle equipment for which it is prescribed (section 30111(b)(3)) and the extent to which the standard will further the statutory purpose of reducing traffic accidents and associated deaths and injuries (section 30111(b)(4)). The responsibility for promulgation of FMVSSs is delegated to NHTSA (49 CFR 1.95).

b. MAP–21 (Incorporating the Motorcoach Enhanced Safety Act of 2012)

NHTSA is issuing this final rule in accordance with MAP–21, which incorporates the Motorcoach Enhanced Safety Act of 2012 into Subtitle G.[21] Section 32703(b) of MAP–21 requires the Secretary (NHTSA by delegation) to prescribe regulations that would address certain aspects of motorcoach crash performance within 2 years if the agency determines that the standards would meet the requirements and considerations of section 30111(a) and (b) of the National Traffic and Motor Vehicle Safety Act.[22]

Two subsections of section 32703(b) are particularly relevant to this final rule. Subsection (b)(1) specifies that the Secretary is to establish improved roof and roof support standards that ''substantially improve the resistance of motorcoach roofs to deformation and intrusion to prevent serious occupant injury in rollover crashes involving motorcoaches.'' Subsection (b)(2) directs the Secretary to ''consider advanced glazing standards for each motorcoach portal and [to] consider other portal improvements to prevent partial and complete ejection of motorcoach passengers, including children.'' [23]

MAP–21 contains other provisions pertaining to this rulemaking. Section 32702 states that ''motorcoach'' has the meaning given to the term ''over-the-road bus'' in section 3038(a)(3) of the Transportation Equity Act for the 21st Century (TEA–21).[24] Section 3038(a)(3) of TEA–21 (*see* 49 U.S.C. 5310 note) defines ''over-the-road bus'' as ''a bus characterized by an elevated passenger deck located over a baggage compartment.'' However, section 32702 of MAP–21 excludes transit buses and school buses from the ''motorcoach'' definition.[25]

Under § 32702, ''portal'' means any opening on the front, side, rear, or roof of a motorcoach that could, in the event of a crash involving the motorcoach, permit the partial or complete ejection of any occupant from the motorcoach, including a young child. Section 32703(b)(2) also states that in prescribing such standards, the Secretary shall consider the impact of such standards on the use of motorcoach portals as a means of emergency egress.

[18] NTSB/HAR–11/03 PB2011–916203; Multivehicle Collision Interstate 44 Eastbound Gray Summit, Missouri, August 5, 2010; December 2011.

[19] FMVSS No. 217 S3 says the standard ''applies to buses, except buses manufactured for the purpose of transporting persons under physical restraint.'' Accordingly, the NPRM proposed that the latch requirement apply to all buses except buses used for transporting persons under physical restraint.

[20] Motor Coach Glazing Retention Test Development for Occupant Impact During a Rollover (Martec Study), Final Report published on August 2006, Docket No. NHTSA–2002–11876–15.

[21] The Motorcoach Enhanced Safety Act of 2012 is incorporated into the Moving Ahead for Progress in the 21st Century Act, Public Law 112–141 (Jul. 6, 2012).

[22] *Id.* § 32703(b).

[23] While this final rule is mainly aimed at addressing the rollover structural integrity of specific large bus types, the reduced deformation of the bus structure would ensure that any advanced glazing installed on portals would be retained on their mounting and reduce the risk of occupant ejection in rollover crashes. Further, the requirement that emergency exits should not open during the rollover test would also ensure that the exits do not become ejection portals. Thus, both subsection (b)(1) and subsection (b)(2) are relevant to this rule.

[24] Moving Ahead for Progress in the 21st Century Act, Public Law 112–141, 32702(6).

[25] *Id.* § 32702(6)(A)–(B).

MAP–21 further directs the Secretary to apply any regulation prescribed in accordance with section 32703(b) to all motorcoaches manufactured more than 3 years after the date on which the regulation is published.[26] In addition, the Secretary may assess the feasibility, benefits, and costs of applying any requirement established under section 32703(b)(2) to ''motorcoaches manufactured before the date on which the requirement applies to new motorcoaches'' (retrofit).[27] Finally, MAP–21 also authorizes the Secretary to combine the required rulemaking actions as the Secretary deems appropriate.[28]

IV. The Final Rule and Response to Comments

a. Establishing FMVSS No. 217a and New Requirements

This final rule adopts most of the proposals from the 2016 NPRM (the differences between the NPRM and this final rule are highlighted in the section below). As discussed in the NPRM, this final rule establishes a new standard within 49 CFR part 571 that will now be referred to as FMVSS No. 217a. This new standard will set out requirements that windows in certain types of buses must meet when evaluated by the dynamic test procedure described in the 2016 NPRM. Additionally, the new requirements will allow for only a 1-inch maximum protrusion for emergency exit window latches when the emergency exit window is open. Although there are some differences between the final rule and the NPRM, after reviewing the public comments to the NPRM, the agency has decided to adopt many of the proposals from the 2016 NPRM.

b. Differences Between the NPRM and the Final Rule

This final rule makes amendments to several of the proposals in the 2016 NPRM based on the comments the agency received. The most notable change between the 2016 NPRM and this final rule is in the applicability of FMVSS No. 217a. This final rule excludes all perimeter seating buses, even if those buses are also OTRBs, from the requirements in FMVSS No. 217a since these buses are also excluded from the structural integrity requirements in FMVSS No. 227 and therefore could lack the requisite integrity to retain advanced glazing within the window frame. Additionally, the final rule excludes all rear windows from FMVSS No. 217a requirements because the field data does not indicate an ejection risk from rear windows. Other differences between the 2016 NPRM and the final rule are minor updates to the regulatory text which include: (1) an adjustment to the location within FMVSS No. 217 for the new regulatory text that adds the emergency exit latch protrusion requirement; (2) new figures to the FMVSS No. 217a regulatory text to clarify the window pre-breakage procedure and the emergency exit opening space; and (3) adjustments to the FMVSS No. 217a regulatory text regarding the window pre-breakage procedure to specify steps to take if the electric staple gun used to pierce the glazing does not produce holes or perceivable damage to the glazing.

V. Summary of Comments and Agency Responses

a. Overview of Comments

NHTSA received 11 unique comments on the NPRM. Comments were submitted by large bus manufacturers, including IC Bus (ICB), Van Hool N.V. (Van Hool), Prevost and Nova Bus divisions (Prevost), and Blue Bird Body Company (BBBC); a motorcoach operator, Greyhound Lines, Inc. (Greyhound); industry groups, including Enhanced Protective Glass Automotive Association (EPGAA), and School Bus Manufacturers Technical Council (SBMTC); a U.S. government agency, the NTSB; glazing manufacturers, including SABIC Innovative Plastics US LLP (SABIC) and Exatec, LLC (Exatec); and a consumer advocacy group, The Advocates for Highway and Auto Safety (Advocates).

Most commenters expressed support for an FMVSS on advanced anti-ejection glazing and emergency exit latches that do not hinder passenger egress, but views differed on how these concepts should be implemented. For example, Greyhound, Prevost, and Van Hool expressed concern that advanced glazing, specifically laminated glass, may increase the potential for head and neck injuries of belted passengers. Additionally, several commenters stated that the NPRM did not account for all costs associated with the proposed rule.

Most commenting bus manufacturers and SBMTC requested that certain bus types or window types be excluded from applicability under this rulemaking, including entertainer buses, school buses, school bus-derivative buses, driver's windows, windows in doors, rear windows, and windows that are partially blocked by equipment or seating. Conversely, NTSB requested more bus types be included in the rulemaking, such as medium-sized buses with a GVWR of 11,793 kg (26,000 lb) or less, not including school buses.

Exatec, ICB, and SABIC all expressed concerns that the proposed glass pre-breakage procedure did not properly account for advanced glazing that may not break upon application of a line load by the electric staple gun.

No commenters supported mandating a retrofit for the glazing requirements, but NTSB did support a retrofit requirement for the minimum latch protrusion. A detailed discussion of comments and the agency's responses can be found below.

b. Applicability

Bus Types

NHTSA proposed to apply the FMVSS No. 217a window glazing dynamic impact test requirements to generally the same group of vehicles covered by the bus rollover structural integrity NPRM published in August 2014.[29] NHTSA noted that both requirements should apply to high occupancy vehicles associated with an unreasonable risk of fatal rollover involvement. According to the data, these vehicles are generally OTRBs regardless of GVWR, and other buses with a GVWR greater than 11,793 kg (26,000 lb). Accordingly, the NPRM proposed that buses subject to FMVSS No. 217a would be (a) new OTRBs (regardless of GVWR), pursuant to the Motorcoach Enhanced Safety Act of 2012, and (b) all new buses other than OTRBs with a GVWR greater than 11,793 kg (26,000 lb). Similar to the bus rollover structural integrity proposal, school buses, transit buses, and perimeter seat buses (as defined in the August 2014 NPRM)[30] were excluded from the FMVSS No. 217a proposed requirements. Prison buses were also excluded from FMVSS No. 217a proposed requirements because prison buses have bars over the windows that would impede the impactor for the glazing dynamic impact tests.

The December 29, 2022 final rule establishing FMVSS No. 227, ''Bus rollover structural integrity,'' excluded perimeter seating buses that are non-OTRBs as well as those that are OTRBs

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[26] *Id.* § 32703(e)(1).

[27] *Id.* § 32703(e)(2), ''Retrofit Assessment for Existing Motorcoaches.''

[28] *Id.* § 32706.

[29] 79 FR 46090 (Aug. 6, 2014).

[30] Per the August 2014 NPRM: Transit bus means a bus that is equipped with a stop-request system sold for public transportation provided by, or on behalf of, a State or local government and that is not an over-the-road bus; Perimeter-seating bus means a bus with 7 or fewer designated seating positions rearward of the driver's seating position that are forward-facing or can convert to forward-facing without the use of tools and is not an over-the-road bus.

from the requirements in FMVSS No. 227. The November 2023 final rule [31] responding to petitions for reconsideration of the December 2022 final rule expanded the definition of transit buses to include buses with a stop-request system sold for public transportation provided by, or on behalf of, the federal government. As detailed later in this section, this final rule adopts the 2015 NPRM proposals for applicability of FMVSS No. 217a but extends the exclusions to include perimeter seating buses that are OTRBs and the expanded definition of transit buses. These buses excluded from FMVSS No. 217a requirements are also excluded from FMVSS No. 227 and so may lack the requisite structural integrity to ensure any advanced glazing in windows does not pop out of its frame in a crash and thereby negate the potential benefits of the advanced glazing.

Additionally, in the NPRM the agency proposed applying the emergency exit window latch protrusion requirement to the same buses covered by FMVSS No. 227 and all buses governed under FMVSS No. 217, which includes all school buses. The agency is adopting the window latch applicability proposal as part of this final rule.

Medium-Sized Buses

NTSB commented that the final rule should include medium-sized non-school buses with GVWRs in the range of 4,536–1,793 kg (10,001–26,000 lb). It noted that these buses are typically built as body-on-chassis vehicles without an elevated passenger deck over a baggage compartment, so they do not fall within the ''over-the-road bus'' definition. NTSB cited the 2009 bus crash near Dolan Springs, Arizona,[32] and a 2014 bus crash in Davis, Oklahoma [33] where passengers were ejected from medium-sized buses and died as a result. The NTSB's Davis, Oklahoma accident report stated that a lack of appropriate crashworthiness standards contributed to the severity of passenger injuries.

Agency Response

As proposed in the NPRM, the agency has decided that the requirements for FMVSS No. 217a will not be applicable to medium-sized non-OTRBs.[34] NHTSA bases this decision on a review of data for medium-sized buses from 2006–2019 as shown below in Table 6. During this period there were 37 fatalities with some degree of ejection from crashes involving medium-sized buses. During the same period there were 112 fatal ejections in OTRBs and large buses, even though the population of OTRBs and large buses is much smaller than the population of medium-sized buses. Specifically, approximately 2,200 large buses (including OTRBs) are produced annually, compared to approximately 16,000 medium-sized buses.[35] Although there may be certain risks of occupant ejection from medium-sized bus crashes, the agency has concluded that medium-sized buses do not pose a sufficient safety need to warrant application of FMVSS No. 217a to those buses.

TABLE 6—FATAL CRASHES AND EJECTED FATALITIES FOR LARGE BUSES AND MEDIUM-SIZED BUSES

[FARS 2006–2019]

Bus size	Avg. annual fatal crashes	Avg. annual ejection fatalities	Avg. annual fleet sales [36]
Large Bus (greater than 26,000 lb GVWR) and all OTRBs	7.9	8.0	2,200
Medium-Size Bus (GVWR of 10,000–26,000 lb)	5.9	2.6	16,000

Data show a considerable disparity between the rate of fatal ejections for large buses (OTRBs and other buses covered by this final rule) versus medium-sized buses. Not only are large buses involved in 34 percent more fatal crashes on average annually, but they also have 3 times as many ejected occupant fatalities annually compared to medium-sized buses.

School buses and transit buses in the medium-sized bus range have a very low rate of fatal ejections in rollover events. The bus rollover structural integrity requirements for FMVSS No. 227 only apply to OTRBs and buses other than OTRBs with a GVWR greater than 26,000 lb, meaning that if the agency were to apply this final rule to medium-sized buses, occupants in those buses would not receive the protections afforded by FMVSS No. 227.[37] One of the reasons the agency promulgated FMVSS No. 227 was because windows were popping out of place during rollover events, creating ejection portals. Since medium-sized buses do not have to comply with FMVSS No. 227, requiring medium-sized buses to utilize enhanced glazing may not be effective in mitigating ejection because the advanced glazing may pop out of the window due to excessive structural deformation during a crash and thereby create an ejection portal. Accordingly, it would be illogical from a safety standpoint to make medium-sized buses subject to FMVSS No. 217a, but not to FMVSS No. 227. Thus, the agency has decided not to make medium-sized buses applicable under this final rule.

Entertainer Buses

The NPRM proposed to exclude perimeter seating buses from the final rule with the exception of, however, if perimeter seating buses that met the definition of an OTRB. Prevost commented that entertainer buses should be completely exempt under the final rule, regardless of whether they fit the definition of an OTRB. Buses referred to as entertainer buses are generally built from an OTRB shell and can contain interior features such as kitchens, bathrooms, bedrooms, lounge areas, dining areas, generators, and slide out portions of the structure. The window configuration may or may not be the same as those of other OTRBs built as typical passenger vehicles.

[31] 88 FR 77523.

[32] Bus Loss of Control and Rollover, Dolan Springs, Arizona, January 30, 2009. Highway Accident Report NTSB/HAR–10/01 (Washington, DC: NTSB 2010).

[33] Truck-Tractor Semitrailer Median Crossover Collision with Medium-Size Bus on Interstate 35, Davis, Oklahoma, September 26, 2014. Highway Accident Report NTSB/HAR–15/03 (Washington, DC: NTSB 2015).

[34] Medium-sized buses have a GVWR greater than 4,536 kg (10,000 lb) and less than or equal to 11,793 kg (26,000 lb).

[35] Medium-Size Bus Production and Sales Supplemental Information Report. Docket Item #30 from NTSB HWY17MH011 Highway Investigation. *https://data.ntsb.gov/Docket?ProjectID=94934.*

[36] Medium-Size Bus Roadway Departure, Return, and Rollover Bryce Canyon City, Utah September 20, 2019. Accident Report NTSB/HAR–21/01 PB2021–100917.

[37] FMVSS No. 227 has several express exemptions; the standard does not apply to school buses, school bus derivative buses, transit buses, prison buses, and perimeter-seating buses.

Prevost commented that reducing the number of ejection-related fatalities is an important aspect of motorcoach safety and must be inherent to the design. Prevost further agreed with the intent of the proposed regulation to mitigate the creation of ejection portals, and to create uniformity throughout the industry products. However, Prevost requested special consideration for an exemption from the proposed requirements for entertainer buses. Prevost stated that an ''entertainer coach is very different from the passenger motorcoach both in design and application. From a design perspective, they have fewer and smaller passenger windows, offering relatively less chance of a potential, partial, or full ejection.''

Agency Response

The agency believes that the term ''entertainer bus'' is not a term of art to be used in the standard. The buses that Prevost described in its comment are likely considered perimeter-seating buses, a bus type that NHTSA defined in the NPRM [38] and excluded from compliance in the proposal, unless the perimeter seating bus in question fits the definition of an OTRB. After reviewing Prevost's comment, NHTSA has decided to maintain that under this final rule the new standard will not be applicable to perimeter-seating buses. Further, to align the application of FMVSS No. 217a with FMVSS No. 227, perimeter-seating buses that also meet the definition of an OTRB will also be excluded from FMVSS No. 217a.

As stated in the FMVSS No. 227 motorcoach structural integrity final rule, the agency does not find a reason to distinguish between OTRBs with perimeter seating and non-OTRBs with perimeter seating.[39] The safety data indicate no relevant differences between these vehicles based on safety need. In other words, OTRBs with perimeter seating do not present a greater risk of injury compared to non-OTRBs with perimeter seating.

Furthermore, as discussed above, the advanced glazing requirements are most effective when paired with the improved structural integrity required by FMVSS No. 227. Therefore, the agency is excluding OTRBs with perimeter seating to mirror the decision made in the final rule for FMVSS No. 227. Many of the safety benefits gained from advanced glazing are dependent on sufficiently strong vehicle structural elements, meaning it would not make sense to apply advanced glazing requirements to a set of vehicles that do not have to comply with the more stringent structural integrity requirements of FMVSS No. 227.

Lastly, to synthesize the definition with this decision in this final rule, the agency has decided to amend the definition of a perimeter seating bus in the regulatory text by deleting the phrase ''and is not an over the road bus'' from the end of the proposed definition.

School Bus Derivative Buses

ICB recommended that commercial buses built from school bus designs should not have to meet the ejection mitigation requirements of the proposed rule. ICB noted that its commercial buses are ''much different'' from a traditional motorcoach, meaning the data and studies NHTSA used for the NPRM potentially would not apply to their buses. ICB stated that the operating environment of its commercial buses derived from school buses is more closely related to that of school buses than the operating environment and conditions of OTRBs, meaning that the routes ICB commercial buses are used on are generally routes involving lower speeds and frequent stops. ICB wrote ''[t]he commercial variants of school buses are typically used in applications such as church buses, college campus buses, local shuttles and tours, emergency responders, and parks and recreation departments.''

Agency Response

The agency disagrees with ICB's generalization of school bus derivative bus designs and their operating environments. NHTSA is therefore not excluding school bus derivative buses from FMVSS No. 217a as part of this final rule. The agency is basing this decision on the fact that school bus derivative buses are available for use in intercity travel and are offered for sale with motorcoach-style features, such as larger windows than school buses. While these buses are not required to comply with FMVSS No. 227, ''Bus rollover structural integrity,'' these buses are required to comply with FMVSS No. 220, ''School bus rollover protection,'' and FMVSS No. 221, ''School bus body joint strength.'' When the agency defined the term ''school bus derivative bus'' in FMVSS No. 227, the agency defined these buses as ''a bus that meets Federal motor vehicle safety standards for school buses regarding emergency exits (§ 571.217), rollover protection (§ 571.220), bus body joint strength (§ 571.221), and fuel system integrity (§ 571.301).'' To meet the regulatory definition of a school bus derivative bus, the bus must comply with specific school bus requirements—including the structural integrity requirements of FMVSS Nos. 220 and 221—even if the bus is not used for school-related purposes.

One of the agency's concerns when it promulgated the structural integrity final rule was the possibility of window glazing popping out of place and creating ejection portals. The school bus structural integrity standards, FMVSS No. 220 and FMVSS No. 221, ensure the windows in school bus derivative buses are less likely to ''pop out,'' similar to FMVSS No. 227 for OTRBs and other large buses. Thus, the agency believes it is reasonable for school bus derivative buses to be subject to the new FMVSS No. 217a but not to FMVSS No. 227.

ICB requested that commercial buses built from school bus designs should not have to meet the ejection mitigation requirements of the proposed rule. Although some of the commercial buses derived from school bus designs are similar to school bus vehicles not subject to the proposed rule, it is the use patterns of the buses that makes them distinct from school buses. School buses are typically used for local transportation of students from home to school and from school back home. Like transit buses, school buses are typically operated at lower rates of speed with frequent starts and stops. The commercial buses derived from school bus designs are sold to groups that use the buses for both intracity and intercity travel. Some of these buses utilize larger windows and coach-style seating, making them even more like OTRBs.

A school bus is defined in 49 CFR 571.3 as ''a bus that is sold, or introduced in interstate commerce, for purposes that include carrying students to and from school or related events, but does not include a bus designed and sold for operation as a common carrier in urban transportation.'' In other words, the definition of a ''school bus'' is use-based—if it looks like a school bus and operates for school bus purposes, it is a school bus and must comply with school bus requirements. If it looks like a school bus, but is not used for school bus purposes, it is not a school bus and does not have to comply with all school bus requirements. This distinction in the FMVSS is a critical reason why the agency believes school bus derivative buses should be covered under FMVSS No. 217a. Forcing manufacturers to comply with two separate structural integrity requirements would be illogical. However, unlike structural integrity,

[38] According to the NPRM, perimeter-seating bus means a bus with 7 or fewer designated seating positions rearward of the driver's seating position that are forward-facing or that can convert to forward-facing without the use of tools and is not an over-the-road bus.

[39] 86 FR 74284–74285.

there is not an existing vehicle-level school bus-specific advanced glazing standard. Therefore, NHTSA has decided not to exclude school bus derivative buses from the dynamic impact test requirements of FMVSS No. 217a. If a school bus derivative bus weighs greater than 11,793 kg (26,000 lb), it will have to comply with FMVSS No. 217a.

Transit Buses

As part of this final rule, NHTSA is adopting a slightly altered definition of the term ''transit bus.'' The definition proposed in the NPRM read: ''a bus that is equipped with a stop-request system sold for public transportation provided by, or on behalf of, a State or local government and that is not an over-the-road bus.''

In considering how to define the term for this final rule, the agency considered its response to petitions for reconsideration of the final rule for FMVSS No. 227, ''Bus rollover structural integrity,'' concerning the definition of a transit bus. To ensure consistency among standards, NHTSA has decided to adopt the definition adopted in the agency's response to petitions for reconsideration of FMVSS No. 227. This definition of ''transit bus'' differs from the definition proposed in the NPRM.

In the petitions for reconsideration for the structural integrity final rule, petitioners argued that buses that are manufactured as transit buses but sold to entities that are not state or local governments (or operated on behalf of state or local governments) are not considered transit buses. The entities that the petitioners described are either private operators or the federal government. The petitioners stated that these transit-type buses are operated in a similar manner as transit buses operated by state or local governments and should therefore be included in the definition of ''transit bus.''

In NHTSA's responses to petitions for reconsideration of FMVSS No. 227,[40] the agency partially granted the petitioners' request for adjusting the transit bus definition. NHTSA amended the transit bus definition by including transit-type buses operated by the federal government, but not including transit-type buses operated by private entities. NHTSA determined the federal government utilizes transit-type buses in a similar manner as other public transit agencies, but private operators may utilize these buses in higher-risk driving patterns. This amended definition is also being adopted as part of this final rule establishing FMVSS No. 217a. The amended definition of transit bus is now:

''Transit bus means a bus that is equipped with a stop-request system sold for public transportation provided by, or on behalf of, a Federal, State, or local government and that is not an over-the-road bus.''

Emergency Exit Latch Protrusion Limit Requirements Applicability

Two commenters requested clarification on the applicability of the emergency exit latch protrusion limit requirement proposed in the NPRM. ICB commented that it understands the protrusion limits are applicable to all buses, including school buses. SBMTC stated that the protrusion limit requirements should apply to all school buses, regardless of GVWR. To support its request, SBMTC also noted that the NTSB-requested latch protrusion limits are from a crash involving a school bus.

Agency Response

To clarify, in the NPRM, NHTSA proposed that the emergency exit latch protrusion requirement be applicable to the buses to which the dynamic impactor test would apply (OTRBs regardless of GVWR and other large buses, except transit buses, prison buses, school buses, and perimeter-seating buses, and school buses). NHTSA also requested comment on the merits of requiring all buses subject to FMVSS No. 217 to meet the requirement. After reviewing the comments, the agency has decided to adopt this proposal as part of this final rule. To avoid confusion over the applicability of this emergency exit window latch protrusion requirement, NHTSA is creating a new paragraph in FMVSS No. 217 as part of this final rule.

The NPRM proposed adding the protrusion limits into FMVSS No. 217 S5.4.1 and S5.4.2.2. The first section, S5.4.1, applies to emergency exits on all buses except certain emergency exits on certain school buses outlined in S5.2.3. The other amended section, S5.4.2.2, applies only to school buses with a GVWR of 10,000 lb or less. The preamble of the NPRM states ''the maximum latch plate protrusion requirement would be applicable to the buses to which the impactor tests would apply. . . . However, NHTSA is also proposing to extend the maximum latch plate protrusion requirement to other buses as well . . . . NHTSA is proposing to extend the proposed requirement to school buses also.''[41] The proposed amendment did not clearly indicate which bus types would need to comply with the protrusion limits. As stated in the NPRM, NHTSA's intent was for the protrusion limits to apply to all school buses, regardless of GVWR. Therefore, the changes proposed in the NPRM for FMVSS No. 217 S5.4.1 and S5.4.2.2 will not be implemented. Instead, the requirement will be adopted in a different location in FMVSS No. 217, which is reflected in the amended regulatory text at the end of this final rule.

The content of the changes is the same as what was proposed in the NPRM, but the location has changed to be in its own section that applies to all bus types within FMVSS No. 217. This change should alleviate any confusion concerning the applicability of the emergency latch protrusion requirement.

Applicable Window Types

In the NPRM, NHTSA proposed applying the dynamic impact test requirements to all side windows, rear windows, and glazing panels/windows on the roof of applicable buses that met the minimum size requirements. The Motorcoach Enhanced Safety Act directs the agency to consider requiring advanced glazing standards for ''each motorcoach portal'' (section 32703(b)(2)). The Act defines ''portal'' as ''any opening on the front, side, rear, or roof of a motorcoach that could, in the event of a crash involving the motorcoach, permit the partial or complete ejection of any occupant from the motorcoach, including a young child'' (section 32702(9)). NHTSA applied the proposed advanced glazing requirements to the portals the agency believed pose a valid risk of ejection. The agency estimates that side bus windows account for about 80 percent of portals (potential ejection routes) on buses.

The NPRM proposed not applying the dynamic impact test requirements to the front windshield, roof hatches, or any doors that do not contain glazing of at least the minimum size. Accident data from real-world rollover crashes indicate that passenger ejections generally do not occur from the front windshield, emergency doors, or service doors. As proposed in the NPRM, the dynamic impact test procedure applies to windows that have a minimum dimension measured through the center of their area of 279 mm (11 in) or greater.

The NPRM proposed to amend FMVSS No. 217 to specify in S5.4.1 of the standard that emergency exit latches and other related release mechanisms not protrude more than 25 mm (1 inch)

[40] 88 FR 77523.

[41] 81 FR at 27921–27922.

into the opening of an emergency exit when the window is opened to the minimum emergency egress opening (allowing passage of an ellipsoid 500 mm (19.7 inches) wide by 330 mm (11.8 inches) high). The purpose of this proposed requirement was to limit the potential for objects such as latch plates to protrude into the emergency exit window opening space even when the protrusion still allows the exit window to meet the opening size requirements. These requirements were proposed in the NPRM to only apply to emergency exit windows.

Minimum Window Size

Regarding minimum dimensions, ICB and Advocates provided comments and recommendations for changes to the requirements. Advocates expressed concern with the lack of evidence supporting the exemption from testing of windows with a maximum dimension of 11 inches or less. ICB stated that the minimum surface dimension should be 381 mm (15 in) based on a typical side passenger window size for school buses.

Agency Response

The testing standard, as discussed in the Martec report, provides that the window glazing impact loading event is modelled after a motorcoach side rollover with an occupant from one side of the bus being thrown from their seat and impacting glazing on the opposite side of the bus.

As stated in the NPRM: ''The window would be tested if it is large enough to fit the impactor face plus a 25 mm (1 inch) border around the impactor face plate edge without contact with the window frame. The dimensions of the dynamic impactor the agency proposed to use were 177 mm by 212 mm (7 inches by 8.3 inches).'' The headform impactor used in FMVSS No. 217 has a 6-inch diameter, and the minimum required dimension measured through the center of the window is 8 inches for the window to be tested. Using a proportional relationship for the wider (8.3 inch) dimension of the impactor in FMVSS No. 217a results in a minimum required dimension measured through the center of the window's area of 11 inches (279 mm).

As discussed in the Martec report, the loading case was chosen as a representative loading situation so that a minimum level of protection would be provided for all bus occupants, drivers, and passengers, for all crash scenarios. The Martec study determined that the occupant impacting the opposite side window would primarily be through shoulder contact. The impactor was fabricated to represent the mass, stiffness, and contacting area of the United States side impact dummy (US–SID) shoulder. The minimum window dimension is based upon this impactor size. Testing a window smaller than the impactor would cause the vehicle structure around the window to be loaded during testing, thus lowering the force applied to the glazing material. Using an impacting face smaller than the proposed guided impactor face in order to evaluate smaller windows would not be representative of the loading analysis conducted. The agency does not agree with the request to evaluate other crash scenarios for occupant-to-window contact.

ICB requested NHTSA increase the minimum window size to match the size of a typical school bus window, which ICB stated is 381 mm (15 inches). As discussed later in the preamble, since school bus-sized windows are large enough to satisfy emergency exit requirements, they are large enough to become an ejection portal that could permit the partial or complete ejection of a passenger if the glazing is vacated from the opening. Therefore, NHTSA will not increase the minimum window surface dimension as ICB has requested.

Rear Windows

ICB stated that the rear windows should be exempt from the anti-ejection requirements of FMVSS No. 217a. ICB pointed out that in traditional motorcoaches there is typically not a rear window, and that most bus crash injuries and fatalities involve traditional motorcoaches. Additionally, ICB stated that it is not aware of any crash reports for ''a survivable rollover incident that would propel an occupant with such force to the rear of the vehicle that it would eject them through the rear glazing.'' ICB further stated that rear windows are usually partially blocked by forward facing seats, which makes it less likely for passengers to be ejected out the rear of a bus. ICB pointed to a sentence from the Martec report which ICB interpreted to imply that the impactor anvil test does not apply to rear-window glazing.

BBBC stated that the rear windows should be exempt on ''large commercial buses that are constructed substantially the same as school buses'' because they are usually partially blocked by seats. Additionally, BBBC stated that since NHTSA's testing was only performed on side windows, additional research would be required before establishing performance requirements for the rear glazing.

Agency Response

After reviewing the comments from ICB and BBBC, the agency further analyzed typical bus designs, ejection data, and fatal crash data. The agency has concluded that rear bus windows will be excluded from testing as part of this final rule.

In the NPRM, NHTSA proposed applying the dynamic impact test requirements to all side windows, rear windows, and glazing panels/windows on the roof of applicable buses that met the minimum window size requirements. The agency recognized that OTRBs typically have the bus engine in the rear, and therefore usually have no windows on the rear of the bus. However, the agency stated that nothing precludes bus designs from having windows in the rear of the bus that could be potential ejection portals.

The crash type most likely to result in an ejection through the rear glazing would be a rear impact. As stated by ICB and BBBC and confirmed by NHTSA, there were no recorded fatalities in applicable buses from rear impact crashes in the 2006–2019 FARS data. While it is conceivable occupants could be ejected through the rear glazing in other crash types, it is less likely. Further, as BBBC indicated, rear windows in large buses that are not OTRBs are often substantially blocked by the rear seats. As a result, occupants are less likely to be ejected through the rear glazing. In the event of a partial ejection through a rear window, the occupant is less likely to experience serious injury or death, because there is a low likelihood the bus will roll onto its rear side.

The requirements and evaluation procedures of FMVSS No. 217a are based upon analysis of unbelted passenger impacting side bus windows during a rollover crash scenario. This loading case was chosen as a representative loading situation so that a minimum level of protection would be provided for all bus occupants, drivers, and passengers, for all crash scenarios. Therefore, as a practical matter, NHTSA has decided rear windows will be exempt from the impact test requirements of FMVSS No. 217a.

Windows Mounted on Doors and Hatches

ICB questioned whether the dynamic impact test requirements apply to all window glazing, including those in doors and emergency exit hatches. In their comments, ICB argued that ''NHTSA did not intend for the glazing anti-ejection requirements to be applicable to glazings in any door or roof hatch emergency exit and we ask that NHTSA make that clear in the final rule.'' BBBC stated that the NPRM did not ''adequately convey NHTSA's intention to exclude windows that are part of a side or rear door.''

Agency Response

Both BBBC and ICB stated that windows which are part of doors should be exempt from the anti-ejection requirements. NHTSA has observed that in current buses there are typically windows in the emergency exit doors and in regular doors. The agency stated in the NPRM that NHTSA would not be applying the proposed requirements to the front windshield, or to emergency exit doors, service doors, or roof hatches. The agency does not intend to apply the glazing ejection mitigation requirements to the structure securing side and rear doors to the vehicle. However, all bus windows are potential ejection portals if the glazing material breaks. If a window in a side door or roof hatch and has the requisite minimum dimensions of 279 mm (11 in) or greater measured through the center of its area, that window will be subject to the proposed anti-ejection requirements.

The agency has concluded that this final rule is applicable to all side and roof window glazing that meet the minimum window dimensions. Furthermore, NHTSA wishes to clarify that the anti-ejection requirements proposed for FMVSS No. 217a do not apply to the non-window portion of doors, service doors, or roof hatches. Any window in a door, service door, or roof hatch would have to meet the anti-ejection requirements if such a window exceeds the minimum size (279 mm or 11 inches) specified in S5 of FMVSS No. 217a.

School Bus Sized Windows

SBMTC commented that school bus size windows used on commercial buses derived from school bus designs are too small to be covered by the proposed anti-ejection requirements. BBBC, ICB, and SBMTC claimed that since OTRBs have larger windows than the commercial buses derived from school buses, commercial buses with these windows should not be subject to the same requirements as traditional OTRBs. ICB indicated that it does ''install larger 'non-typical' school bus windows in some of its commercial buses and [it is] not asking for any exemption for these larger bus windows.''

Agency Response

First, as mentioned in the preceding paragraphs, if a bus derived from a school bus design is not a school bus and has a GVWR greater than 11,793 kg (26,000 lb), it will have to comply with FMVSS No. 217a. The fact that certain school bus derivative buses may have smaller windows does not change this requirement. Furthermore, FMVSS No. 217 requires buses other than school buses to have emergency exit windows large enough to ''admit unobstructed passage, keeping a major axis horizontal at all times, of an ellipsoid generated by rotating about its minor axis an ellipse having a major axis of 50 centimeters and a minor axis of 33 centimeters.'' Since these school bus windows are large enough to satisfy emergency exit requirements, they are large enough to become an ejection portal that could permit the partial or complete ejection of a passenger if the glazing is vacated from the opening. FARS data from 2006–2019 include 26 fatal ejections from school buses with a GVWR greater than 26,000 lbs. This data shows that school bus sized windows can become ejection portals.

Lastly, although school bus derivative buses may use the same sized windows as school buses, NHTSA believes that school bus derivative buses are more likely than school buses to be used in a manner that has a higher risk of crashes. Therefore, although school bus derivative buses may have smaller windows than traditional OTRBs, these windows are large enough for a passenger, especially a child or smaller adult, to be fully or partially ejected through if such a window is broken out from the surrounding bus structure. Accordingly, a bus being equipped with ''school bus sized'' windows will not create an exemption to FMVSS No. 217a under this final rule. If the windows are large enough to be tested with the impactor, the fact that the windows are ''school bus sized'' will not impact their applicability to this standard.

Driver Side Windows

Both BBBC and ICB commented that because seat belts should protect bus drivers from ejection, driver side windows should be exempt from this final rule. ICB indicated that the seat belt usage rates for bus drivers is as high as or higher than the 84% rate for commercial truck drivers listed in a Federal Motor Carrier Safety Administration (FMCSA) study.[42]

Agency Response

The agency has decided not to exempt driver side windows from the requirements under this final rule. FARS data from 2006–2019 show 9 drivers were fatally ejected from school buses with a GVWR greater than 26,000 lb.[43] The numbers of ejected drivers are relatively low, but the risk is present in bus crashes. Also, advanced glazing in driver side windows will protect the drivers against partial ejections. Bus manufacturers will be able to use similar anti-ejection design features for driver side windows as those anti-ejection features used for the remaining bus windows. Under the final standard, if a bus driver side window meets the minimum size requirements, it will have to meet the requirements of FMVSS No. 217a.

Blocked Windows

SBMTC commented that some side wheelchair lift doors are ''effectively blocked by the stowed wheelchair lift'' and that as a result, these windows do not pose a risk for ejection. ICB commented that NHTSA should exclude glazing in ''[d]oors, such as wheelchair lift doors, that have equipment or other items that would prevent or restrict passenger ejection.'' ICB also commented that doors with no adjacent seat should be exempted from the 217a requirements.

Additionally, BBBC argued that NHTSA did not intend to apply the dynamic test requirements to glazing in wheelchair lift doors, ''which would have a wheelchair lift between the passenger and the window.'' BBBC also stated that in many of the buses it manufactures, the rear seats obstruct much of the rear window. BBBC stated these obstructed windows should be exempt from the dynamic impact test requirements.

Agency Response

SBMTC, BBBC, and ICB stated that since wheelchair lift ramps block the window in the wheelchair access door, such windows should not have to meet the proposed anti-ejection requirements. The agency examined different wheelchair access doors and the wheelchair lift ramps in their stowed positions. Some lift ramps are stowed outside the bus in a storage compartment under the bus. Other configurations stow the ramp inside the bus in a folded position. These interior

[42] Safety Belt Usage by Commercial Motor Vehicle Drivers (SBUCMVD) 2013, U.S. Department of Transportation, Federal Motor Carrier Safety Administration (FMCSA).

[43] According to the 2006–2019 FARS data, 6 of these fatal driver ejections were through a side door opening, 1 was through a side window, 1 was through the windshield, and 1 was an unknown ejection path.

ramps may partially block the door window.

Windows that have no blockage will have to meet the anti-ejection requirements, since no part of the vehicle would block a passenger from contacting the window. Windows completely blocked by wheelchair lift ramps will not have to meet the anti-ejection requirements, since passengers would not be able to contact such windows. Windows that are partially blocked by wheelchair lift ramps would need to meet the anti-ejection requirements if the daylight opening of such windows is large enough such that the minimum dimensions measured through the center of the daylight opening area is not less than 279 mm. Note that the definition of daylight opening states that the periphery includes surfaces 100 mm inboard of the window and 25 mm outboard of the window, not including gaskets, weather stripping, grab handles, or seats. Also, since bus passengers can walk about the bus while it is in motion, the agency does not agree with ICB's suggestion to restrict the anti-ejection requirements to only those windows which have a seating position near that window glazing.

Emergency Exit Windows and Latches

ICB agreed with the agency that the window latch release mechanism should not be a hindrance in evacuations through the emergency window exit. Both BBBC and ICB argued that the protrusion limits are intended to only apply to emergency exit windows, and not to other types of emergency exits such as doors or hatches. Both respondents specifically asked for the word ''window'' to be inserted into the sentence planned for the end of FMVSS No. 217, S5.4.1 so that their interpretation of the protrusion requirement applicability is specifically written into the standard.

Agency Response

The NPRM was silent on protrusion concerns for emergency exit doors and roof hatches. The NPRM did discuss latch protrusion issues in the context of the emergency exit windows on the school bus involved in the Gray Summit crash. Additionally, no other respondents commented on the lack of concern for protrusions impeding passenger emergency egress through side door or roof exits. The confusion over which emergency exits are subject to the protrusion limits may stem from the section of regulatory text into which the protrusion limits were placed.

FMVSS No. 217, S5.4.1 does not specifically list the emergency exits to which that section applies. Further, the title for FMVSS No. 217 S5.4 is ''Emergency exit opening,'' not ''Window emergency exit opening.'' Window emergency exits are a subset of roof, side, and rear emergency exits. Placing the emergency window exit protrusion limits into a section covering multiple types of exits may have created confusion for the respondents that asked for this clarification. The protrusion limit for emergency exit window latches is also to be applied to school bus emergency exit windows, through addition of the similar text into S5.4.2.2 of FMVSS No. 217. However, to avoid additional confusion by including an emergency exit window specific provision into a section devoted to small school bus emergency exit doors, the agency has decided to place the emergency exit latch protrusion requirement at the end of S5.4.

As mentioned above in the discussion on the protrusion limit applicability for all buses, the agency is relocating this requirement into a new subsection, FMVSS No. 217 S5.4.4, so that the requirement will be more easily understood as applicable to all buses included in FMVSS No. 217. This location also clarifies the application of the protrusion requirements is only for window emergency exits. The NPRM's proposed text additions to FMVSS No. 217 S5.4.1 and S5.4.2.2 are not being adopted and the new S5.4.4 contains the planned protrusion limit requirements. NHTSA is including the word ''window'' in the standard for clarification as ICB and BBBC suggested.

c. Occupant Injury Protection

In the event of a rollover crash involving a large bus or OTRB, there is concern for more than just injury or death resulting from ejection from the bus; there is also a risk that passengers may suffer injuries from impacting reinforced glazing during a crash. While the main objective of this final rule is to protect occupants by preventing ejection through windows and glazing panels, the agency has also considered the impact forces bus occupants would experience when contacting the advanced glazing during a crash. Several commenters discussed this potential issue, and a summary of those comments along with the agency's responses can be found in the paragraphs below.

Rigidity of Advanced Glazing

Greyhound, Prevost, and Van Hool suggested that advanced glazing would be too rigid, causing an increase in the number and severity of passenger injuries. Greyhound commented ''that NHTSA should consider technologies that reduce ejections while not increasing impact injuries.'' Van Hool stated that ''[t]he passenger on the rollover-side wearing the seat belt in a bus according to this NPRM might be victimized because in a single rollover his head will hit a surface that is strong enough to retain the body of a free-falling passenger of the other, non-rollover side.'' Prevost stated, based upon information in a 2007 Los Angeles Times article, that ''[laminated] glass could increase head and neck injuries to passengers who wear seat belts.''

Agency Response

The agency shares the respondents' concerns for injuries caused by collisions with advanced glazing and window panels in OTRB and large bus crashes. However, the agency disagrees with the argument that advanced glazing may cause injuries which would not otherwise occur from a broken or unbroken tempered glazing panel.

The Los Angeles Times article that Prevost referenced provided no supporting information for the conclusion that laminated glazing is harder than tempered glazing material. The agency has force deflection data from the bus glazing panel research conducted for this final rule, which can be seen in Table 7 below. In tests where the guided impactor struck the center of bus windows made of a single glazing panel, the tempered glazing panels had higher peak force levels and lower deflections than glazing panels made from laminated glass, polycarbonate, and acrylic. This test data indicates that tempered glass is harder and more rigid than the other glazing types, including laminate glass. The higher force levels and lower deflections indicate that a bus occupant hitting tempered glazing at high speeds could receive higher contact injuries than if they were to hit a different type glazing material.

TABLE 7—DATA FROM BUS GLAZING GUIDED IMPACTOR TESTING [44] SINGLE PANEL WINDOW GLAZING

Glazing configuration (bonding method)	Actual impact velocity (km/h)	Peak force (N)	Peak impactor face excursion (mm)	Interior glass pane broken
Laminated glass (Rubber)	21.5	4,780	116	Yes.
Laminated Glass (Rubber)	21.2	5,879	106	Yes.
Tempered Glass (Rubber)	21.3	8,030	49	No.
Acrylic (Rubber)	21.4	6,211	66	No.
Tempered Glass (Glued)	20.8	8,518	41	No.
Laminated Glass (Glued)	20.9	7,592	57	Yes.
Polycarbonate (Glued)	21.2	6,822	69	No.

In the case of belted occupants, a belted occupant seated against the bus side wall is at risk of partial ejection of their upper torso, hands, arms, neck, and head if the window breaks. It is safer for any passenger to be retained inside the bus by an advanced glazing surface than to be partially outside the bus when it hits and/or slides along the pavement or ground. According to FARS data from 2006–2019, thirty-nine percent of all large bus and OTRB fatalities were ejected, as detailed in Table 8 below. Because the vast majority of occupants in large bus and OTRB crashes are not ejected, this data and study prove that, in the event of a rollover crash, it is safer for an occupant to remain inside the vehicle than to be ejected, even though that may mean a potential collision with an unbroken advanced glazing panel.

TABLE 8—OCCUPANT FATALITIES BY EJECTION STATUS FARS 2006–2019

[Large buses (GVWR greater than 26,000 lb) and all OTRBs]

Bus type	Not ejected	Ejected	Total
Van-based	1	0	1
Large Van	0	0	0
Intercity Bus	117	96	213
Other Bus	46	13	59
Unknown Bus	8	3	11

Other Means of Injury Prevention

In Greyhound's comment, it urged the agency to consider alternative technologies to prevent passenger ejection and reduce injuries. Greyhound suggested that the advanced glazing will not prevent fatalities due to ejection. Greyhound suggested that there are ''other technologies, including those in use in the automotive and trucking industries, which may have a higher likelihood of retaining passengers in the vehicle in rollover/tipover events.''

Agency Response

NHTSA is always willing to consider specific proposals that may enhance passenger safety in the agency's final rules. However, in this instance, Greyhound did not provide a name or description of the ''other technologies'' that may be more effective than advanced glazing in mitigating the risk of passenger ejection in OTRB and large bus crashes. Additionally, Greyhound may have overlooked several general aspects of occupant movement during a crash. All occupants come to a stop at some point during a crash; the main question is how occupants stop. The answer to this question plays a significant role in determining the extent of passenger injuries or even risk of death in rollover crashes. The proposed requirements of this rule provide partial ejection protection for belted occupants seated against bus windows as well as protection against partial or complete ejections of unbelted passengers that may fall or move into the ejection portal created by a broken window. As stated above, the agency welcomes comments about other technologies or vehicle safety countermeasures that others believe would be more beneficial than the requirements proposed in the NPRM. However, in this case, there simply is not enough detail in Greyhound's comment to compare ''other technologies'' to the proposals in the NPRM. The agency is confident that the new requirements adopted in this final rule will be highly effective in mitigating the risk of passenger ejection during rollover crashes involving large buses and OTRBs.

d. Test Procedures and Equipment

Multiple commenters discussed the dynamic impact test procedure and the equipment used to conduct the dynamic impact test. The agency has decided to adopt a few of the recommendations made in the comments, which means the adopted test procedure will be slightly different from the test procedure proposed in the NPRM. Specifically, the agency is amending the proposed regulatory text for the window pre-breakage procedure as well as the edge impact test procedure for increased clarity.

Guided Impactor Specifications

Two of the commenters asked for more details to be provided for the guided impactor test equipment. BBBC requested that NHTSA change the word ''mass'' to the phrase ''mass to bring total mass of impactor to 26 kg'' in the proposed Figure 1 of the regulatory text, which illustrates the guided impactor. Additionally, BBBC and SBMTC requested more details on the foam used on the impactor face.

Agency Response

The impactor design being adopted as part of this final rule is the same impactor design proposed in the NPRM. The agency has decided not to change the language for the proposed impactor

[44] Duffy, S., & Prasad, A., National Highway Traffic Safety Administration, Motorcoach Side Glazing Retention Research, pg 18, (Report No. DOT HS 811 862) (Nov. 2013).

test as BBBC requested, as the agency does not believe that these changes are necessary to provide the clarity BBBC requested. Instead, NHTSA has made a few changes to the impactor design figure, shown below as Figure 1, which will be included in the regulatory text as well as a separate technical supporting document that can be found in the docket for this rulemaking (Technical Support Document). The changes to the figure are designed to provide additional clarity, and the agency believes these changes will resolve any confusion BBBC had regarding the mass of the impactor design.

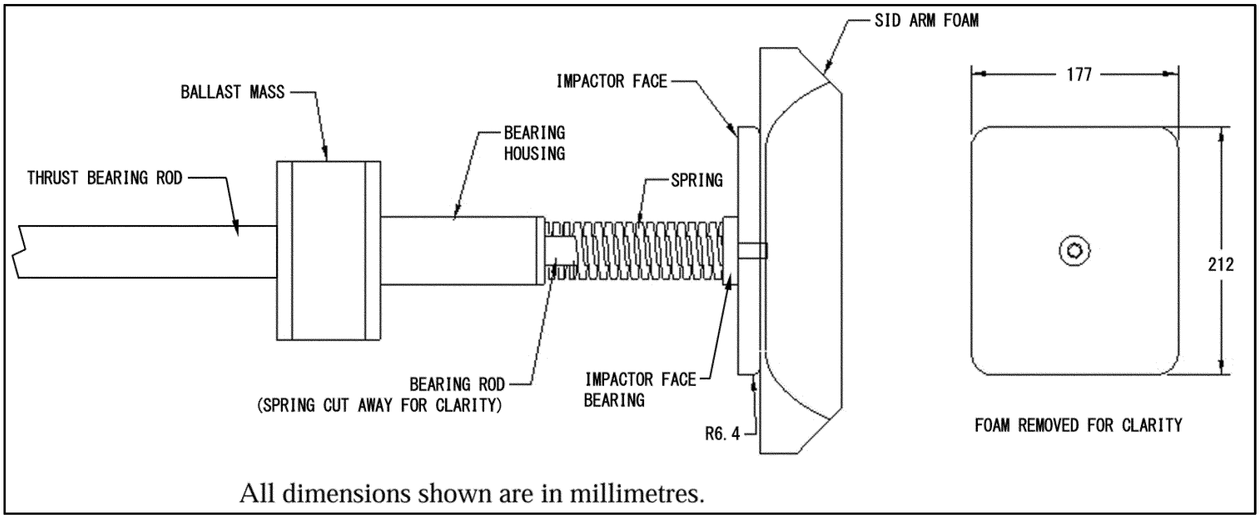


Figure 1: Components of the Guided Impactor

The changes between this figure and the figure proposed in the NPRM include (1) changing the term ''mass'' to ''ballast mass,'' (2) changing the term ''foam'' to ''SID arm foam,'' (3) adding the ''thrust bearing rod'' to the figure, and (4) labeling the ''impactor face bearing.'' This figure now illustrates and names all components of the impactor that contribute to the overall mass of 26 kg (57 lb). The Technical Support Document includes more details and figures that provide example masses for each component.

As proposed in the NPRM, the agency is adopting the requirement that the total mass of the impactor be 26 kg (57 lb), which represents the effective mass measurements from the Martec study. The impactor is designed to represent the torso of the SID. To clarify, when the regulatory text says that the impactor must be a total mass of 26 kg (57 lb), it is referring to the mass of the entire impactor assembly, not just one component of the impactor. In Figure 1 above—which will also be adopted as part of the regulatory text—the agency has decided to show the entire impactor assembly, and has labeled one component of the impactor as the ''ballast mass.'' The agency believes the clarification of the ''total mass of the impactor'' combined with labeling the ballast mass will alleviate any confusion BBBC had on the mass issue.

Regarding the foam used on the impactor face, in an effort to provide greater clarity, the agency is able to share the following additional details. The foam used on the impact side of the impactor plate is the 50th percentile male side impact dummy (SID) arm foam. SID arm foam is composed of a piece of urethane foam, conforming to the properties listed in the Technical Support Document. Additional details of the foam can be found in the Technical Support Document, and a copy of the engineering drawing, SID–069, is also in the docket of this final rule.

Window Pre-Breakage Test Procedure

In the NPRM, NHTSA proposed a breaking specification and method that involves applying a line load to the glazing, to simulate the damage the glazing could experience in a rollover prior to impact by an occupant. The line loads would be applied at set distances on both the interior and exterior glass plies of the laminated glazing. The window breaking procedure would damage but not destroy laminated glazing, while it would obliterate tempered glazing. Since tempered glazing would be obliterated, this proposal would have the effect of prohibiting manufacturers from having applicable bus windows made solely from tempered glazing.

The first step in the proposed test procedure is to mark the glazing surface on the occupant-side interior glass in a horizontal and vertical grid of points separated by 75 mm (3 inches), with the first point coincident with the geometric center of the daylight opening. Next, the grid on the opposite side of the glazing would be marked. For most glazing, the grid on the opposite side of the glazing would be staggered to avoid tearing the PVB interlayer. For laminates, ''the opposite side of the glazing'' means the opposing glass ply directly opposite of the PVB interlayer. ''Staggered'' means that the 75 mm (3 inch) offset pattern has a 75 mm × 75 mm (3 inch × 3 inch) pattern on the occupant-side interior glass and the same pattern, offset by 37.5 mm (1.5 inch) horizontally and vertically, on the outside exterior glass surface.

For windows that are a single-pane unit, NHTSA would use the grid pattern on the occupant-side interior surface and the staggered grid pattern on the outside exterior surface of the glazing.

For double-glazed windows, the agency proposed using a grid pattern on the occupant-side interior surface of the interior pane and on the outside of the exterior pane. For double-glazed windows that consist of one pane of tempered glass, that pane would be broken and removed, and the remaining glazing (that is not of tempered glass) would be pre-broken on both sides (occupant interior and outside exterior) with the grid and staggered grid patterns, respectively. For double-glazed windows that do not consist of any tempered glass pane, it would not be practical to apply the 75 mm (3 inch) pre-break pattern to the insulated surface (inside the air gap) of the individual panes. For cases in which neither pane is tempered glass, both the occupant side of the interior pane and the outside of the exterior pane would be marked in the grid pattern, but the patterns would not be offset (one side would not use the staggered pattern) due to a lack of need. That is, for those windows there would be little likelihood of tearing the PVB interlayer even when the patterns are not offset.

The agency proposed breaking the defined grid points using an unloaded electric staple gun, since the device worked well for that purpose in our developmental testing. The staple gun would apply a 12.7 mm (0.5 inch) line load (with a thickness of 1.3 mm (0.05 inches)) (the size of a standard staple) onto the glazing with a force in the range of 3,500 newtons (N) (787 lb) to 5,000 N (1,124 lb) when the front nose opening of the staple gun is held parallel to the glazing surface. These staple gun specifications are intended to break the glass with a single punch without producing tears in the PVB interlayer. These line loads would be applied to the glazing starting with the inside surface of the glazing, and starting with the forwardmost, lowest hole in the pattern. NHTSA would continue applying the line loads 75 mm (3 inches) apart, moving rearward on the bus. When the end of a row is reached, the agency would move to the most forward hole in the next higher row, 75 mm (3 inches) from the punched row. After completing the applications on the inside surface, the agency would repeat the process on the outside surface.

When applying the line load, NHTSA would place a 100 mm (4 inch) by 100 mm (4 inch) piece of plywood on the opposite side of the glazing as a reaction surface against the punch. If a particular window were constructed such that the inner laminated material is penetrated or damaged, the procedure would not be halted or invalidated. The impactor test would be conducted at the conclusion of the glazing breakage procedure. If punching a hole causes the glazing to disintegrate, as would occur when testing tempered glazing, the procedure would be halted for that item of glazing and the impactor test would be conducted on what glazing, if any, remains. If there is no glazing remaining after the hole-punching procedure, there would be a failure to comply since the window would not be able to restrain the impactor or prevent passage of the 102 mm (4 inch) diameter sphere.

BBBC requested that the specific electronic staple gun used during the agency's research testing be specified in the final rule. ICB commented that it does not understand why the FMVSS No. 226 spring-loaded center punch breakage method is not practical for this proposed regulation. SABIC, Exatec, and ICB each noted that it may not be possible to break or even force holes into all types of glazing, specifically glazing made from polycarbonate material. ICB also requested improved clarity through the addition of figures or diagrams for the glazing pre-breaking procedure.

Agency Response

While the agency understands BBBC's preference for a glazing material breakage procedure identical to that used during the agency's testing, NHTSA does not believe it is necessary to specify a model of electronic staple gun to be used in the regulatory text and will not being doing so as part of this final rule. Instead, the agency has decided to specify the length over which the line load is to be applied as well as the force applied by the staple gun to the glazing. Although the agency did not list any force level in the NPRM's proposed regulatory text, NHTSA believes it will be useful to include the average force level (4,200 N (994 lb)) and standard deviation (850 N (191 lb)) obtained from sampling the Duo Fast Model EWC electric staple gun force levels as the target force in this final rule. This force was adequate to break the laminate glazing's glass layer without tearing the inner PVB material. For these reasons, NHTSA declines to accept BBBC's suggestion to list a specific electric staple gun model in the final rule.

ICB questioned why NHTSA developed a new glass breakage procedure that differs from the existing glass breakage procedure in FMVSS No. 226. As stated in NHTSA's ''Motorcoach Side Glazing Retention Research,'' [45] ''[i]t was quickly determined that the automatic center punch used in FMVSS No. 226 was not practical for large bus windows and was not tested in this study.'' Due to the effort required to actuate the center punch and the large size of motorcoach windows, NHTSA determined the center punch used in the FMVSS No. 226 glazing pre-breaking procedure would not be a practical tool for the FMVSS No. 217a glazing pre-breaking procedure. Accordingly, NHTSA developed the breakage procedure proposed in the NPRM and is adopting that procedure as part of this final rule.

SABIC, Exatec, and ICB each shared concerns that the glazing breakage procedure could effectively preclude usage of their polycarbonate glazing material. These commenters stated it may be possible that certain glazing types would receive little to no marking when attempting to break that glazing using the required glazing breakage procedure. Their stated concern is that if no hole can be made, then their glazing cannot pass the test. A similar concern was addressed in the final rule for FMVSS No. 226.

Like FMVSS No. 226, the hole break pattern for FMVSS No. 217a will be marked onto the bus's window glazing, as shown in the regulatory text below, then the electric staple gun would be used once at each marked location. It is possible that certain glazing may have smaller, or no holes produced. Similar to the agency's response to the comment in response to the FMVSS No. 226 NPRM, NHTSA believes that even if certain glazing may have smaller, or no holes produced by the breakage procedure being adopted in this final rule, the window may still be weakened and should be tested in accordance with the rest of the procedures outlined for the impact test.

Even though the agency has decided to adopt the pre-breakage test procedure as proposed in the NPRM as part of this final rule, NHTSA has decided to include an additional figure to the regulatory text to aid in the clarification of the glazing pre-breakage procedure as ICB requested. The combined proposed revision to FMVSS No. 217a is shown in the appendix of this final rule.

Edge Impact Test Procedure

During agency review, NHTSA determined the edge impact test procedure could be improved with three distinct updates, which are described briefly here. The first update is to describe the impactor positioning for an additional glazing orientation. For the scenario where a window on the bus roof does not have a latch or other discrete attachment point, the agency has decided to define which edge with which to align the impactor. In order to be consistent with side windows that do not have a latch, the agency is using the rearmost edge of a roof window as the reference edge because if a latch were present, it would likely be located on the rearmost edge due to the

[45] Duffy, S., & Prasad, A., National Highway Traffic Safety Administration, Motorcoach Side Glazing Retention Research, pg 18, (Report No. DOT HS 811 862) (Nov. 2013).

requirement in FMVSS No. 217 S5.2.3.2(b). Second, the agency determined a tolerance to properly define the lateral distance between the impactor face plate edge and the window frame. NHTSA is defining a tolerance of ± 2 mm based on the positioning of a similar impactor as described in FMVSS No. 226, ''Ejection mitigation.'' The third update is necessary to further clarify the alignment of the impactor face plate with respect to a latch. Due to varying latch designs, the center of the latch may not necessarily correspond to the center of the location where the latch attaches to the movable portion of the window. Because the location where the latch attaches to the movable portion of the window is where the latch is most likely to fail, the agency has decided to specify that location for the edge impact procedure by referencing the latch attachment point when aligning the impactor. The agency is adopting these three updates to the edge impact test procedure as part of this final rule.

e. Performance Requirements

Impact Testing Displacement Limits

In the NPRM, NHTSA proposed to specify performance requirements for windows comprised of unbroken and broken glazing when the glazing is subjected to impactor testing. In NHTSA's impactor test of glazing near a latching mechanism and in the impactor test of glazing at the center of the daylight opening, an ''ejection reference plane'' would be determined prior to the test. The plane would be based on the passage of a 102 mm (4 inch) diameter sphere through a potential ejection portal of the window. The agency would require that no part of the window (excluding glazing shards) may pass this ''ejection reference plane'' during the dynamic impact test. If any part of the window glazing or window frame passes the plane, there would be a failure to comply.

For unbroken glazing, the window would be subject to either of the following two impacts, as selected by NHTSA in a compliance test: (a) an impact near a latching mechanism, and (b) an impact at the center of the daylight opening. The displacement limit for these tests on the unbroken glazing was proposed to be 102 mm (4 inch) both during and after the test.

For pre-broken glazing, the window would be subject to an impact test at the center of the daylight opening. The displacement limit for this test was proposed to be 175 mm (6.89 inch) during the test and 102 mm (4 inch) after the test.

Advocates expressed concerns that the pass/fail criteria for the rule had not been adequately supported. Advocates stated that the 6.9-inch excursion limit and the 4-inch dynamic displacement limits are inadequate requirements. Advocates was concerned that ''[a]ny amount of excursion exposes the occupant in contact with the window to impacts with objects outside of the vehicle such as the roadway, and as such should be reduced the greatest extent possible.'' Advocates requested that the agency ''establish requirements that push the industry to adopt the safest reasonable practices, as opposed to the bare minimum or current average performance.''

Regarding permitted deflections, ICB provided comments and recommendations for changes to the requirements. ICB stated that there should not be a deflection requirement based on the ejection reference plane as part of the requirement.

Agency Response

The agency has decided not to adjust the proposed excursion limit of 175 mm for the pre-broken glazing impact test. Advocates stated that the agency used the International Code Council (ICC) guardrail spacing requirements as justification for 102 mm excursion limits in FMVSS No. 226. Advocates are incorrect in this belief, as the final rule notice establishing FMVSS No. 226 noted that other FMVSSs (FMVSS No. 206 and FMVSS No. 217) as well as the ICC have a 100 mm maximum limit on a portal/opening to minimize the risk of an occupant being ejected or of a child passing through the portal/opening. The final rule establishing FMVSS No. 226 reported that test data highlighted an increased likelihood of large portals forming when excursions were over 100 mm. The agency believes that the 102 mm excursion limit based upon the ejection reference plane remains an appropriate requirement.

Concerning the 175 mm displacement limit for the pre-broken glazing test, the agency asked for comments and additional data in the NPRM. NHTSA noted in the NPRM that this limit was based on two tests of a single production bus window design. It was also noted in the NPRM that results from laminate glazing testing conducted for the Martec study resulted in an average displacement of 175 mm for the impactor in the center of daylight opening impacts (using the 75 mm (3 inch) diagonally offset pattern).

No other respondents commented either for or against the excursion limits. Advocates stated that ''excursion exposes the occupant in contact with the window to impacts with objects outside of the vehicle such as the roadway, and as such should be reduced the greatest extent possible.'' As discussed earlier, the manner in which occupants come to a stop during a crash will contribute to the extent and severity of their injuries. Based on data from NHTSA's ''Motorcoach Side Glazing Retention Research,'' [46] where different configurations of pre-broken laminated glass window units were impacted at the Martec conditions, the thicker PVB layer resulted in lower excursion limits and higher impact force values for almost all of the pre-broken glazing configurations.

Advocates did not offer any additional data, studies, or suggestions for what a better, lower excursion limit should be for the pre-broken glazing test. Using the data at the agency's disposal, an excursion limit of 175 mm is reasonable and sufficient. NHTSA chose this excursion limit based on practicability, costs, and safety needs. Using a 100 percent thicker PVB layer yielded a 14 percent lower excursion limit in our testing. This method is effective for manufacturers to reduce the excursion limit if necessary to comply or for slight improvements. The NPRM requested comments on the practicability, costs, and potential benefits of using a lower excursion limit such as 146 mm, which is the average excursion found during the testing with the thicker PVB layer (using the same 75 mm diagonally offset breaking procedure). Advocates did not provide any comment on this aspect of the excursion limit, nor did any other commenter. Therefore, the agency will not adjust the proposed excursion limit of 175 mm for the pre-broken glazing impact test.

ICB also expressed doubt regarding the appropriateness of deflection limits as part of the bus glazing anti-ejection requirements. ICB suggested that the glazing and window frame should be allowed to flex. The agency understands that window glazing, and perhaps even the window frame, will flex when hit by the guided impactor face. However, unlimited flexing, or displacement, is undesirable because glazing deflection past the ejection reference plane would allow tears to develop in glazing that could lead to an ejection portal. Additionally, the displacement limit provides a means of ensuring the

[46] Duffy, S., & Prasad, A., National Highway Traffic Safety Administration, Motorcoach Side Glazing Retention Research, pg 18, (Report No. DOT HS 811 862) (Nov. 2013).

window does not open during the impact test, which would result in a portal for occupant ejection. Limiting the deflection to the ejection reference plane ensures that a minimum level of passenger retention will be maintained by the bus window glazing material. Therefore, the agency is not adopting ICB's recommendation to remove the deflection limit for the unbroken window test.

Emergency Exit Window Latch Protrusion

The NTSB investigation into the Grey Summit bus crash noted that passenger egress through the emergency exits was hindered when passengers snagged their clothing on the emergency exit latch hardware protruding into the egress route.[47] Several passengers in the lead school bus, and a witness who assisted in the evacuation, stated in post-crash interviews that emergency egress was hindered by the design of the emergency exit window. Particularly, the 4-inch by 3-inch emergency release latch plate for the emergency exit window was elevated about 1 inch from the window base and snagged the clothing of several passengers as they were exiting through the window opening.

The additional requirements as outlined in the NPRM proposed to limit how far emergency exit latches may protrude into the emergency exit opening. The NPRM for this rule proposed that emergency exit latch protrusions cannot extend more than 1 inch into the opening of the window when the window is opened to the minimum emergency egress opening specified under FMVSS No. 217. This opening is described in S5.4.1 as ''large enough to admit unobstructed passage, keeping a major axis horizontal at all times, of an ellipsoid generated by rotating about its minor axis an ellipse having a major axis of 50 centimeters and a minor axis of 33 centimeters.'' The NPRM proposed making all buses governed under FMVSS No. 217 applicable under this requirement.

The NTSB agreed that emergency exit window latches need to be functional after a crash to ensure passengers can egress through all viable exits; consequently, the NTSB supported testing the latches after impact tests. Advocates also supported the agency's proposals to minimize emergency exit latch protrusions and to require these latches to remain operable following the impact testing.

[47] NTSB/HAR–11/03, *https://www.ntsb.gov/investigations/AccidentReports/Reports/HAR1103.pdf,*

Concerning the 1-inch protrusion limit proposed in the NPRM, both the NTSB and Advocates requested a lower limit for allowable protrusion. NTSB noted that the emergency latch in the Gray Summit crash protruded 1 inch into the emergency exit opening; therefore the proposed 1-inch maximum limit would not have prevented clothes from snagging in that crash scenario. NTSB noted that the manufacturer has since decreased the height of its buses' emergency release latch plate so that it does not protrude into the window opening more than 0.5 inches. Advocates stated in their comments that there exist ''flush-mount [latch] designs that entail no protrusion at all.'' However, they added that these latches are implemented in non-motorcoach designs. NTSB stated that, if NHTSA allows any degree of latch protrusion, the latch should be designed to eliminate its potential to snag clothing or otherwise impede evacuation.

SBMTC suggested NHTSA should provide a formal definition of ''opening'' as used in the proposal that ''emergency exit latches, or other related release mechanisms, shall not protrude more than 25 mm into the opening of the emergency exit when the window is in the open position.'' ICB commented that the ''protrusion requirement applies to a latch or latch mechanism that is attached and remains with the bus body structure and not to a latch or latch mechanism that is attached to and moves with the exit window itself.'' ICB wrote that the protrusion limit applies to anywhere in the window opening, even if the opening is larger than required for the passage of the ellipsoid specified in S.5.4.1. ICB also asked if ''a latch or latch mechanism, that is spring loaded and protrudes more than 25 mm into the window opening in order to release the window, but then returns to a position that protrudes less than 25 mm, would be compliant with this requirement.''

Agency Response

The agency has decided that it cannot justify a reduction in the emergency exit window latch protrusion requirements based on the comments and data provided in response to the NPRM. It is unknown at this time what the financial burden on the industry would be to require emergency exit latches to be replaced with flush-mount designs or reduced protrusions. It is also unproven at this time whether flush-mount latch designs would withstand the impact forces from the FMVSS No. 217a impact tests without additional modifications. The commenters did not provide information on the current status of latch designs used in different bus types, or what changes would be needed to comply with their suggested lower protrusion limits. Therefore, although we acknowledge that a one-inch protrusion may hinder egress in certain cases, NHTSA is denying the requests to reduce the emergency exit window latch protrusion limit.

ICB is correct that the protrusion limits apply only to the latch components that remain with the bus structure. The latch protrusion in the Grey Summit bus crash that snagged on occupants' clothing was mounted to the bottom of the window frame. Latches and related components that protrude into the window opening from the fixed bus structure are difficult for occupants to avoid when attempting to climb through the window opening during an emergency. This difficulty results in a high likelihood of the protrusion snagging onto occupants' clothing. If the latch components are located on the portion of the emergency exit window that opens, the occupant would likely be able to reduce the risk of snagging any protrusion by opening the window farther. Thus, the protrusion limits apply only to the latch components that remain with the bus structure when the emergency exit window is in the open position to allow passage of the ellipsoid specified in S5.4.1 of FMVSS No. 217.

ICB stated the protrusion limit applies to anywhere in the window opening even when the window is opened beyond what is required by S5.4.1 of FMVSS No. 217. This statement is incorrect. As proposed in the NPRM, the protrusion limit only applies to the window opening when the emergency exit is opened to the amount necessary to admit unobstructed passage of the ellipsoid specified in S5.4.1 of FMVSS No. 217.

ICB asked if ''a latch or latch mechanism, that is spring loaded and protrudes more than 25 mm into the window opening in order to release the window, but then returns to a position that protrudes less than 25 mm,'' would be compliant with this requirement. An emergency exit opening system in which part of the latch mechanism protrudes into the opening space while the window latch lock is being released would be acceptable, as long as the latch components are all below the protrusion limit once the window is opened to the amount specified in S5.4.1. For example, a lever handle could protrude more than an inch into the opening while it is being moved from the closed position to the open position. However, once the lever is in the position to allow the window to be opened, all parts of the lever and its attachment bracket must protrude less than one inch from the structure to which it is attached.

Force Required To Open Emergency Exits

NTSB stated that from its accident investigations it ''found that some passengers have difficulty in opening motorcoach windows and evacuating from them because of the weight of the windows and the challenge of keeping them open.'' NTSB cited results from its crash investigations that support this concern. NTSB also requested that NHTSA take action in this, or a future, rulemaking to address the ease of opening such windows and their ability to remain open independently. NTSB stated ''[s]uch action is needed to improve evacuation from emergency exit windows for motorcoaches and school buses.''

Agency Response

While NHTSA shares the NTSB's concern for the capability of school bus occupants to easily open emergency exits, this aspect of emergency egress is not within the scope of this rulemaking. Therefore, NHTSA will not be mandating requirements concerning the force required to open emergency exits on school buses as part of this final rule.

f. Organization of the Standard and Language Used in the Standard

Several commenters provided feedback on the organization of the proposed standard, as well as the language used in the proposed standard. In response to these comments, the agency has decided to make several amendments to the proposed organization and language of the standard, which will be adopted as part of this final rule. The amendments to the proposed organization and language are highlighted in several of the agency response sections below.

Merging FMVSS No. 217a Into FMVSS No. 217

ICB suggested ''that there should not be a separate and distinct regulation for FMVSS 217a Anti-Ejection Glazing for Bus Portals.'' ICB stated that it would be better to have all bus window and glazing requirements included in FMVSS No. 217. However, ICB did note that it is ''helpful to keep the latch protrusion requirements separate from the anti-ejection requirements.''

Agency Response

The agency has chosen to keep the bus anti-ejection requirements and procedures in a separate standard. Having FMVSS No. 217a separate from FMVSS No. 217 serves to highlight the differences in the two standards. Additionally, having the bus glazing anti-ejection requirements in a separate standard avoids confusion with existing FMVSS No. 217 requirements and procedures. This separation is useful for school bus applicability, since the planned FMVSS No. 217a has no applicability to school buses whereas FMVSS No. 217 does have specific requirements for school buses.

102 mm Sphere Application Force and Passage

Section 5.2(b) in the NPRM's proposed regulatory text states that ''[e]ach piece of window glazing and each surrounding window frame shall be retained by its surrounding structure in a manner that prevents the formation of any opening large enough to admit the passage of a 102 mm diameter sphere under a force, including the weight of the sphere, of up to 22 newtons.'' This wording is different from the language used in S5.1(b) and S5.3(b). Those two sections use the phrase ''. . . when a force of no more than 22 newtons is applied with the sphere at any vector . . .'' The text in S5.1(b) and S5.3(b) correctly states a 22 N force is applied to the glazing by the sphere. To be consistent, the agency has decided that the same wording in S5.1(b) and S5.3(b) will be used in S5.2(b). Additionally, the agency has decided to amend S5.1(b), S5.2(b), and S5.3(b) so that ''passage'' is amended to ''complete passage.'' This change is based upon agency feedback recommending improved clarity in the regulatory text for compliance purposes. It was noted that without usage of the word ''complete,'' there would be no distinction between minimal, partial, and complete passage of the sphere through the glazing. The amended language is reflected in the final regulatory text for FMVSS No. 217a.

Testing Requirements Organization

ICB requested separate sections in the standard for each impact test (center impact, edge impact, and pre-broken glazing impact tests) with the requirements for each type of test in that section.

Agency Response

After reviewing the organization of the three types of tests (center impact, edge impact, and pre-broken glazing impact tests), the agency concluded that the requirements for each are already in separate sections. Within the proposed regulatory text for FMVSS No. 217a, S5.1 includes the requirements for the edge impact test, S5.2 includes requirements for the center impact test, and S5.3 includes requirements for the pre-broken glazing impact test. Accordingly, NHTSA does not see any need to adjust the organization of these requirements as part of this final rule.

g. Compliance Date

When the NPRM for this rule was published, NHTSA proposed a compliance date of 3 years after publication of a final rule. Based on research from NHTSA's Vehicle Research and Test Center, the agency believes that some manufacturers would need to redesign their emergency exit latch systems or adopt a design that would meet the proposed requirements. Also, manufacturers would have to transition from double-glazed tempered/tempered windows to a new setup that has at least one layer of laminated glass or advanced glazing that can meet the proposed requirements. The agency has determined that a 3-year lead time after publication of a final rule is appropriate as some design, testing, and development will be necessary to certify compliance to the new requirements.

The rollover structural integrity final rule has a compliance date of December 30, 2024, which is 3 years after the publication date of December 29, 2021. Similarly, the agency proposed a compliance date of 3 years after publication of the final rule for this advanced glazing rulemaking. Since the two rulemakings were initially being developed concurrently, and since the anti-ejection requirements are dependent upon the rollover structural integrity requirements, the agency proposed in the NPRM to make the compliance date of the two rulemakings the same. The agency also proposed that, to enable manufacturers to certify to the new requirements as early as possible, optional early compliance with the standard would be permitted. EPGAA commented that the glazing industry should have no issue supporting the three-year phase-in period since ''the manufacturing technology and capacity already exist to produce advanced glazing solutions.'' BBBC stated that making the compliance date the same for the two rulemakings (FMVSS No. 227 and FMVSS No. 217a) is preferred only if the date is a minimum of 3 years after the publication of both final rules. ICB also requested alignment of the implementation time for FMVSS No. 227 and FMVSS No. 217a. Van Hool stated that it would prefer to extend the crash requirements for the retention of glazing and the opening of emergency exits after the crash.

Agency Response

Since the rollover structural integrity final rule was published significantly earlier than this anti-ejection glazing final rule, the agency has decided not to align the compliance date of the two standards. The agency agrees with EPGAA that the MAP–21 mandated lead time of 3 years is sufficient for the necessary design, testing, and development to comply with this standard. To align the compliance dates of FMVSS No. 227 and a final rule for advanced glazing, the agency would either need to delay the compliance date of FMVSS No. 227 or accelerate the compliance date of advanced glazing final rule establishing FMVSS No. 217a. As stated in the NPRM, NHTSA believes a lead time of 3 years is an appropriate amount of time to account for the changes required to comply with this anti-ejection glazing standard. The agency will not decrease the lead time of this standard to align the compliance date with FMVSS No. 227. Additionally, the structural integrity improvements due to compliance with FMVSS No. 227 will benefit occupants during a rollover crash even if the anti-ejection glazing improvements have not yet been implemented. Therefore, the agency will not delay the compliance date of FMVSS No. 227 to align with a final rule establishing FMVSS No. 217a as BBBC and ICB have requested.

The agency is unclear about what Van Hool was requesting in it comment on the compliance date. If Van Hool was asking for additional lead time, it did not state how much additional time it was requesting before implementation of improved passenger anti-ejection benefits. Accordingly, NHTSA has decided not to grant Van Hool's request.

For the reasons discussed above, NHTSA is adopting the 3-year compliance date as proposed in the NPRM as part of this final rule.

h. Retrofitting

Greyhound and ICB agreed with the agency that it would make little sense to require retrofitting of bus windows without improving the structural integrity of the bus. Greyhound indicated that any requirements for enhanced window standards should apply only to buses manufactured after the implementation date of those standards. NTSB requested NHTSA consider requiring retrofit of existing buses for improved window latch design, stating that ''NHTSA has identified simple countermeasure latch designs that reduce latch openings when the window is struck near the latch.''

Agency Response

The agency has decided to not require retrofitting of buses with improved latch designs and window glazing materials as part of this final rule. As stated in the NPRM, the simple countermeasure for latch designs was to add a washer screwed onto the top of the existing MCI E/J-series striker post. The agency has no data to determine if this fix would work for other latch systems, or if other redesigns to those latch systems would be necessary. For example, it is not known if the other buses have enough strength at the latch anchorage locations of each window for the improved latch system. Every window system would require analysis and most likely testing to verify its capability to successfully manage the new loads. Each window structure would need to be inspected for pre-existing damage that would cause the improved latch system to fail when subjected to the new loads. Therefore, NHTSA disagrees with the NTSB's argument that a simple countermeasure exists for retrofitting all existing buses. It is not practical to retrofit improved latch systems onto existing buses because of the unique nature of each existing window structure and latching mechanism.

Additionally, NHTSA retains its plan to not require retrofitting of advanced glazing into existing buses. The agency agrees with Greyhound and ICB that it makes little sense to upgrade the window glazing without also improving the bus structure in accordance with FMVSS No. 227. Therefore, NHTSA will not require retrofitting for any requirements of this standard.

i. Definitions and Descriptions

Daylight Opening

BBBC commented that the proposed S4 definition of ''daylight opening'' through its use of the terms ''horizontal'' and ''vertical'' assumes the opening is essentially purely horizontal or vertical, respectively. While BBBC stated that openings are usually one or the other, BBBC recommended that NHTSA consider how to apply that definition to an opening that may be in a plane that is not purely vertical or horizontal, such as one 45 degrees to either plane.

Replying to the questions asked in the NPRM concerning Executive Order (E.O.) 12866 and E.O. 13563, ICB and SBMTC requested improved clarity through the addition of figures and diagrams for various terms, including daylight opening and periphery. ICB stated that the definition for daylight opening given in the NPRM is ''confusing and overly complicated.'' It also asked for clarification concerning the items to be included in the daylight opening measurement and further suggested that any window frame, weather stripping, or flexible gasket material should not be included in portal size measurements.

Agency Response

NHTSA is adopting the proposed definition of daylight opening; however the specifications for daylight opening for rear windows have been deleted.[48] Due to the number of comments received concerning the definition of daylight opening, NHTSA has elected to add figures and additional details in the Technical Support Document to aid in understanding the definition as part of this final rule. This Technical Support Document is included in the docket for this final rule. For the purposes of FMVSS No. 217a, ''daylight opening'' is the opening generated when the visible glazing, including flexible material, is removed from the window. It is the opening bounded by the bus structure's window frame. ''Daylight opening'' applies to all side and roof windows of the vehicle, including emergency exit windows. ''Daylight opening'' is used to help determine where the FMVSS No. 217a guided impactor will hit.

BBBC commented that the proposed definition for daylight opening does not account for window openings that are not purely vertical or horizontal. BBBC is correct that while most windows are oriented vertically or horizontally, there are applications where the window may be installed at an angle or consist of curved glazing. The agency believes the proposed definition of daylight opening properly accounts for these situations where the window is not purely horizontal or vertical. The proposed definition specifies the orientation of the ''daylight opening'' to be based on the bus's longitudinal axis and whether the window is on the bus's side wall or roof. If the window is installed at an angle or uses curved glazing, the daylight opening would still be measured based on the proposed definition depending on whether the window is located in the bus side wall or roof. Therefore, whether a window is purely vertical or horizontal, the daylight opening would be determined in the same manner. The Technical Support Document provides illustrations and examples for determining the daylight opening for curved glazing. The Technical Support Document also addresses the comments from ICB and SBMTC, which requested

[48] Since the impact tests no longer apply to rear windows in this final rule, there is no need for defining daylight opening for rear windows.

additional figures and clarification surrounding the definition of daylight opening and periphery.

Portal

ICB commented that a portal is related to the opening created in the bus structure when the window is opened. ICB stated that the term ''portal'' is confusing and that the term be replaced with ''opening.''

Agency Response

NHTSA has decided not to replace the term ''portal'' with ''opening'' as part of this final rule. The definition of a portal according to the proposed FMVSS No. 217a text is ''an opening that could, in the event of a crash involving the vehicle, permit the partial or complete ejection of an occupant from the vehicle, including a young child.'' This definition comes directly from MAP–21. An opening is a more general term, and a portal is a specific type of opening. A portal can be any type of opening in a bus wall, floor, or roof that could allow even a partial ejection of an occupant in the event of a crash. Some examples of a portal include an open window or door, a broken window with some glazing removed, a hole in the bus wall, or an open roof hatch. While there are no minimum dimensions associated with portals, it must be large enough to admit at least partial passage of an occupant, even if they are a smaller child. NHTSA will not replace the word ''portal'' with ''opening,'' because an opening does not have to be large enough to admit at least partial passage of an occupant.

Miscellaneous Comments on Clarification of Terms

In addition to the clarifications discussed above, ICB requested improved clarity through the addition of figures and diagrams for measuring minimum surface dimension of an opening and glazing pre-breaking procedures.

Agency Response

NHTSA believes these topics are discussed in sufficient detail in the NPRM and in this final rule. Additional details for the glazing breaking procedures, the latch protrusion into the emergency exit when the window is in the open position, and how to measure minimum surface dimension of an opening are items that will be included in the agency's compliance test procedures for this rule.

j. Costs and Benefits

In the NPRM and Preliminary Regulatory Evaluation (PRE), NHTSA anticipated that tempered glazing would not meet the requirements of the dynamic impact tests, particularly the pre-broken impact test, and the agency believed the double-glazed tempered/tempered windows would need to be replaced, at minimum, with a single-glazed laminated window. Thus, the cost and benefit estimates assumed the manufacturers would be upgrading from double-glazed tempered/tempered glazing to single-glazed laminated glazing.

The target population for total lives saved was based on fatalities from rollover crashes in applicable buses and was reduced by the expected lives saved due to Electronic Stability Control (ESC), seat belt usage, and rollover structural integrity. The NPRM noted that advanced glazing would also prevent fatalities in other crash types, but it did not include those crash types in the estimation due to lack of need to further justify the rule.[49]

For the governing scenario of replacing double-glazed tempered/tempered glazing with single-glazed laminated glazing, NHTSA estimated the costs and benefits as summarized in Table 9 below. NHTSA determined replacing a double-glazed tempered/tempered glazing with a single-glazed laminated glazing would result in a weight decrease and cost increase.[50] For additional details and the calculations associated with these data, refer to the PRE included in the docket with the NPRM.

TABLE 9—ADVANCED GLAZING ANNUAL COSTS AND BENEFITS FROM PRE

Costs		Benefits	
Item	Value ($M)	Item	Amount
Material	$0.191	Lives Saved[A] Fuel Savings[B]	0.33–1.54 lives per year. 0.04 mpg.

Notes:
[A] Range is dependent on seat belt usage, from 15 percent usage to 84 percent usage.
[B] Fuel savings due to weight savings estimated at 336 lb per vehicle.

According to the PRE and NPRM, the main cost associated with the requirements in this rule would be the material costs for the new glazing types and window units. The agency also anticipated that modifications to the window latch systems would be needed to meet the dynamic impact test requirements. Applying these material costs to the population of new, large buses and motorcoaches produced annually resulted in approximately $191,000.[51]

Switching from a double-glazed tempered/tempered window unit to a single-glazed laminated window unit would reduce the overall weight of the window unit. This weight reduction would result in improved fuel economy for each bus. The weight of the double-glazed tempered/tempered window units used in NHTSA's testing were 100 lb and 110 lb (avg of 105 lb). The single-glazed laminated window unit weighed

[49] 81 FR 27925.

[50] The agency estimated that a fully framed and assembled double-glazed tempered/tempered window (approximately 25 square feet) costs $340. Likewise, the agency estimated that a fully framed and assembled single-glazed laminated window (approximately 25 square feet) costs $353.75. The incremental cost of choosing a single-glazed laminated window over a double-glazed tempered/tempered window is $13.75 per window or $165.00 per bus assuming 12 windows. The weight of the double-glazed tempered/tempered window units used in NHTSA's testing were 100 lb and 110 lb (avg of 105 lb). The single-glazed laminated window unit weighed 77 lb. This difference results in an average weight savings of 28 lb per window unit. Assuming an average of 12 windows per bus results in 336 lb of weight savings per bus.

[51] The agency estimated that there are 2,200 new over-the-road and applicable large buses manufactured annually. NHTSA estimated that MCI manufactures about 47.7 percent of the market population and already includes laminated glazing as part of its production window options. Assuming 12 windows per bus, the cost to equip laminated glass instead of tempered glass is $13.75 per window, and the cost of latch improvements is $0.05 per window, the total annual incremental cost for new buses covered under this proposal is $191,169 (= 2,200 × 0.477 × $0.60 + 2,200 × 0.523 × $165.60) in 2013 dollars.

77 lb. This difference resulted in an average weight savings of 28 lb per window unit. Assuming an average of 12 window units per bus resulted in 336 lb of weight savings per bus. Based on the calculations outlined in the PRE, this change resulted in an increase of 0.04 mpg per bus. Projecting that fuel economy benefit over the life of each affected bus produced annually resulted in approximately $2.90 million worth of fuel economy savings at a 3% discount rate.[52] Table 10 below summarizes the costs and benefits of the rule as outlined in the PRE.

TABLE 10—SUMMARY OF ANNUALIZED COSTS AND BENEFITS DUE TO THE ANTI-EJECTION GLAZING NPRM

[Costs are in millions of 2013 dollars]

	15% belt use rate			84% belt use rate		
	Undiscounted	3%	7%	Undiscounted	3%	7%
Equivalent Lives Saved	1.60	1.37	1.03	0.34	0.29	0.22
Net Cost [A]	($5.57)	($4.30)	($3.20)	($3.98)	($3.05)	($2.25)
Cost per Equivalent Lives Saved	($3.48)	($3.14)	($3.11)	($11.71)	($10.52)	($10.23)
Benefits from Comprehensive Costs Avoided	$15.44	$13.22	$9.95	$3.30	$2.82	$2.12
Net Benefits	$21.02	$17.52	$13.15	$7.28	$5.87	$4.37

Notes: [A] Net costs are negative because the fuel savings are expected to outweigh the material costs.

Glazing Construction for Compliance

BBBC, Prevost, Van Hool, SBMTC, and ICB expressed concerns that usage of laminated glazing could result in increased weight and cost per bus, leading to increased fuel usage and possibly resulting in reduced seating capacity in buses close to their weight limit. Prevost questioned the agency's assumption that double-glazed tempered/tempered windows could be replaced with a single pane of laminated glazing. Van Hool and Prevost expressed concern for changes in thermal properties, which would directly influence costs associated with heating and cooling of the bus interiors. Prevost also obtained a price quotation for installing laminated glazing in its motorcoaches. According to Prevost, for equivalent sizes, shapes, and tinting, the estimated cost increase when compared to its current double-glazed tempered/tempered configuration was ''on the order of five thousand dollars ($5,000) per vehicle.'' ICB stated it uses single-paned tempered glazing for bus windows. According to ICB, replacing this material with single paned laminated glazing ''could add up to 200 lb of additional weight.'' Van Hool also stated that ''[d]ouble laminate or tempered/laminated glazing might do the trick at no expense for seating capacity, but with no gain either.''

EPGAA agreed with the agency's conclusion that there is a weight reduction in direct replacement of laminated for tempered glazing in situations where the overall thickness remains the same since the density of the plastic interlayer is about half that of glass. EPGAA expressed doubt that there will be a significant change in the desire of bus OEMs to employ double-glazed insulating assemblies for buses used in colder climate zones. EPGAA stated that the insulating units are employed to increase the interior glass temperature and thus reduce any propensity for condensation or fogging while increasing occupant thermal comfort. EPGAA stated that advanced glazing does not in itself create a significant impact in thermal performance compared to monolithic glass since it has a similar thermal conductivity.

EPGAA commented that advanced glazing would offer a benefit through reduced sound transmission when compared to monolithic tempered glass, creating a quieter cabin. EPGAA also commented that advanced glazing would result in a significant reduction in UV exposure of occupants and interior components. EPGAA stated that with the addition of optional low emissivity or solar control layers the advanced glazing may also be used to significantly reduce the solar load and hence air conditioning load. EPGAA also stated that certain added layers may function to reduce condensation or fogging thresholds and could in some cases help to eliminate the need for the double-glazed insulating assemblies. EPGAA concluded that while the fuel savings based on reduction in use of insulating glass assemblies may be overestimated, there are unstated monetary savings associated with air conditioning load reduction as well as reduced UV exposure of occupants.

Agency Response

Based on comments and feedback from the bus manufacturers and SBMTC, NHTSA understands most bus manufacturers will not be replacing double-glazed tempered/tempered windows with single-glazed laminated windows. Instead, it is more representative of the industry to assume the manufacturers will simply exchange at least one pane of tempered glazing with laminated glazing but keep the double-glazed window construction. In other words, the double-glazed tempered/tempered windows will likely be replaced with double-glazed laminated/tempered windows, where either the interior or exterior pane is laminated glazing. This replacement will maintain or improve the thermal and sound insulation properties that are experienced by occupants with the current glazing units. The cost-benefit analysis in this final rule uses this change as the governing scenario, instead of the scenario presented in the PRE.

This change in governing scenario results in the removal of the weight reduction benefit that was estimated in the PRE. EPGAA stated in its comments that there is some weight reduction when directly replacing tempered glazing with laminated glazing due to the lower density of the PVB interlayer compared to glass. However, the laminated glazing is often thicker than the tempered glazing it replaces, and the PVB interlayer only makes up approximately 6 percent of the glazing thickness.[53] Therefore, any weight difference is considered negligible for

[52] A typical large bus travels 56,000 miles per year and has an average fuel economy of 6.1 mpg. With the 47.7 percent current compliance rate, an estimated 1,151 buses would benefit from this fuel economy increase.

[53] Duffy, S., & Prasad, A., National Highway Traffic Safety Administration, Motorcoach Side Glazing Retention Research, pp. 10–13 (Report No. DOT HS 811 862) (Nov. 2013). Washington, DC:.

the purposes of the cost and benefit calculations.

As Prevost commented, there are additional costs to consider if manufacturers would be replacing their current double-glazed window units with single-glazed laminated windows. Switching from a double-glazed tempered/tempered window construction to a double-glazed laminated/tempered window construction will be more expensive for bus manufacturers than switching to a single-glazed laminated window as previously calculated. The agency estimates that a fully framed and assembled double-glazed tempered/tempered window (approximately 25 square feet) costs $377.73. Likewise, NHTSA estimated that a fully framed and assembled double-glazed laminated/tempered window (approximately 25 square feet) costs $438.84. The incremental cost of choosing a double-glazed laminated/tempered window over a double-glazed tempered/tempered window is $61.11 per window or $733.32 per bus (assuming 12 windows per bus). As outlined in the costs and benefits section of this final rule, even with the higher costs associated with this governing scenario this final rule is still cost beneficial.

Previous Rulemakings

Van Hool expressed concern that the possible positive influences of ESC on bus rollovers were not properly accounted for. Van Hool asked how effective an ESC system would be during a bus rollover. Further, Van Hool proposed that the severity of an unbelted occupant's contact with the opposite side glazing during a rollover would be mitigated by the effects of ESC.

Prevost stated that it ''believe[s] that the estimated usage of seat belts is higher than what is listed in the NPRM.'' Prevost also stated that ''[s]eat belt usage is the single most important safety system to mitigate passenger ejection and we commend NHTSA on the attention they continue to give to this. We believe that pre-trip safety briefings will further increase the percentage of seat belt usage.'' Van Hool stated that any seat belt usage data is speculative at best and that the agency manipulated the seat belt estimates ''in order to make the numbers work.''

Van Hool commented that the effects of the requirements from FMVSS No. 227 have not been taken into account and that there has not been enough consideration of the performance changes to the vehicle structure that will be created by bus designs changing to meet FMVSS No. 227. Van Hool stated that its bus windows do not break in a rollover test under Regulation No. 66 of the Economic Commission for Europe of the United Nations (ECE R.66). Van Hool stated the agency has not adequately proven that the FMVSS No. 217a impactor test represents rollover forces acting on the windows of future buses that fulfill the requirements of FMVSS No. 227 and/or ECE R.66.

Agency Response

Details concerning the effectiveness of ESC for buses was discussed in both the agency's 2012 NPRM proposing to require ESC on heavy vehicles and a 2011 agency research note.[54] The analysis estimated that ESC would be 40–56 percent effective against a rollover event. In other words, 44–60 percent of the rollover events would still occur, even with ESC installed in the heavy buses. Since ESC alone only partially mitigates the risk of rollover crashes, there remains a need to protect passengers from ejection conditions in applicable vehicles. NHTSA has accounted for the crash reducing effects of ESC when calculating the estimated lives saved from the advanced glazing requirements in this final rule.

The agency agrees with Prevost on the importance of seat belt usage in all motor vehicles. The agency examined seat belt usage rates of 15% and 84% in the NPRM. For the cost-benefit analysis in this final rule, the upper bound was increased to 90 percent. Nationally the seat belt usage rate in passenger vehicles has been approximately 90 percent very year from 2016 to 2021.[55] Therefore, the agency analysis based on the 90 percent usage rate in motorcoaches is reasonable as a conservative upper bound since usage rates in buses are not believed to be as high as passenger vehicles. NHTSA has accounted for a range of bus occupants using seat belts when calculating the estimated lives saved from the advanced glazing requirements in this final rule.

The bus structural integrity rollover test used in FMVSS No. 227 and ECE R.66 is an effective test to determine a bus's capability to maintain a survival space during a rollover event.[56] However, in that test, ballast weight for each occupant is strapped to the seats for the FMVSS No. 227 evaluation. Windows are not intended to be evaluated under loading from moving objects in that test. While the increased structural rigidity is expected to reduce the number of fatal ejections, those requirements do not account for passengers being ejected through windows that have been broken by internal impacts. The rollover structural integrity FRE estimates a 74 percent effectiveness of ejection mitigation in preventing fatalities. It also states that the enhanced rollover structural integrity test procedure does not include a condition to simulate occupant loading, and therefore estimates a midpoint effectiveness of 37 percent for unrestrained ejected fatalities. As outlined above, this effectiveness is accounted for when calculating the expected number of lives saved from the requirements in this final rule.

Supporting Data

Van Hool stated that ''the data driving this NPRM seems to be from 1980–2004'' and that this data was collected well before seat belts were in use. Van Hool commented that if 2010–2015 data were used there would not be a strong case for requiring anti-ejection glazing. Van Hool commented that ''recently released FMCSA crash data indicates the lowest fatality rates given the higher numbers of coaches on the road and the highest number in miles traveled.''

Van Hool also expressed doubt for the particular occupant loading chosen in the Martec study, and the agency's usage of that loading to develop the proposed anti-ejection requirements for this rule. Van Hool expressed a preference to use the structural integrity rollover test used in FMVSS No. 227 as the bus motion to study for window glazing loading during crashes. Van Hool stated a ''passenger could not be projected against the window, nor could he be ejected out of the bus through the opposite side.''

Agency Response

The 1980–2004 data to which Van Hool refers was used for the Martec report, which was completed in 2006. The data presented in the report was the most recently available information at the time that study was conducted. Those crashes were investigated to identify the rollover events most likely to produce worst-case occupant to glazing impact loads. While the Martec report and its source data are over 10

[54] 77 FR 3076 NPRM for new FMVSS No. 136 (May 23, 2012); Effectiveness of Stability Control Systems for Truck Tractors, DOT HS 811 437 (Jan. 2011).

[55] Seat Belt Use in 2021—Overall Results, Traffic Safety Facts Research Note, Report number DOT HS 813 241 (Dec. 2021), *https://crashstats.nhtsa.dot.gov/Api/Public/Publication/813241,* last accessed December 18, 2023.

[56] Matolcsy, M., ''The Severity of Bus Rollover Accidents,'' 20th International Technical Conference for the Enhanced Safety of Vehicles, Paper 989, Lyon, France (2007). Available at: *www-nrd.nhtsa.dot.gov/pdf/esv/esv20/07-0152-O.pdf.*

years old, data indicate that passengers continue to be ejected from motorcoaches during rollover and other crashes. NHTSA did not rely on the Martec report data as the ''driving data'' for this rule. The driving data used for the NPRM and PRE was from 2004–2013. NHTSA has updated that data to be from 2006 to 2019 for the final rule.

The Martec report stated that its objective was ''to improve the level of safety protection of passengers in motorcoach crashes by reducing the likelihood of ejection during vehicle collision or rollover, as such ejections are associated with a high probability of fatality.'' The report authors examined Transport Canada bus crash investigation reports and then chose to model the passenger motion in a bus during a crash where

. . . the bus rolled onto its side after yawing while trying to negotiate a sharp turn at elevated speed. The bus had a significant lateral velocity, the underside of the bus contacted the ground, furrowed into the sod, and the bus rolled over on its side. A rear hinged/latched emergency window (on the impacted side) was either dislodged during the crash or had been opened prior to the rollover, and there were fatalities due to ejections through the window opening.[57]

The claim that a passenger could not move unobstructed to the opposite side of a bus during a vehicle rollover does not apply to all bus seating configurations. The Martec study appropriately used a severe bus crash event and conducted computer simulations to determine a possible window loading scenario caused by a passenger's unrestrained movement during such a crash event. With this bus glazing anti-ejection rule the agency is establishing requirements such that the retained windows will mitigate partial ejections of belted occupants seated next to the windows as well as retain the estimated 10 to 85 percent of unbelted occupants. The anti-ejection requirements will mitigate the occurrence of window portals being created by movement of unrestrained passengers. Accordingly, the agency will not be adopting Van Hool's recommendation to use the motion from a belted passenger in a rollover test as the load basis for window glazing anti-ejection requirements as part of this final rule.

VI. Overview of Costs and Benefits

After accounting for the above comments from the NPRM, NHTSA analyzed the anticipated effects of a final rule and determined the net result is cost beneficial. The agency anticipates that tempered glazing will not meet the requirements of the dynamic impact tests, particularly the pre-broken impact test. Therefore, the governing scenario we use for the cost-benefit analysis assumes the manufacturers will replace at least one pane of their double-glazed tempered/tempered window units with laminated glass.

For fatality data analysis, NHTSA used FARS data from 2006–2019. The agency decided not to use 2020 data for data summaries and averages due to the effect of the COVID–19 pandemic on the industry. NHTSA believes the 2020 data could disproportionately skew the costs and benefits analysis. For injury data analysis, NHTSA used the National Automotive Sampling System—General Estimates System (NASS–GES) data from 2006–2015 and Crash Report Sampling System (CRSS) data from 2016–2019. The NASS–GES system was retired in 2016 and replaced by the CRSS system. The same 14-year period 2006–2019 was used to match the time frame of fatality data.

The costs resulting from today's final rule are the material costs attributed to upgrading the window glazing material and improving the latching mechanisms as necessary. As discussed in the FRE for today's final rule, approximately 47.7 percent of motorcoach manufacturers currently use laminated glass in their window units. The remaining 52.3 percent of motorcoach and large bus manufacturers are assumed to use double-glazed tempered/tempered window units, or some other glazing construction that may not comply with the performance requirements in this final rule. These windows will need to be upgraded to at least a double-glazed laminated/tempered glazing window unit construction. Additionally, NHTSA estimates that modifications to the window latch systems for all motorcoach and large bus manufacturers will be needed in order to meet the dynamic impact test requirements. Table 11 summarizes the incremental costs associated with administering the upgrades necessary for compliance with today's final rule.

TABLE 11—INCREMENTAL COSTS FROM REPLACING TEMPERED/TEMPERED GLAZING WITH LAMINATED/TEMPERED GLAZING AND UPGRADED WINDOW LATCHES

Glazing type	Cost per window	Cost for improved latch per window	Number of side glass positions	Cost per vehicle	Number of applicable vehicles	Total cost to upgrade all applicable vehicles	Total cost assuming 47.7% compliance rate
Double-glazed tempered/tempered	$430.62	$0.00	12	$5,167.48	2,200	$11,368,457	NA
Double-glazed laminated/tempered	500.28	0.06	12	6,003.40	2,200	13,209,144	NA
Incremental cost	69.66	0.06	12	835.92	2,200	1,840,687	963,477

The benefits of today's final rule are calculated based on the number of expected equivalent lives saved[58] from ejections during crashes involving the applicable buses. NHTSA calculated the fatal target population using FARS data from 2006–2019 and injury data from NASS–GES (2006–2015) and CRSS (2016–2019). The target population was estimated using both a 15 percent seat belt usage scenario and a 90 percent seat belt usage scenario based on the 2021 large bus rollover structural integrity final rule. The resulting target population (*i.e.,* unrestrained ejected[59] occupants) estimated for today's final rule after accounting for the benefits from the other initiatives applicable to the same group of buses (seat belts, ESC, and structural integrity) is 6.38 fatalities at the 15 percent seat belt use rate and 1.18 fatalities at the 90 percent seat belt use rate. Based on the various rollover tests on buses performed by the agency,

[57] Motor Coach Glazing Retention Test Development for Occupant Impact During a Rollover (Martec Study), Final Report published on August 2006, Docket No. NHTSA–2002–11876–15.

[58] For details concerning equivalent lives saved, reference the FRE docketed with this final rule.

[59] For the analysis, both complete and partial ejections are included as ''ejected occupants'' since the anti-ejection glazing is expected to reduce the risk of both ejection types.

NHTSA believes that the required advanced glazing would maintain its retention capability in single and double ¼-turn bus rollover crashes. Accordingly, the agency expects that the requirements would result in 0.37 to 1.91 equivalent lives saved annually. Table 12 below summarizes the costs and benefits of today's final rule.

TABLE 12—SUMMARY OF ANNUALIZED COSTS AND BENEFITS DUE TO ADVANCED GLAZING

[Costs are in millions of 2022 dollars]

Discount rate	15% belt use rate			90% belt use rate		
	Undiscounted	3%	7%	Undiscounted	3%	7%
Equivalent Lives Saved [A B]	1.9191	1.5064	1.1491	0.3740	0.2936	0.2240
Material Costs	$0.96	$0.96	$0.96	$0.96	$0.96	$0.96
Cost per Equivalent Lives Saved	0.50	0.64	0.84	2.58	3.28	4.30
Benefits from Comprehensive Costs Avoided	24.72	19.40	14.80	4.82	3.78	2.88
Net Benefits	23.75	18.44	13.84	3.85	2.82	1.92

Notes:

[A] These values from the FRE account for serious injuries (MAIS 3–5) by utilizing a relative injury factor.

[B] MAIS = Maximum AIS, AIS = Abbreviated Injury Scale, MAIS 0 = No Injury, MAIS 1 = Minor, MAIS 2 = Moderate, MAIS 3 = Serious, MAIS 4 = Severe, MAIS 5 = Critical, MAIS 6 = Maximum (untreatable).

VII. Regulatory Notices and Analyses

E.O. 12866, E.O. 14904, E.O. 13563, and DOT Regulatory Policies and Procedures

NHTSA has considered the potential impact of this final rule under E.O. 12866, E.O. 14094, E.O. 13563, DOT Order 2100.6A and the DOT's regulatory policies and procedures. This final rule is not considered to be significant under the DOT's regulatory policies and procedures.[60]

This final rule creates a new FMVSS (FMVSS No. 217a) and makes several changes to FMVSS No. 217. Specifically, the final rule creates a new standard that will establish requirements for advanced glazing in over-the-road buses and buses weighing over 26,000 lb. The final rule also creates a requirement establishing a minimum protrusion limitation requirement for emergency exit latches. The agency estimates that compliance with the final rule would result in an annual cost of $0.96 million to manufacturers. More information on costs can be found in section VI above.

Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.,* as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (*i.e.,* small businesses, small organizations, and small governmental jurisdictions). The Small Business Administration's regulations at 13 CFR part 121 define a small business, in part, as a business entity ''which operates primarily within the United States.'' (13 CFR 121.105(a)). No regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the Regulatory Flexibility Act to require federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities.

NHTSA has considered the effects of this rulemaking action under the Regulatory Flexibility Act. According to 13 CFR 121.201, the Small Business Administration's size standards regulations used to define small business concerns, manufacturers of the vehicles covered by this final rule would fall under North American Industry Classification System (NAICS) No. 336111, Automobile Manufacturing, which has a size standard of 1,000 employees or fewer. NHTSA estimates that there are 26 manufacturers of these types of vehicles in the United States (including manufacturers of motorcoaches, cutaway buses, second-stage motorcoaches, and other types of large buses covered by this final rule). Using the size standard of 1,000 employees or fewer, we estimate that approximately 10 of these 26 manufacturers would be considered small businesses.

The agency does not believe that this final rule will have a significant economic impact on those small entities. First, the agency estimates that the incremental costs to each vehicle that currently does not comply with the requirements would be approximately $836 per unit to meet the final rule. This incremental cost will not constitute a significant impact given that the average cost of the vehicles covered by this final rule ranges from $200,000 to $400,000. Further, these incremental costs, which are very small compared to the overall cost of the vehicle, can ultimately be passed on to the purchaser and user.

In addition, the agency believes that certifying compliance with the rule will not have a significant impact on the manufacturers. Small manufacturers have various options available that they may use in certifying compliance with the standard. Manufacturers are not required to use NHTSA's test as the basis for their certification. While the agency's test defined in the regulatory text will be an objective test capable of determining which vehicles meet the minimum requirements, manufacturers can use other methods in certifying the compliance of their own vehicles.

For instance, a manufacturer could obtain advanced glazing windows from a glazing supplier and test the glazing on body sections of the vehicle. NHTSA used this approach in its motorcoach side glazing retention research program. The manufacturer could ''section'' the vehicle or otherwise obtain a body section representative of the vehicle, or test the glazing on test frames. It could base its certification on these tests, without testing a full vehicle.

Unlike NHTSA, manufacturers certifying compliance of its own vehicles have more detailed information regarding their own vehicles and can use reasonable engineering analyses to determine whether its vehicles will comply with the requirements. We believe that a small manufacturer would be closely familiar with its own vehicle design and would be able to use modeling and relevant analyses on a vehicle-by-vehicle basis to reasonably predict whether its design will meet the requirements of this final rule.

[60] 44 FR 11034 (Feb. 26, 1979).

We also note that the product cycle of the covered buses is significantly longer than those of other vehicle types. With a longer product cycle, we believe that the costs of certification for manufacturers would be further reduced as the costs of conducting compliance testing and the relevant analyses could be spread over a significantly longer period of time.

Finally, we note that the requirements in this final rule may affect the operators of the buses that are the subject of today's final rule—some of which may be small businesses—but only indirectly as purchasers of these vehicles. As mentioned above, we anticipate that the impact on these businesses will not be significant because the expected price increase of the vehicles (those that do not comply with the requirements) used by these businesses is small ($836 for each vehicle valued between $200,000 and $400,000).

For the aforementioned reasons, I hereby certify that this final rule will not have a significant economic impact on a substantial number of small entities.

Federalism

NHTSA has examined this final rule pursuant to E.O. 13132 (64 FR 43255; Aug. 10, 1999) and concluded that no additional consultation with states, local governments, or their representatives is mandated beyond the rulemaking process. The agency has concluded that the final rule does not have sufficient federalism implications to warrant consultation with state and local officials or the preparation of a federalism summary impact statement. The final rule does not have ''substantial direct effects 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.''

NHTSA rules can have preemptive effect in two ways. First, the National Traffic and Motor Vehicle Safety Act contains an express preemption provision: When a motor vehicle safety standard is in effect under this chapter, a state or a political subdivision of a state may prescribe or continue in effect a standard applicable to the same aspect of performance of a motor vehicle or motor vehicle equipment only if the standard is identical to the standard prescribed under this chapter. 49 U.S.C. 30103(b)(1). It is this statutory command by Congress that preempts any non-identical state legislative and administrative law address the same aspect of performance.

The express preemption provision described above is subject to a savings clause under which ''[c]ompliance with a motor vehicle safety standard prescribed under this chapter does not exempt a person from liability at common law.'' 49 U.S.C. 30103(e). Pursuant to this provision, state common law tort causes of action against motor vehicle manufacturers that might otherwise be preempted by the express preemption provision are generally preserved.

NHTSA rules can also preempt state law if complying with the FMVSS would render the motor vehicle manufacturers liable under state tort law. Because most NHTSA standards established by an FMVSS are minimum standards, a state common law tort cause of action that seeks to impose a higher standard on motor vehicle manufacturers will generally not be preempted. However, if and when such a conflict does exist—for example, when the standard at issue is both a minimum and a maximum standard—the state common law tort cause of action is impliedly preempted. See *Geier* v. *American Honda Motor Co.,* 529 U.S. 861 (2000).

Pursuant to E.O. 13132, NHTSA has considered whether this final rule could or should preempt state common law causes of action. The agency's ability to announce its conclusion regarding the preemptive effect of one of its rules reduces the likelihood that preemption will be an issue in any subsequent tort litigation. To this end, the agency has examined the nature (*e.g.,* the language and structure of the regulatory text) and objectives of this final rule and finds that this final rule, like many NHTSA rules, prescribes only a minimum safety standard.

Accordingly, NHTSA does not intend that this final rule preempt state tort law that would effectively impose a higher standard on motor vehicle manufacturers than that established by this final rule. Establishment of a higher standard by means of state tort law would not conflict with the minimum standard finalized in this document. Without any conflict, there could not be any implied preemption of a state common law tort cause of action.

National Environmental Policy Act

NHTSA has analyzed this final rule for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action will not have any significant impact on the quality of the human environment.

Paperwork Reduction Act

Under the procedures established by the Paperwork Reduction Act of 1995, a person is not required to respond to a collection of information by a federal agency unless the collection displays a valid Office of Management and Budget (OMB) control number. This rulemaking will not establish any new information collection requirements.

Unfunded Mandates Reform Act (UMRA)

The Unfunded Mandates Reform Act of 1995 (UMRA) requires federal agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a federal mandate likely to result in the expenditure by state, local or tribal governments, in the aggregate, or by the private sector, of more than $100 million annually (adjusted annually for inflation, with base year of 1995). UMRA also requires an agency issuing an NPRM or final rule subject to the Act to select the ''least costly, most cost-effective or least burdensome alternative that achieves the objectives of the rule.'' This final rule would not result in a federal mandate that will likely result in the expenditure by state, local or tribal governments, in the aggregate, or by the private sector, of more than $100 million annually (adjusted annually for inflation, with base year of 1995).

E.O. 12778 (Civil Justice Reform)

When promulgating a regulation, agencies are required under E.O. 12988 to make every reasonable effort to ensure that the regulation, as appropriate: (1) specifies in clear language the preemptive effect; (2) specifies in clear language the effect on existing federal law or regulation, including all provisions repealed, circumscribed, displaced, impaired, or modified; (3) provides a clear legal standard for affected conduct rather than a general standard, while promoting simplification and burden reduction; (4) specifies in clear language the retroactive effect; (5) specifies whether administrative proceedings are to be required before parties may file suit in court; (6) explicitly or implicitly defines key terms; and (7) addresses other important issues affecting clarity and general draftsmanship of regulations.

Pursuant to this Order, NHTSA notes as follows. The preemptive effect of this final rule is discussed above. NHTSA notes further that there is no requirement that an individual submit a petition for reconsideration or pursue other administrative proceedings before they may file suit in court.

National Technology Transfer and Advancement Act

Under the National Technology Transfer and Advancement Act of 1995 (NTTAA) (Pub. L. 104–113), all federal agencies and departments shall use technical standards that are developed or adopted by voluntary consensus standards bodies, using such technical standards as a means to carry out policy objectives or activities determined by the agencies and departments. Voluntary consensus standards are technical standards (*e.g.,* materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies, such as the International Organization for Standardization and the Society of Automotive Engineers. The NTTAA directs us to provide Congress, through OMB, explanations when we decide not to use available and applicable voluntary consensus standards. There are no voluntary consensus standards developed by voluntary consensus standards bodies pertaining to this final rule.

Plain Language Requirement

E.O. 12866 requires each agency to write all rules in plain language. Application of the principles of plain language includes consideration of the following questions:

- Have we organized the material to suit the public's needs?
- Are the requirements in the rule clearly stated?
- Does the rule contain technical language or jargon that isn't clear?
- Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand?
- Would more (but shorter) sections be better?
- Could we improve clarity by adding tables, lists, or diagrams?
- What else could we do to make the rule easier to understand?

NHTSA has considered these questions and attempted to use plain language in promulgating this final rule. If readers have suggestions on how we can improve our use of plain language, please write us.

Regulatory Identifier Number (RIN)

The DOT assigns a RIN to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading at the beginning of this notice may be used to find this action in the Unified Agenda.

Privacy Act

In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its decision-making process. DOT posts these comments, without edit, including any personal information the commenter provides, to *www.regulations.gov,* as described in the system of records notice (DOT/ALL–14 FDMS), which can be reviewed at *www.transportation.gov/privacy.* 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).

List of Subjects in 49 CFR Part 571

Imports, motor vehicles, motor vehicle safety.

Amended Regulatory Text

In consideration of the foregoing, NHTSA amends 49 CFR part 571 as follows:

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

■ 1. The authority citation for part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.95.

■ 2. Section 571.217 is amended by
■ a. In paragraph S.4 removing the definition of ''Daylight opening'';, and
■ b. Adding paragraph S5.4.4 to read as follows:

§ 571.217 Standard No. 217; Bus emergency exits and window retention and release.

* * * * *

S5.4.4 *Protrusion Limit on Emergency Exit Window Latches and other related mechanisms*

For buses applicable under S3 of this standard, manufactured on or after October 30, 2027, any emergency exit window latch and other related release mechanisms shall not protrude more than 25 mm (1 inch) into the opening of the emergency exit window when that window is in the open position as described under S5.4.1 and S5.4.2.

* * * * *

■ 3. Section 571.217a is added to read as follows:

§ 571.217a Standard No. 217a; Anti-ejection glazing for bus portals; Mandatory applicability beginning October 30, 2027.

S1. *Scope.* This standard establishes requirements to improve side and roof bus portals by way of glazing that is highly resistant to partial or complete occupant ejection in all types of crashes.

S2. *Purpose.* The purpose of this standard is to reduce death and injuries resulting from complete and partial ejections of bus occupants through side and roof portals during rollovers and other crashes.

S3. *Application.*

(a) Subject to S3(b) of this section, this standard applies to:

(1) Over-the-road buses manufactured on or after October 30, 2027, and

(2) Buses, other than over-the-road buses, that have a gross vehicle weight rating (GVWR) greater than 11,793 kilograms (kg) manufactured on or after October 30, 2027.

(b) This standard does not apply to school buses, transit buses, prison buses, and perimeter-seating buses.

S4. *Definitions.*

Daylight opening means, for openings on the side of the vehicle (other than a door opening), the locus of all points where a horizontal line, perpendicular to the vehicle longitudinal centerline, is tangent to the periphery of the opening. For openings on the roof of the vehicle, daylight opening means the locus of all points where a vertical line is tangent to the periphery of the opening. The periphery includes surfaces 100 millimeters (mm) inboard of the inside surface of the window glazing and 25 mm outboard of the outside surface of the window glazing. The periphery excludes the following: Any flexible gasket material or weather stripping used to create a waterproof seal between the glazing and the vehicle interior; grab handles used to facilitate occupant egress and ingress; and any part of a seat.

Over-the-road bus means a bus characterized by an elevated passenger deck located over a baggage compartment.

Perimeter-seating bus means a bus with 7 or fewer designated seating positions rearward of the driver's seating position that are forward-facing or can convert to forward-facing without the use of tools.

Portal means an opening that could, in the event of a crash involving the vehicle, permit the partial or complete ejection of an occupant from the vehicle, including a young child.

Prison bus means a bus manufactured for the purpose of transporting persons subject to involuntary restraint or confinement and has design features consistent with that purpose.

Stop-request system means a vehicle-integrated system for passenger use to signal to a vehicle operator that they are requesting a stop.

Transit bus means a bus that is equipped with a stop-request system sold for public transportation provided by, or on behalf of, a Federal, State, or local government and that is not an over-the-road bus.

S5. *Requirements.* When tested according to the procedures specified in S6 of this section and under the conditions specified in paragraph S7 of this section, each applicable bus shall meet the following requirements specified in this section. The requirements of this paragraph S5 n do not apply to portals other than side and roof portals, and do not apply to a side or roof portal whose minimum surface dimension measured through the center of its area is less than 279 mm.

S5.1 *Edge impact.*

(a) When the ejection impactor described in S8 of this section contacts the target location specified in S6.1.1 of this section of each side or roof daylight opening of a vehicle at 21.6 km/h ± 0.4 km/h, no portion of the window (excluding glazing shards) may pass the ejection reference plane defined under the procedures of S6 of this section.

(b) Each piece of window glazing and each surrounding window frame shall be retained by its surrounding structure in a manner that prevents the formation of any opening large enough to admit the complete passage of a 102 mm diameter sphere when a force of no more than 22 newtons (N) is applied with the sphere at any vector in a direction from the interior to the exterior of the vehicle.

S5.2 *Center impact.*

(a) When the ejection impactor described in paragraph S8 of this section contacts the target location specified in paragraph S6.1.2 of this section of each side or roof daylight opening of a vehicle at 21.6 km/h ± 0.4 km/h, no portion of the window (excluding glazing shards) may pass the ejection reference plane defined under the procedures of paragraph S6.3 of this section.

(b) Each piece of window glazing and each surrounding window frame shall be retained by its surrounding structure in a manner that prevents the formation of any opening large enough to admit the complete passage of a 102 mm diameter sphere when a force of no more than 22 N is applied with the sphere at any vector in a direction from the interior to the exterior of the vehicle.

S5.3 *Center impact to pre-broken glazing.*

(a) When the ejection impactor described in S8 of this section contacts the target location specified in S6.1.3 of this section of each side or roof daylight opening of a vehicle at 21.6 km/h ± 0.4 km/h, no portion of the impactor may displace more than 175 mm past where the surface of the glazing had been in an unbroken condition.

(b) Each piece of window glazing and each surrounding window frame shall be retained by its surrounding structure in a manner that prevents the formation of any opening large enough to admit the complete passage of a 102 mm diameter sphere when a force of no more than 22 N is applied with the sphere at any vector in a direction from the interior to the exterior of the vehicle.

S5.4 *Post-Impact Emergency Exit Release and Operability.*

After the impacts described in paragraphs S5.1, S5.2, and S5.3 of this section, each emergency exit provided in accordance with Standard No. 217 (§ 571.217) shall be capable of releasing and opening according to the requirements specified in that standard.

S6. *Test procedures.*

S6.1 *Target locations.*

S6.1.1 *Edge impact.* Position the impactor face on the glazing adjacent to a latch or discrete attachment point such that, when viewed perpendicular to the glazing surface, the center of the impactor face plate is as close as practicable to the center of the latch attachment point or discrete attachment point with the impactor face plate either horizontal or vertical, whichever orientation provides the shortest distance between the two centers, while maintaining at least a 25 mm ± 2 mm distance between the impactor face plate edge and the window frame. ''Window frame'' includes latches, handles, attachments, and any solid structures other than the glazing material or flexible gaskets. If the window does not have any latches or discrete attachment points (*e.g.,* it is fully rubber bonded or glued), position the impactor as follows:

(a) For side windows, directly above the center of the lower window edge, with the impactor face plate either horizontal or vertical, whichever orientation provides the shortest distance between the two centers, with the bottom edge of the impactor face plate 25 mm ± 2 mm above the daylight opening periphery when viewed perpendicular to the glazing surface.

(b) For roof glazing panels or roof windows, directly forward of the center of the rearmost window edge, with the impactor face plate either horizontal or vertical, whichever orientation provides the shortest distance between the two centers, with the rearmost edge of the impactor face plate 25 mm ± 2 mm forward of the daylight opening periphery when viewed perpendicular to the glazing surface.

S6.1.2 *Center impact.*

Position the center of the impactor face, with the long axis of the impactor face plate either vertical or horizontal, at the center of the daylight opening area of the window with the glazing intact.

S6.1.3 *Center impact to pre-broken glazing.*

Position the center of the impactor face, with the long axis of the impactor face plate either vertical or horizontal, at the center of the daylight opening area of the window with the glazing pre-broken following the procedure in paragraphs S6.2.1 and S6.2.2 of this section.

S6.2 *Window glazing pre-breaking procedure.*

S6.2.1 Breakage pattern. Locate the geometric center of the daylight opening. Mark the surface of the window glazing in a horizontal and vertical grid of points separated by 75 mm ± 2 mm with one point coincident within ± 2 mm of the geometric center of the daylight opening (Figure 2).

(a) If the window is a single-pane unit, then both the occupant space interior and outside exterior surfaces of the glass pane are marked with the 75 mm grid pre-break pattern. The patterns are offset diagonally from one another (the points on one surface of the glass pane are offset 37.5 mm ± 2 mm horizontally and 37.5 mm ± 2 mm vertically from the points on the contralateral surface of the glass pane).

(b) If the window is an insulated unit or double-glazed window, then both the occupant space side of the interior pane and the outside of the exterior pane are marked with the 75 mm grid prebreak pattern.

(1) If one of the glass panes is constructed of tempered or toughened glass, the insulated surface of the remaining glass pane (within the air gap) is marked with the 75 mm grid pre-break pattern. The patterns are offset diagonally from the remaining glass pane's contralateral surface.

(2) If neither pane is tempered glass, then both the occupant space side of the interior pane and the outside of the exterior pane are marked with the 75 mm grid pre-break pattern. The patterns are not diagonally offset from one another. The insulated surfaces of the glass panes (within the air gap) are not marked.

S6.2.2 *Breakage method.*

(a) Use a 100 mm ± 10 mm × 100 mm ± 10 mm piece of rigid material as a reaction surface on the opposite side of the glazing to prevent to the extent possible the window surface from deforming by more than 10 mm when pressure is being applied by the staple gun.

(b) Start with the inside surface of the window and forwardmost, lowest mark made as specified in S6.2.1 of this section. Use an electric staple gun without any staples to apply a load along a line of 12 to 14 mm onto the glazing. The applied force shall be 4,200 N ± 850 N. Apply the line load only once at each marked location, even if the glazing does not break or no perceptible mark or hole results.

(c) Continue applying the line load with the electric staple gun by moving rearward in the grid until the end of a row is reached. Then move to the forwardmost mark on the next higher row and apply the line load. Continue in this pattern until the line load has been applied to all grid points on the inside surface of the glazing.

(d) Repeat the process on the outside surface of the window.

(e) If applying the line load causes the glazing to disintegrate, halt the breakage procedure and proceed with the next step in the compliance test.

S6.3 *Determination of ejection reference planes.*

(a) For side windows, the ''ejection reference plane'' is a vertical plane parallel to the longitudinal vertical center plane of the bus passing through a point located at a lateral distance of 102 mm from the lateral most point on the glazing and surrounding frame, with the window in the closed position.

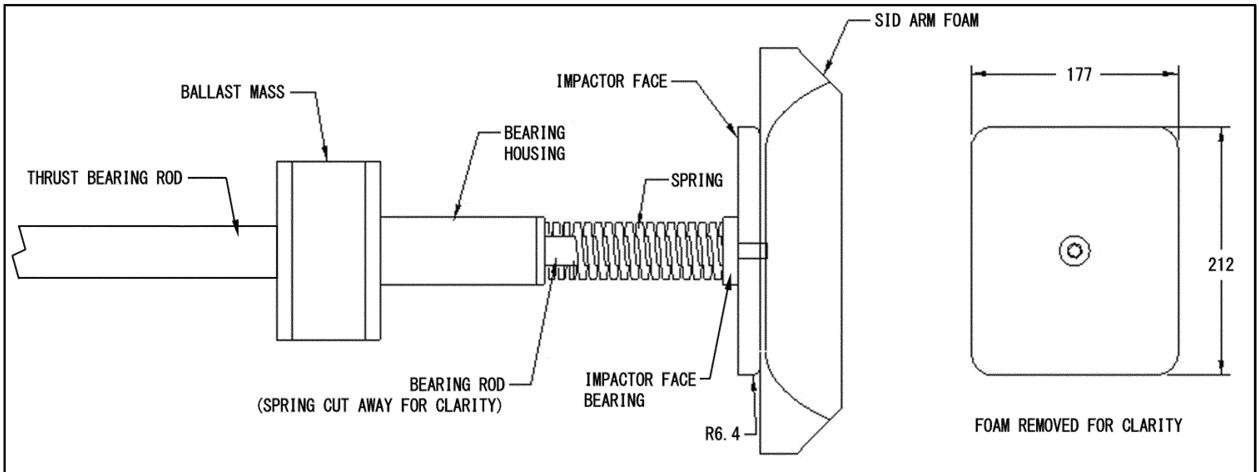
(b) For roof glazing panels/windows, the ''ejection reference plane'' is a horizontal plane passing through a point located at a vertical distance of 102 mm from the highest point on the glazing and surrounding frame, with the window/panel in the closed position.

S7. *Test conditions.*

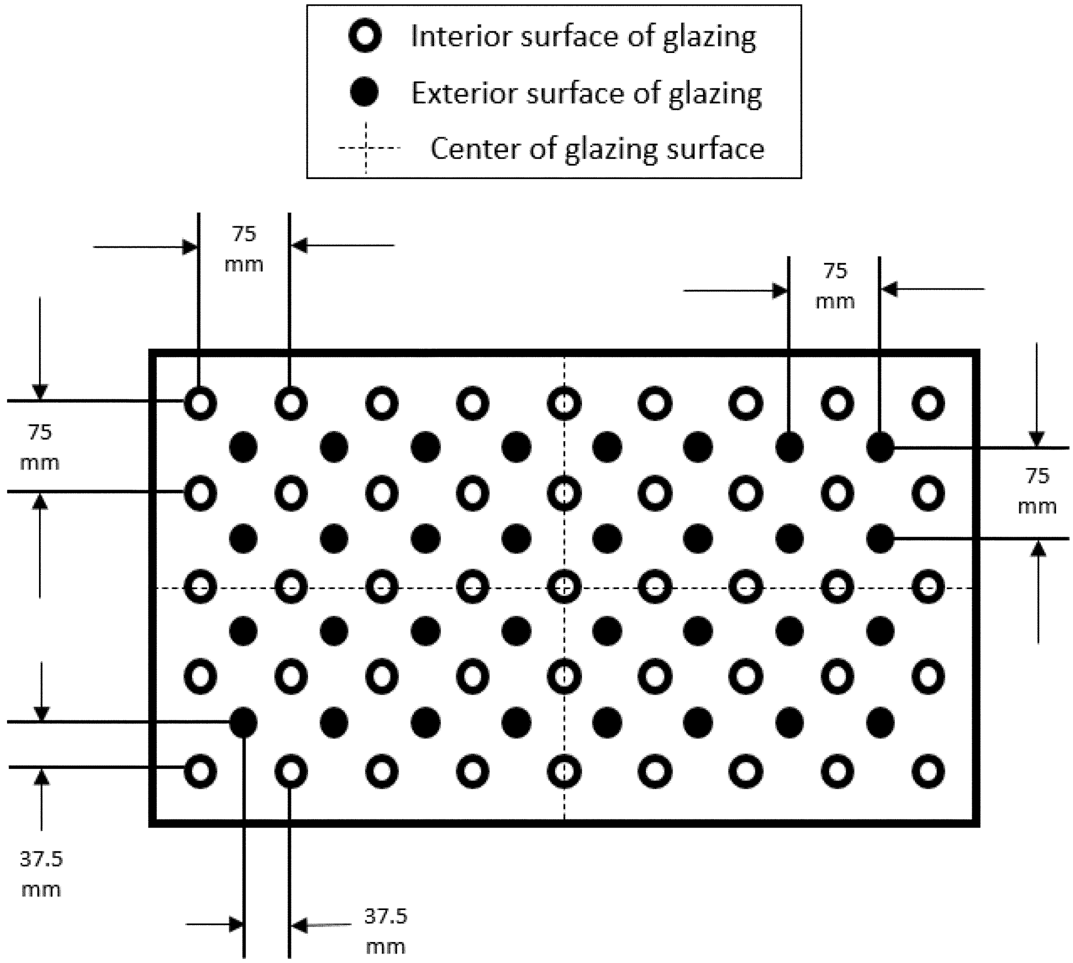
During testing, the ambient temperature is between 18 degrees C. and 29 degrees C., at any relative humidity between 10 percent and 70 percent.

S8. *Guided impactor.*

The impactor test device has the dimensions shown in Figure 1 of this section. It has a total impactor mass of 26 kg ± 1.0 kg and a spring stiffness of 258 N/mm ± 39 N/mm. The impactor is propelled in the horizontal direction in impacts to the side daylight openings and is propelled vertically in impacts to the roof daylight openings.



All dimensions shown are in millimetres.



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Sophie Shulman,

Deputy Administrator.

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 622

[Docket Nos. 090206140–91081–03 and 120405260–4258–02; RTID 0648–XE422]

Revised Reporting Requirements Due to Catastrophic Conditions for Federal Seafood Dealers, Individual Fishing Quota Dealers, and Charter Vessels and Headboats in Portions of Florida

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Temporary rule; determination of catastrophic conditions.

SUMMARY: In accordance with the regulations implementing the individual fishing quota (IFQ) and Federal dealer reporting specific to the commercial reef fish fishery in the Gulf of Mexico (Gulf) and the coastal migratory pelagic (CMP) fisheries in the Gulf, the Regional Administrator (RA), Southeast Region, NMFS has determined that the catastrophic conditions caused by Hurricane Helene in the Gulf for certain Florida counties still exist. This temporary rule authorizes in the described affected area any dealer who does not have access to electronic reporting to delay reporting of dealer reports (trip tickets), any Southeast Region Headboat Survey (SRHS) program participant to delay reporting electronic logbooks, and authorizes IFQ dealers within the affected area to use paper-based forms, if necessary, for basic required administrative functions, *e.g.,* landing transactions. This temporary rule is intended to facilitate continuation of IFQ and dealer reporting operations during the period of catastrophic conditions.

DATES: The RA is authorizing Federal dealers, for-hire electronic reporting program participants, and IFQ dealers in the affected area to use revised reporting methods from November 2, 2024, through December 1, 2024.

FOR FURTHER INFORMATION CONTACT: IFQ Customer Service, Britni Lavine, telephone: 866–425–7627, email: *nmfs.ser.catchshare@noaa.gov.* Federal dealer reporting, Fisheries Monitoring Branch, telephone: 305–361–4581. NMFS Southeast For-Hire Integrated Electronic Reporting Program: 1–833–707–1632.

SUPPLEMENTARY INFORMATION: The reef fish fishery of the Gulf is managed under the Fishery Management Plan (FMP) for Reef Fish Resources of the Gulf of Mexico (Reef Fish FMP), prepared by the Gulf of Mexico Fishery Management Council (Gulf Council). The CMP fishery is managed under the FMP for CMP Resources in the Gulf of Mexico and Atlantic Region (CMP FMP), prepared by the Gulf Council and South Atlantic Fishery Management Council. Both FMPs are implemented through regulations at 50 CFR part 622 under the authority of the Magnuson Stevens Fishery Conservation and