APTA STANDARDS DEVELOPMENT PROGRAM

STANDARD

American Public Transportation Association
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Passenger Rail Equipment Safety Standards (PRESS) Construction & Structural Working Group

Attachment Strength of Interior Fittings for Passenger Railroad Equipment

Abstract: This standard contains minimum requirements for the static strength of interior fittings and the strength of attachment of interior fittings to the carbody structure.

Keywords: attachment, design, fittings, strength, load

Summary: This standard provides requirements for the minimum strength and attachment strength of interior fittings on passenger railroad equipment, along with design practices required to ensure the proper functioning of interior fittings and to reduce the extent and severity of passenger injuries resulting from secondary impact during a collision, derailment or other emergency.

Scope and purpose: This standard covers fittings used in the interior of commuter and intercity passenger rail cars, as well as operating cabs of passenger equipment. It specifies the minimum strength and attachment strength for interior fittings, including overhead luggage storage racks, luggage stacks, stanchions and handholds, windscreens and partitions, bicycle racks, and miscellaneous interior fittings. It also contains design requirements for interior fittings. For passenger seating, reference APTA-PR-CS-S-016-99, Latest revision; for major equipment attachments, reference APTA-PR-CS-S-034-99, Latest revision; and for safety appliances, reference APTA-PR-M-S-016-06, Latest revision. This standard shall be used in specifications for the procurement of new passenger railcars excluding options to an existing contract. It shall also be used, as applicable, in specifications for rebuilding existing rail passenger vehicles, where carbody structure makes this practical, and for replacement systems.

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Participants

The American Public Transportation Association greatly appreciates the contributions of the **Construction & Structural Working Group**, which provided the primary effort in the drafting of this document.

At the time this standard was completed, the working group included the following members:

Eloy Martinez, LTK Engineering Services, *Chair*
Mehrdad Samani, LTK Engineering Services, *Vice Chair*
Martin Young, Sound Transit, *Secretary*

Gabriel Amar, *Systra*
Enrique Arroyo-Rico, *Alstom*
Danny Bailey, *DCTA*
Jeffrey Bennett, *DDOT*
Evelyne Berthomme, *Alstom*
Allen Bieber, *STV*
Martin Bigras, *Bombardier*
Robert Bocchieri, *ARA*
Michael Burshtin, *Amtrak*
Paul Callaghan, *Transport Canada*
Gordon Campbell, *Crosslinx*
Luiz Cano Fernandez, *Alstom*
Bruce Cardon, *UTA*
Michael Carolan, *Volpe Center*
Mike Cook, *LTK*
Robert Cook, *SCRRA*
Joshua Coran, *Talgo*
Sean Cronin, *Metra*
Richard Curtis, *Curtis Engineering*
Felipe Czank, *Alstom*
Nathaniel Eckman, *LTK*
Shaun Eshraghi, *Volpe Center*
Steve Finegan, *SNC Lavalin*
Christian Forstner, Seisenbacher
Tom Freeman, *Intl. Name Plate*
Andre Gagne, *Bombardier*
Gene Germaine, *Kustom Seating*
Michael Gill, *SNC Lavalin*
Garrett Goll, *Voith*
Robert Gonzales, *Mid Region Council of Govts*
Jeffrey Gordon, *Volpe Center*
Glenn Gough, *Siemens*
Hugues Gregoire, *Bombardier*
Yosi Grunberg, *SNC Lavalin*
Tony Gutierrez, *Siemens*
Dong Keun Ha, *SCRRA*
Dongni Han, CRRC
Nicholas Harris, *LTK*
Jason Hesse, *STV*
Ritch Hollingsworth, *LTK*
Karina Jacobson, *Volpe Center*
Paul Jamieson, *Atkins*
Robert Jones, *Stadler*
Larry Kelterborn, *LDK Advisory*
Joseph Kenas, *Bombardier*
Steven Kirkpatrick, *ARA*
Peter Lapre, *FRA*
Paul Larouche, *Bombardier*
Dominique Le Corre, *Alstom*
Ana Maria Leyton, *Transport Canada*
Patricia Llana, *Volpe Center*
William Luebke, *Kustom Seating*
Francesco Maldari, *LIRR*
Amy Mayes, *Knorr*
Ronald Mayville, *SGH*
James Michel, *retired Amtrak*
Dimitar Mihaylov, *NCTD*
Tomoyuki Minami, *JRC*
Travis Nelson, *LTK*
Juergen Neudorfsky, *Seisenbacher*
Steve Orzech Jr., *Freedman Seating*
Chase Patterson, *Voith*
Thomas Peacock, *Atkins*
Gary Petersen, *TransLink*
Anand Prabhakaran, *Sharma & Assoc.*
Denis Robillard, *Baultar*
Steven Roman, *LTK*
Mehrdad Samani, *LTK*
Brian Schmidt, *Altamont Corridor Express*
Gerhard Schmidt, *Siemens*

Martin Schroeder, *Jacobs*
Frederic Setan, *Alstom*
Kristine Severson, *Volpe Center*
Melissa Shurland, *FRA*
Nick Sorensen, *UTA*
Benjamin Spears, *LTK*
Jeremy Spilde, *Metro Transit*
Laura Sullivan, *VOLPE*
Lukasz Szymsiak, *VIA Rail Canada*
Michael Trosino, *Amtrak*
Rudy Vazquez, *Amtrak*
Doug Warner, *Herzog*
Cliff Woodbury, *LTK*
Leonard Woolgar, *Baultar*
Galiane Yergeau, *VIA Rail Canada*
Theresa Zemelman, *RVBA*
Steven Zuiderveen, *FRA*

Project team
Narayana Sundaram, *American Public Transportation Association*
Nathan Leventon, *American Public Transportation Association*

Introduction

This introduction is not part of APTA PR-CS-S-006-98, Rev. 2, "Attachment Strength of Interior Fittings for Passenger Railroad Equipment."

This standard provides a consistent set of requirements for interior fittings on all types of passenger intercity or commuter railroad equipment. The requirements in this standard are intended to prevent failure or separation of interior fittings from the carbody during a collision, derailment or other incident, and to provide a crashworthy vehicle interior that will significantly reduce the extent and severity of passenger injuries due to secondary impact occurring during an incident.

This standard establishes safety requirements for six subsystems within the interior of a passenger rail vehicle: overhead luggage storage racks, luggage stacks, stanchions/handholds, windscreens/partitions, bicycle racks, and miscellaneous interior fittings.

This standard applies to all:

- Railroads that operate intercity or commuter passenger train service on the general railroad system of transportation; and
- Railroads that provide commuter or other short-haul rail passenger train service in a metropolitan or suburban area, including public authorities operating passenger train service.

Attachment Strength of Interior Fittings for Passenger Railroad Equipment

1. Overview

1.1 General

The following requirements define the required strength for permanently or semi-permanently attached interior fittings located within the passenger compartment, including the lavatory and operating cabs. Except where specifically stated, transient objects that passengers and crew members bring onto and remove from the equipment are not subject to the requirements herein.

To the extent possible, all interior fittings in a passenger car shall be recessed or flush-mounted. Sharp edges and corners shall be either avoided or padded to mitigate the consequences of an impact with such surfaces. Where protrusions are unavoidable, rounded edges shall be used.

Materials that may fracture to reveal sharp edges or dangerous inserts shall not be used. Wherever possible, use shall be made of energy-absorbing features in areas where passenger impact may occur.

At the time of publication, compliance with Revision 1 of this standard is required by regulation in *49 CFR Appendix G to Part 238—Alternative Requirements for Evaluating the Crashworthiness and Occupant Protection Performance of a Tier I Passenger Trainset*, and *49 CFR Part 238.733 for Interior fixture attachment.* Portions of this standard are intended to provide details on how to demonstrate compliance with the requirements of *49 CFR Part 238.233 for interior fittings attachment strength,* which apply to every tier. Tier III trainsets can comply with the interior fixture attachment strength requirements under *49 CFR 238.733 (a)(2)* only if the associated conditions are met. All the other dimensional (clearance, etc.), geometric requirements (lip, etc.) shall apply to Tier III trainsets too.

1.2 Compliance

Analysis shall be performed to demonstrate compliance with all requirements contained in this standard. The carbuilder is responsible for demonstrating compliance with the requirements of this standard.

2. Strength requirements

2.1 Overhead luggage storage racks

2.1.1 On equipment ordered before December 1, 2021

All longitudinal overhead luggage storage racks shall be designed to provide longitudinal and lateral restraint for stowed articles. Overhead luggage racks shall be open shelf–type, open ladder–type or fully enclosed modular units.

Overhead storage racks, including their attachments to the carbody, shall have ultimate strength sufficient to resist loads due to individually applied static loads represented by the following values, acting on the mass of the luggage stowed. The mass of the luggage stowed may be determined by the railroad.

- Longitudinal: 8g
- Vertical: 4g
- Lateral: 4g

Overhead storage racks shall have sufficient strength to support a distributed load as defined by the operating railroad, but not less than 250 lb (1111 N) applied midway between adjacent supports without permanent deformation. Overhead storage rack door latches shall be designed to withstand a 120 lb (536 N) distributed load, acting perpendicular to the door latch face, without releasing.

2.1.2 For equipment ordered on or after December 1, 2021

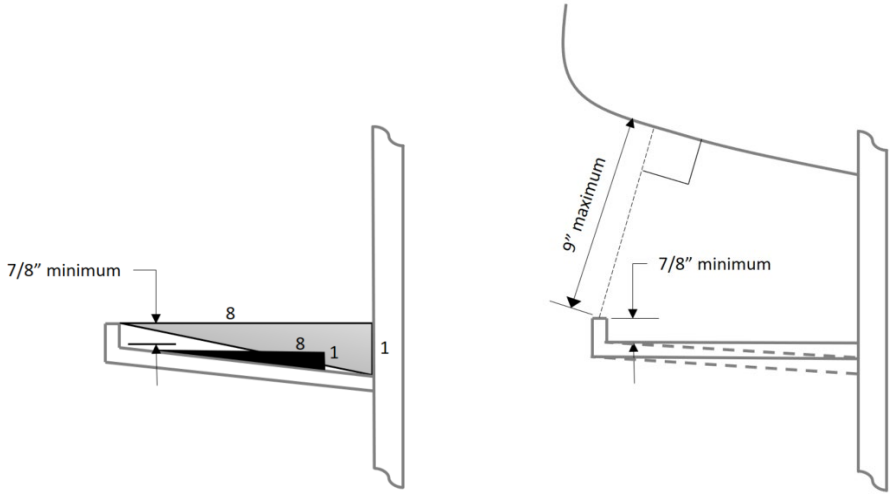
All longitudinal overhead luggage storage racks shall be designed to provide longitudinal and lateral restraint for stowed articles. To restrain the lateral movement of luggage, these racks shall have:

- a minimum ⅞ in. (2.22 cm) high lip on the longitudinal front rail, and rear rail on open type racks; and
- a slope downward in the outboard direction at a minimum ratio of 1:8 with respect to a horizontal plane. The lip on the edge of the luggage rack may be used to achieve the minimum slope.

For luggage racks with less than 9 in. of vertical clearance, a minimum ⅞ in. (2.22 cm) lip may be used in lieu of the 1:8 slope, reference **Figure 1** for examples of compliant designs.

To restrain the longitudinal movement of luggage, transverse vertical dividers shall be provided at no greater than 10 ft (3.05 m) intervals.

FIGURE 1
Schematic of Overhead Luggage Storage Rack Configurations



(a)

⅞ in. minimum lip required, measured from working surface of rack to tip of lip, *and* 1:8 slope required. Lip may be used to satisfy requirement.

(b)

For space-constrained installations where the perpendicular distance from ceiling to tip of lip is ≤ 9 in., rack slope requirement does not apply.

Overhead storage racks, including their attachments to the carbody, shall have ultimate strength sufficient to resist loads due to the following individually applied design static load factors acting on the mass of the

luggage stowed, combined with the mass of the storage rack. The mass of the luggage stowed shall be determined by the railroad.

- Longitudinal: 8g
- Vertical: 4g
- Lateral: 4g

Overhead storage racks shall have sufficient strength to support a downward vertical load not less than 250 lb (1112 N) applied midway between adjacent supports on the inboard edge without permanent deformation of the luggage rack or its attachment to the carbody structure.

Latches for overhead storage rack door systems, when used, shall be designed to withstand a 120 lb (534 N) load, acting perpendicular to the latch toward the centerline of the car, without releasing. Luggage rack doors shall contain a positive securement device to secure the door in the closed position. The doors may be self-opening when the door latch is released.

2.2 Luggage stacks

All luggage stacks shall be designed to provide longitudinal and lateral restraint for stowed articles. Luggage stacks, including their attachments to the carbody, shall have ultimate strength sufficient to resist loads due to the following individually applied design static load factors acting on the mass of the luggage stowed, combined with the mass of the luggage stack. The minimum mass of luggage stowed shall be based on a distributed mass of 20 lb/sq. ft (100 kg/m^2) applied on each luggage-storage surface.

- Longitudinal: 8g
- Vertical: 4g
- Lateral: 4g

2.3 Handholds and stanchions

Handholds and stanchions, including handholds attached to windscreens and partitions, and their attachments to the carbody structure shall have an ultimate strength capable of resisting a design static load factor of 8g acting on the mass of the stanchion in any horizontal direction.

Handholds, other than those mounted to passenger seats, and their attachments to the carbody structure shall resist a 500 lb (2224 N) load acting in any direction at the midpoint of the span, distributed over a length of no more than 3 in., without local buckling or failure of the attachment. The handhold shall not permanently deform more than 2 percent of its length, measured at the midpoint of its span, after the load has been removed. Reference the APTA standard “Passenger Seats in Passenger Rail Cars,” APTA-PR-CS-S-016-99, latest revision, for requirements pertaining to passenger seat handholds.

2.4 Windscreens and partitions

Windscreens and partition panels, and their attachments to the carbody, shall be capable of withstanding a 500 lb (2224 N) load applied normal to the panel in either direction at the midpoint, without failure of the panels or their attachment to the carbody.

2.5 Bicycle racks

Bicycle racks shall be designed to provide longitudinal, vertical and lateral restraint for stowed bicycles. Bicycle racks, including their attachments to the carbody, and the mechanism to secure bicycles to the racks, shall have ultimate strength sufficient to resist loads due to the following individually applied design static

load factors acting on the mass of the bicycle(s) stowed, combined with the mass of the bicycle rack. The weight of a stowed bicycle shall be 50 lb (23 kg) for the purposes of this section.

- Longitudinal: 8g
- Vertical: 4g
- Lateral: 4g

2.6 Miscellaneous interior fittings

Miscellaneous interior fittings such as light fixtures and destination signs within a passenger compartment, including fittings located in the toilet/lavatory compartment, shall be attached to the carbody with sufficient ultimate strength to withstand applied loads as defined by the operating railroad, and individually applied static loads represented by the following design static load factors acting on the mass of the fitting:

- Longitudinal: 8g
- Vertical: 4g
- Lateral: 4g

Food service equipment such as, but not limited to, ovens, warmers, coffee makers, drink dispensers, blenders and toasters shall be attached to their mounting surfaces with sufficient ultimate strength to withstand individually applied static loads represented by the following design static load factors acting on the mass of the loaded equipment:

- Longitudinal: 8g
- Vertical: 4g
- Lateral: 4g

Strength of fixed workstation tables and their attachments to carbody structure is covered by the APTA standard “Fixed Workstation Tables in Passenger Rail Cars,” APTA-PR-CS-S 018-13, Latest revision.

Related APTA standards

APTA-PR-CS-S-011-99, "Cab Crew Seating Design and Performance"
APTA-PR-CS-S-016-99, "Passenger Seats in Passenger Rail Cars"
APTA-PR-CS-S-018-13, "Fixed Workstation Tables in Passenger Rail Cars"
APTA-PR-CS-S-034-99, "Design and Construction of Passenger Railroad Rolling Stock"
APTA-PR-M-S-016-06, "Safety Appliances for Rail Passenger Cars"

References

This standard shall be used in conjunction with the following publications. When the following standards are superseded by an approved revision, the revision shall apply.

49 CFR, Part 238, Passenger Equipment Safety Standards

Association of American Railroads:
AAR S-580, Locomotive Crashworthiness Requirements

Definitions

handhold: A bar or rail designed to be grasped with the hand. A handhold is secured by mechanical attachment to the wall or ceiling structure. Handholds may be oriented vertically, horizontally or at an angle.

interior fitting: Any auxiliary component in the passenger compartment or operating cab on passenger equipment that is mounted to the floor, ceiling, wall or end walls, and that projects into the passenger compartment or cab from the surface or surfaces to which it is mounted.

lateral: The horizontal direction perpendicular to the direction of travel of a rail vehicle.

longitudinal: A direction parallel to the normal direction of travel of a rail vehicle.

luggage rack: Any horizontally oriented receptacle used to store passenger luggage. Luggage racks are usually located over the passenger seating area and are secured to the carbody sidewall structure.

luggage stack: A series of vertically stacked receptacles used to store passenger luggage.

partition: A transverse or longitudinal panel that may enclose a room, or separate the passenger compartment from the operator's area, luggage storage area, or food-service or equipment compartments.

passenger (railroad) equipment: All powered and unpowered passenger cars, locomotives used to haul a passenger car, and any other rail rolling equipment used in a train with one or more passenger cars.

stanchion: An upright handhold that extends from floor to ceiling and is mechanically attached to the floor, ceiling or wall.

windscreen: A panel located adjacent to side doorways that provides security and protection for the passengers from the elements.

Abbreviations and acronyms

AAR Association of American Railroads
CFR Code of Federal Regulations
FRA Federal Railroad Administration
N Newtons
NATSA North American Transportation Services Association

Summary of document changes

- Document formatted to the new APTA standard format.
- Sections have been moved and renumbered to accommodate the new format.
- Scope and summary moved to the front page.
- Definitions, abbreviations and acronyms moved to the rear of the document.
- Two new sections added: "Summary of document changes" and "Document history."
- Some global changes to section headings and numberings resulted when sections dealing with references and acronyms were moved to the end of the document, along with other cosmetic changes, such as capitalization, punctuation, spelling, grammar and general flow of text.
- Updated introduction section to reflect latest language and requirements addressed within this standard.
- Added Section 1.1 General under Overview to clarify certain requirements flowing down from the CFR. Also added provision to address hazards associated with materials that may break or fracture and become hazardous to interior occupants riding down a collision or derailment.
- Section 2.1 - Added in heading reference to dates associated with the new standard in order to "grandfather" existing equipment to previous standard only. Requirement of lip to retain luggage was added as a measure of protection based on the analysis conducted by Volpe National Transportation Surface Center (VNTSC).
- Section 2.1.2 - Added requirement to include mass of the storage rack in addition to the mass of the luggage stowed.
- Section 2.2 – a new section was added for Luggage stacks.
- Sections 2.3 and 2.4 – minor clarifications were made from the previous revision.
- Section 2.5 – a new section was created for Bicycle rack requirements for attachment strength. This section does not deal with placement of bicycle racks.
- Section 2.6 – clarifications were made to this section. Coat hooks were removed from the list of miscellaneous interior fittings.

Document history

Document Version	Working Group Vote	Public Comment/ Technical Oversight	Rail CEO Approval	Policy & Planning Approval	Publish Date
First published	—	—	—	—	March 17, 1999
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