

4. APTA PR-CS-S-006-98, Rev 1. Standard for Attachment Strength of Interior Fittings for Passenger Railroad Equipment

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Abstract: This standard contains minimum requirements for the static strength of interior fittings and the strength of attachment of interior fittings to the car body structure, and recommended design practices for interior fittings of railroad passenger equipment.

Keywords: attachment, design, fittings, strength, load

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Standard for Attachment Strength of Interior Fittings for Passenger Railroad Equipment

1. Overview

Current passenger interior equipment has demonstrated its ability to provide a certain level of structural integrity and passenger safety. However the design of this equipment is largely based on sound ergonomic principals and loose industry standards that are no longer actively maintained. Requirements for interior appurtenance strength and passenger crash protection may also vary from railroad to railroad. The design of new passenger equipment should not be left to a collection of similarly loose standards.

Evidence from railway accidents suggests that secondary impacts during collisions seldom cause fatalities but do cause many injuries. New passenger equipment should be designed to provide a crashworthy vehicle interior that would significantly reduce the extent and severity of passenger injuries from secondary impact on the assumption that no major vehicle structural collapse occurs.

This standard is divided into six sections. Section 1.1 provides the scope of this standard. Section 2 lists references to other standards that are useful in applying this standard. Section 3 provides definitions for technical terms used in this standard. Section 4 establishes safety standards for four sub-systems within the interior of a rail vehicle. Section 5 establishes recommended practices for four sub-systems within the interior of a rail vehicle.

1.1 Scope

This standard covers fittings used in the interior of commuter and intercity railcars, and locomotive cabs. It specifies the minimum strength, and attachment strength for interior sub-systems including overhead luggage racks, stanchions and hand holds, windscreen and partitions, food service equipment, and miscellaneous interior fittings. This standard also contains recommendations for design requirements and design practices for interior sub-systems, including, overhead luggage racks, stanchions and hand holds, windscreen and partitions, and miscellaneous interior fittings.

Comprehensive strength and testing requirements for passenger seating are addressed in the APTA Standard for Row-to Row Seating in Commuter Rail Cars, *APTA PR-CS-S-016-99 Rev 1*

This standard does not cover the strength of attachment of major equipment to the car body - refer to *APTA PR-CS-S-034-99 Rev 1, Section 5.7¹*.

1.2 Purpose

The purpose of this standard is to establish the minimum strength requirements for interior fittings and to establish the minimum design requirements and recommended practices for interior fittings of rail vehicles.

¹ For references in Italics, see Section 2.

This standard shall be used in specifications for the procurement of new passenger railcars. It shall also be used, as applicable, in specifications for rebuilding existing rail passenger vehicles and for replacement systems.

2. 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.

APTA Standard for Row-to-Row Seating in Commuter Rail Cars, APTA SS-C&S-016-99 Rev. 1

APTA Standard for The Design and Construction of Passenger Railroad Rolling Stock, APTA PR-CS-S-034 99 Rev. 1

3. Definitions

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

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

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

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

3.1.5 luggage rack: Any horizontally-oriented receptacle used to store passenger's luggage. Luggage racks are usually located over the passenger seating area, and are secured to the car body sidewall structure.

3.1.6 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.

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

3.1.8 windscreen: A panel located adjacent to side doorways which provide security, and protection for the passengers from the elements.

4. Strength requirements

4.1 Overhead luggage storage racks

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 car body, 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 lbs. (1111 newtons) applied midway between adjacent supports without permanent deformation. Overhead storage rack door latches shall be designed to withstand a 120 lb. (536 newtons) distributed load, acting perpendicular to the door latch face, without releasing.

4.2 Handholds

Handholds and their attachments to car body structure shall have an ultimate strength capable of resisting a transverse 8g static load, acting on the mass of the stanchion.

Handholds and their attachments to car body structure shall resist a 500 lb. (2222 newtons) load acting in any direction at the midpoint of the span without local buckling. The handhold shall not permanently deform more than 2% of its length, measured at the midpoint of its span, after the 500 lb (2222 newtons) load has been removed. Handholds fitted to the top of seats shall be designed to achieve the strength requirements listed in the *APTA Standard for Row-to-Row Seating in Commuter Rail Cars, APTA PR-CS-S-0016-99 Rev. 1*.²

4.3 Windscreens and partitions

Windscreens and partitions, and their attachments to the car body shall have an ultimate strength capable of withstanding a 500 lb. (2222 newtons) load applied longitudinally in either direction at the midpoint, without failure of the panels or their attachment to the car body.

4.4 Miscellaneous interior fittings

Miscellaneous fittings such as coat hooks, light fixtures, and destination signs within a passenger compartment shall be attached to the car body with sufficient ultimate strength to withstand applied loads as defined by the operating Railroad, and individually-applied static loads represented by the following values acting on the mass of the fitting:

² For references in Italics, see Section 2.

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 values acting on the mass of the equipment:

Longitudinal: 8g

Vertical: 4g

Lateral: 4g

Strength of tables and their attachments to car body structure is covered by the *APTA Standard for Row- to- Row Seating in Commuter Rail Cars, APTA PR-CS-S-016-99 Rev. 1*.

5. Recommended practices

5.1 Overhead luggage storage racks

Transverse vertical dividers should be provided at no greater than 8-foot (2.44 m) intervals on the rack to restrain longitudinal movement of luggage. On all open type racks, a minimum one-inch (2.54 cm) high vertical flange may be provided on the longitudinal rear rail to prevent items from falling down between the rack and wall and on the longitudinal front rail to restrain luggage from falling into the aisle.

Luggage rack doors should 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.

5.2 Handholds

The shape and form of a handhold should be commensurate with its function but should not present a significant projection from the surrounding features, which could result in passenger injury in the event of an accident. Consideration should be given to integrating the stanchion or handhold into the design of the surrounding features to reduce the risk of injury arising from passenger impact.

5.3 Windscreens and partitions

Partitions and windscreens should be manufactured from materials that should not fracture and leave sharp or dangerous shards.

The shape and form of the windscreens and partitions should be commensurate with its function and should not contain any projections or sharp edges, which could result in passenger injury in the event of an accident. Consideration should be given to softening edges and corners with moldings or trim having a generous radius.

5.4 Miscellaneous interior fittings

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

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