

7. APTA PR-CS-S-012-02 Standard for Door Systems for New and Rebuilt Passenger Cars

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Abstract: This standard contains the minimum requirements for door systems and door system operation on new and rebuilt rail passenger cars.

Key Words: doors, door systems, emergency evacuation

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Table of Contents

1. Overview	7.3
1.1 Scope	7.3
1.2 Purpose	7.3
2. References	7.3
3. Definitions, abbreviations and acronyms	7.4
3.1 Definitions	7.4
3.2 Abbreviations and acronyms	7.5
4. Types of doors	7.5
4.1 Sliding	7.5
4.2 Plug	7.5
4.3 Bi-parting	7.5
4.4 Bi-folding	7.5
4.5 Hinged	7.5
5. Door operation	7.5
5.1 General	7.5
5.2 Manual	7.6
5.3 Powered	7.6
6. Emergency operation	7.7
6.1 Manual doors	7.7
6.2 Emergency release actuation device, powered doors	7.7
6.3 Interior emergency device signage	7.9
6.4 Exterior emergency device signage	7.9
7. Door sizes	7.9
7.1 General	7.9
7.2 Side doors	7.9
8. Door glazing	7.9
9. Design for ease of maintenance	7.9

APTA PR-CS-S-012-02

Standard for Door Systems for New and Rebuilt Passenger Cars

1. Overview

This standard provides uniformity regarding doors, doorways and door systems for new and rebuilt rail passenger cars. Doors provide the primary emergency egress/access path as well as the convenient, safe entrance and exit for normal boarding, detraining and passing between connected cars.

1.1 Scope

This standard sets out requirements and references regarding the number, type, and method of operation, quantity and size of passenger car door systems. This information provides a standardized basis to describe and specify passenger car door systems and to describe emergency egress/access options for passenger car door systems. Electric locker doors, equipment access doors, toilet doors, cab doors, luggage compartment doors and equipment hatches are not covered by this standard.

1.2 Purpose

This standard provides a set of parameters covering the methods of normal and emergency egress/access for passenger car door systems while recognizing the needs of each unique operating railroad.

This standard shall be used in specifications for the procurement of new and rebuilt passenger cars.

2. References

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 When the following references are superseded by an approved revision, the revision shall apply.

49 CFR, Parts 37 and 38, Americans with Disabilities Act.

49 CFR, Part 238, Rail Passenger Equipment Safety Standards

MIL-STD-1472E, Human Engineering Design Criteria for Military Systems, Equipment and Facilities

APTA SS-PS-002-98, Rev 2, Standard for Emergency Signage for Egress/Access of Passenger Rail Equipment

49 CFR, Part 239, Passenger Train Emergency Preparedness

49 CFR Part 223, Safety Glazing Standards, Locomotive, Passenger Cars, and Caboose

APTA PR-IM-RP-003-98 Rev 2, Recommended Practice for Door System Periodic Inspection and Maintenance

3. Definitions, abbreviations and acronyms

3.1 Definitions

3.1.1 bi-folding door : A door with hinged panels that in the open position fold against the door bulkhead.

3.1.2 bi-parting door: A door, usually sliding, that has two panels that open from the center and are normally synchronized **manual operation:** A door capability that permits operation by hand without tools or keys.

3.1.3 collision post door: The door opening between the collision posts of the car and normally used for passing between cars.

3.1.4 door pocket: A compartment into which a door panel is retracted when in the open position.

3.1.5 lock: A device, usually key operated, used in normal train operations to secure the ends of a train or portion of individual cars from unauthorized access or used to secure a door in the closed position when that door is taken out of service. Bars, latches, hasps and similar devices used to secure a car(s) for storage (overnight or long term) are not covered by this definition, nor are latches and similar devices on equipment access doors

3.1.6 . passenger compartment door (body end door): For cars with end vestibules, the door opening between the main passenger compartment of the car and the car vestibule.

3.1.7 power operation: A door capability that results in the door opening or closing by means of an electric or pneumatic mechanism or a combination thereof controlled from one or more locations, and in an emergency, shall be capable of manual operation with an override device in accordance with 49 CFR Part 238.

3.1.8 plug door: A door with a mechanism that, when opening, moves the door panel(s) out and parallel to the side of the car in the open position.

3.1.9 side entrance door: The door opening(s) on the side of the car normally used for passenger access and egress.

3.1.10 trap door: A hinged panel that rotates upward to reveal a set of steps used for low level access. In the down position, the panel becomes part of the floor used for high-level platform access. In both the up and down positions, the panel is retained by a latch and the panel usually contains a handrail on the underside for use when in the up position.

3.2 Abbreviations and acronyms

CFR Code of Federal Regulations
MIL-STD Military Standard

4. Types of doors

4.1 Sliding

A door in which the panel or panels slide open and closed on a hanger mechanism that is usually mounted above the doorway opening. A sliding door system can have either a single or double (bi-parting) panel configuration.

4.2 Plug

A door in which the panel or panels, in the open position, are positioned parallel to and outside of the car body. Plug doors can be of the sliding plug type whereby to open the door panel(s) first unplug by moving perpendicular to the car body and then open by moving parallel to the car body. Plug doors can also rotate open and closed in a parallelogram motion. Plug door systems can have either a single or double panel configuration.

4.3 Bi-parting

A door with two panels that open by moving in opposite directions.

4.4 Bi-folding

A door with one or two hinged panel assemblies that fold inward or outward against themselves. In the open position, the folded, hinged panels rest against the door post or bulkhead.

4.5 Hinged

A door with a panel hinged on one side that opens and closes by rotating about the hinge.

5. Door operation

5.1 General

All emergency exit doors shall be capable of manual operation without keys or tools in accordance with *49 CFR, Part 238, Rail Passenger Equipment Safety Standards*¹.

All doors must be capable of being functionally tested in accordance with the manufacturer's recommendations.

All emergency exit doors shall be marked in accordance with *APTA PR-PS-S-002-98 Rev 2*,

¹ For references in Italics, see Section 2.

Standard for Emergency Signage for Egress/Access of Passenger Rail Equipment and 49 CFR, Part 239, Passenger Train Emergency Preparedness.

5.2 Manual

5.2.1 Handles

All manually operated doors shall include readily accessible handles, (including handles that are part of a lock set), or pulls.

5.2.2 Opening and closing devices

Manually operated doors may include door closing or cushioning devices, hold open devices and other mechanical assist devices.

5.3 Powered

5.3.1 Operator type

Doors may be powered by either electric or pneumatic devices that can be mounted either on the floor, in the wall or overhead. Motion can be imparted to the door panels through linkages and arms, or by a direct connection to the panel.

5.3.2 Locks

Provisions shall be included to override any locks when the manual release device is exercised as in an emergency.

5.3.3 Door stops

If door travel is not limited by door operators, door open and door closed stops shall be incorporated to facilitate adjustments and to keep doors from overtravel. Doorstops shall be adjustable with respect to the door panel movement. Doorstops shall be of a robust design and manufactured to prevent their binding and/or distortion. Access to the doorstops and operator travel adjustments shall be provided for adjustment purposes during their service life.

5.3.4 Obstruction detection

If obstruction sensing is required, a method for detecting an obstruction and preventing the closure of a powered door shall be included as part of the design of the door controls. The doors shall not lock and permit a closed-door indication if an obstruction is detected.

5.3.4.1 Detection sensitivity

The sensitivity of the obstruction detection system should, at the discretion of the railroad be as follows:

5.3.4.1.1. It should detect a flat bar, 1/4-inch wide and 3 inches high, held between and perpendicular to the door panels or between and perpendicular to the panel and door

frame (for a single panel door opening). This sensitivity should be required along the length of the panel except the uppermost 3 inches and lowermost 1-inch of the door leading edges.

5.3.4.1.2. It should detect an object, 3/8-inch in diameter, held between and perpendicular to the door panels or between and perpendicular to the panel and the door frame (for a single panel door opening) at all locations along the length of the door leading edges, except the uppermost 3 inches and lowermost 1 inch of the seal.

5.3.4.1.3. The equipment should also permit a thin flexible object not detected by the detection system to be pulled free from the leading edges of doors that are fully closed and locked.

5.3.4.2 Recycle operation

Upon sensing of an obstruction, the local door controls shall cause the door operator(s) on the obstructed panels to immediately reverse and open. The controls may attempt to reclose the panels a specified number of times. The number of recycles shall be at the discretion of the railroad. If the obstruction is still detected upon the final reclosure attempt, the motion should reverse and the door panels shall fully open and remain in that position

5.3.5 Closing force

Door closing forces shall not exceed 30 lbf for the full range of door motion.

6. Emergency operation

6.1 Manual doors

All latches and/or handles shall be readily accessible to a person inside or outside the door opening and shall not require the use of tools to access or operate. All latches and handles shall be clearly marked in compliance with the requirements of *APTA PR-PS-S 002-98, Rev 2, Standard for Emergency Signage for Egress/Access of Passenger Rail Equipment² and 49 CFR Part 239, Passenger Train Emergency Preparedness. Consideration of the Americans with Disabilities Act 49 CFR Part 38* shall be given when designing and locating latches and handles.

6.2 Emergency release actuation device, powered doors

6.2.1 General

An emergency release actuation device shall be provided immediately adjacent to the door opening on the interior and exterior of the doorway. Each actuator shall be readily accessible to a person located inside or outside the door opening. *Consideration of the Americans with Disabilities Act 49 CFR, Part 38 and MIL-STD-1472E* shall be given when designing and locating the interior emergency release actuator. It shall be readily

² For references in Italics, see Section 2

accessible without the use of tools or other implement as per 49 CFR Part 238, Rail Passenger Equipment Safety Standards. The emergency release actuation device shall be clearly marked to show its purpose and method of operation as per *APTA PR-PS-S-002-98, Rev 2, Standard for Emergency Signage Standard for Egress/Access of Passenger Rail Equipment* and *49 CFR Part 239, Passenger Train Emergency Preparedness*. The actuation device shall be covered by a clearly labeled, frangible or hinged panel at the discretion of the railroad to reduce nuisance operations.

The emergency release mechanism shall be capable of unlocking and releasing the door so that the door can be manually opened without power. The force necessary to actuate the interior emergency release mechanism shall not exceed 20 pounds. ADA has a target force of 5 pounds that is very hard to achieve. The force necessary to actuate the exterior emergency release mechanism shall not exceed 30 pounds using a lever type mechanism or 50 pounds using a “T” handle type mechanism. The emergency release mechanism shall not require the availability of electric or pneumatic power. Neither shall the emergency release mechanism require the presence of any interlock signals (e.g. “low speed” or “zero speed” signals) for actuation. When actuated, the emergency release mechanism shall override any locks and it shall be possible to manually open the released door with a force not to exceed 35 lbf. The emergency release mechanism shall require manual resetting.

The following shall be taken into account for the installation of emergency release actuation devices:

- 1 Conduit shall be provided for the exterior emergency release actuation device cable to facilitate cable replacement.
- 2 Design of the interior emergency release cable and its interface with the car structure to reduce the possibility of cable kinks or chafing.
- 3 Exterior emergency release actuation devices shall be designed to withstand a minimum 250-pound pull force without damage.
- 4 Sharp cable bends shall be avoided and the number of bends kept to the minimum.
- 5 When actuated, the emergency release actuation device shall remove the electrical power and/or the air supply to the door operator drive components prior to unlocking and releasing the door.

6.2.2 Manual override, exterior side doors

Each powered, exterior side door in a vestibule that is partitioned from the passenger compartment of a passenger car shall be equipped with a manual override in accordance with *49 CFR, Part 238, Rail Passenger Equipment Safety Standards* that is:

- 1 Capable of opening the door without power from the inside of the car;
- 2 Located adjacent to the door which it controls; and

- 3 Designed and maintained so that a person can access the override device from inside the car without the use of a tool or other implement.

6.3 Interior emergency device signage

Signage for the interior emergency release actuation device shall comply with the requirements of *APTA PR-PS-S-002-98, Rev. 2* and *49 CFR, Part 239*.

6.4 Exterior emergency device signage

6.4.1 Side door

Signage for the exterior side door emergency release actuation device shall comply with the requirements of *APTA PR-PS-S-002-98, Rev 2, Standard for Emergency Signage for Egress/Access of Passenger Rail Equipment* and *49 CFR, Part 239, Passenger Train Emergency Preparedness*.

6.4.2 Collision post doors and passenger compartment doors

Signage for the collision post door emergency release device shall comply with the requirements of *APTA PR-PS-S-002-98, Rev. 2* and *49 CFR, Part 239*.

7. Door sizes

7.1 General

Doorways designated for access to accessible areas of the cars shall comply with *49 CFR, Parts 37 and 38, Americans with Disabilities Act*.

7.2 Side doors

Side doors shall comply with the provisions of *49 CFR, Part 238, Rail Passenger Equipment Safety Standards*.

8. Door glazing

All exterior door glazing shall comply with the provisions of *49 CFR, Part 223, Safety Glazing Standards, Locomotive, Passenger Cars, and Cabooses*.

9. Design for ease of maintenance

Accessibility of door equipment for both operational access and maintainability shall be implicit in the design and integration of the door equipment. Subjects to be considered shall include equipment location, accessibility, modularity, ease of replacement, car systems interface requirements and proximity to other systems.

Door design should allow periodic inspection and maintenance of doors in accordance with *APTA PR-IM-RP-003-98, Rev. 1 Standard for Door System Periodic Inspection and Maintenance*.

Doors should be designed for ease of access to sites where adjustments are required (such as door travel, etc.). However, the goal is to design so doors that do not require frequent adjustment so attention should be paid to integration issues such as rigidity of car structure and brackets (so components do not bend or move).