



**APTA RT-VIM-S-023-12, Rev. 1**

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APTA VIM Standards Working Group

# Emergency Egress/Access for Rail Transit Vehicles

**Abstract:** This standard provides guidance to rail transit agencies for the design requirements for emergency egress and access systems for new rail transit vehicles and the retrofit and replacement of side door systems for existing rolling stock to allow for safe passenger evacuation and entry by emergency responders in the event of life-threatening emergencies.

This standard also offers guidance on how agencies must take steps to ensure that all changes are assessed for their impact on operating and maintenance practices and how any changes to operating and maintenance rules, procedures or practices are properly documented in all affected documentation.

**Keywords:** emergency egress/access, emergency response, emergency systems, hazard analysis, self-evacuation

**Summary:** This standard was developed to establish minimum design requirements for emergency egress/access systems intended to provide emergency exit capability for passengers and crew and emergency access capability for emergency response personnel in a life-threatening situation as a result of an accident, incident or environmental situation involving the rail transit vehicle, right-of-way or infrastructure.



## Foreword

The American Public Transportation Association is a standards development organization in North America. The process of developing standards is managed by the APTA Standards Program's Standards Development Oversight Council (SDOC). These activities are carried out through several standards policy and planning committees that have been established to address specific transportation modes, safety and security requirements, interoperability, and other topics.

APTA used a consensus-based process to develop this document and its continued maintenance, which is detailed in the [manual for the APTA Standards Program](#). This document was drafted in accordance with the approval criteria and editorial policy as described. Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

This document was prepared by the VIM Standards Working Group as directed by the Rail Standards Policy and Planning Committee.

This document represents a common viewpoint of those parties concerned with its provisions, namely transit operating/planning agencies, manufacturers, consultants, engineers, and general interest groups. APTA standards are mandatory to the extent incorporated by an applicable statute or regulation. In some cases, federal and/or state regulations govern portions of a transit system's operations. In those cases, the government regulations take precedence over this standard. APTA recognizes that for certain applications, the standards or practices, as implemented by individual transit agencies, may be either more or less restrictive than those given in this document.

This document supersedes APTA RT-VIM-S-023-12, which has been revised. Below is a summary of the working group's changes from the previous document version:

- Abstract and Scope updated to include retrofit, overhaul and replacement of side door systems for existing rolling stock.
- "Note on alternate practices" updated to clarify language and distinguish rail transit from commuter, intercity and high-speed rail operations.
- Language added regarding number and location of emergency egress/access points, including the definition of passenger compartment, to provide clarification.
- Language added to address the evaluation and resolution of hazards and risks associated with emergency exit capabilities, including passenger access to emergency door release and the configuration of the door emergency entry/exit system interlock controls.
- Provisions added for door exterior and interior emergency releases, such as the maximum force required to actuate the mechanisms, feedback characteristics for the actuation of the mechanisms, car-level diagnostic monitors, and/or an annunciation to the operator for the activation of the mechanisms.
- Provisions added for the maximum force required to manually open the door after actuating an emergency release.
- Removed examples of door emergency exit system controls.
- Added requirement for a rail transit agency to define minimum requirements for nonoperational components and missing or defective equipment.



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## Introduction

*This introduction is not a part of APTA RT-VIM-S-023-12, "Emergency Egress/Access for Rail Transit Vehicles."*

This standard is meant to increase the effectiveness of safety devices and features on rail transit vehicles, not only for passengers, but also for operators and emergency response personnel. This standard describes the minimum requirements for emergency egress/access systems for rail transit vehicles.



APTA recommends the use of this document by:

- individuals or organizations that operate rail transit systems;
- individuals or organizations that contract with others for the operation of rail transit systems; and
- individuals or organizations that influence how rail transit systems are operated (including but not limited to consultants, designers and contractors).

This standard is intended to satisfy the following objectives:

- Incorporate safety risk management principles during the design and specification of rail transit vehicles.
- Incorporate safety risk management principles when determining scope of work during the design and specification of major retrofit and replacement campaigns of side door systems.
- Identify those safety-critical standards that provide a high level of passenger safety.
- Identify those safety-critical standards that provide a high level of employee safety.

An effective systems approach uses this standard, as well as APTA standards APTA RT-VIM-S-020-10, “Emergency Lighting System Design for Rail Transit Vehicles,” APTA RT-VIM-S-021-10, “Emergency Signage for Rail Transit Vehicles,” APTA RT-VIM-S-022-10, “Low-Location Emergency Path Marking for Rail Transit Vehicles,” and APTA RT-VIM-S-026-12, “Rail Transit Vehicle Passenger Emergency Systems,” to provide a means for passengers and agency employees to locate, reach and operate emergency exits to facilitate their safe evacuation in an emergency.

Each rail transit agency and vehicle builder should carefully consider the options available to meet emergency evacuation requirements presented in these standards. This standard is intended to address emergency exit/entry of rail transit vehicle passenger compartments. Emergency exit/entry specific to the operator cab is addressed in a separate standard, APTA RT-VIM-RP-025-15, “Operator Protection Features for Rail Transit Vehicles.”

## **Scope and purpose**

This standard applies to rail transit agencies that are in the process of procuring rail transit vehicles or replacing a side door system. This standard specifies minimum criteria for emergency access and egress provisions for rail transit vehicles. Other complementary emergency systems provide lighting, signage and path markings to locate, operate and reach emergency exits and are covered in separate APTA standards.

## **Note on alternate practices**

Individual rail transit systems may modify the practices in this standard to accommodate their specific equipment and mode of operation. APTA recognizes that some rail transit systems may have unique operating environments that make strict compliance with every provision of this standard impossible. As a result, certain rail transit systems may need to implement the standards and practices herein in ways that are more or less restrictive than this document prescribes. A rail transit system may develop alternates to APTA standards so long as the alternates are based on a safe operating history and are described and documented in the system’s safety program plan (or another document that is referenced in the system safety program plan).



Documentation of alternate practices shall:

- identify the specific APTA rail transit safety standard requirements that cannot be met;
- state why each of these requirements cannot be met;
- describe the alternate methods used; and
- describe and substantiate how the alternate methods do not compromise safety and provide a level of safety equivalent to the practices in the APTA safety standard (operating histories or hazard analysis findings may be used to substantiate this claim).

It must be noted that rail transit is not directly comparable with railroads. Rail transit systems differ greatly in the types of service, vehicles and technology employed, with some systems operating fully automated trains on exclusive rights-of-way and others operating on streets mixed with traffic. Rail transit demands a unique approach to solving its problems, and the APTA Rail Transit Standards Program was created to accomplish this complex task.

# Emergency Egress/Access for Rail Transit Vehicles

## 1. General system requirements

Emergency egress and access shall be provided for individual rail transit vehicles, allowing for the safe evacuation of passengers and entry by emergency responders in the event of life-threatening emergencies. Egress and access shall be provided by a combination of doors and windows sufficient in number to accommodate vehicle size, passenger capacity and alternative exit/entry locations. For passenger safety, operation of emergency exit/entry devices shall restrict vehicle motion with doors open.

### 1.1 Operation of emergency access and exit equipment

The provision and operation of emergency exit and entry devices for rail transit vehicles is intended to permit passengers to evacuate from an area of immediate danger to an area of greater safety, and to allow emergency responders to gain entry to a rail transit vehicle in an emergency. The intent of this standard is to provide uncontrolled emergency access and exit points on the vehicle without special tools or keys.

### 1.2 Analysis of hazards and risk mitigation associated with emergency exiting

Passenger-activated emergency exits are intended to permit passengers to self-evacuate to an area of greater safety with or without the assistance of transit or rescue personnel. Immediate passenger evacuation in certain emergency incidents may be the least hazardous course of action. However, unsupervised evacuations may result in passengers exiting to an area of greater danger, which could result in potential injury, death, or loss of passenger and rail transit agency property.

Environmental and operating conditions differ considerably among individual rail transit agencies. Some rail transit operating environments present hazards or risks that may be equal to or greater than the hazards or risks justifying immediate evacuation. Rail transit agencies involved in the purchase of new rail vehicles shall conduct a hazard and risk mitigation assessment to determine the safest means and strategies to respond to and evacuate passengers in the event of an emergency, taking into account the specific hazards, risks and capabilities of that agency's operating environment and emergency features.

The following factors shall be taken into account to ensure that hazards and risks associated with the availability or limitation of emergency exit capabilities are addressed in a manner that will not result in a situation of increased danger to passengers:

- **Vehicle characteristics, such as:**
  - door threshold height affecting evacuation away from station platforms;
  - proximity of operator or additional employees to passengers;
  - emergency communications and surveillance capabilities; and
  - emergency door inhibition circuits based on train location and/or train zero speed signal.
- **Right-of-way characteristics, such as:**
  - at grade, on street;
  - tunnels, elevated structures;
  - close clearances;
  - availability of walkways and catwalks for high-level doors;
  - protective railings on elevated structures;
  - availability of emergency exits between stations;
  - visibility and tripping hazards;
  - proximity of high-voltage adjacent tracks;

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- adjacent sloped areas; and
- other rail transit vehicles on adjacent tracks.
- **Operational issues, such as:**
  - passenger-initiated vehicle stopping for emergencies;
  - stoppage of rail transit vehicles and removal of traction power in evacuation area;
  - emergency response procedures and capabilities; and
  - emergency response for passengers with disabilities.

Provision for passenger self-evacuation from rail transit vehicles must take this operating environment into account to ensure that self-evacuation does not put passengers in greater danger. The hazard and risk assessment shall be used to determine the safest means to respond to and evacuate passengers in the event of an emergency.

Where rail transit vehicles are equipped for passenger-initiated evacuation, the rail transit agency must have established procedures for dispatching agency and rescue personnel to the scene as quickly as possible to supervise the evacuation. Procedures must also be established for the immediate control of rail transit vehicle movements and removal of traction power proximate to the evacuation.

Where the hazard and risk assessment determines that relative risk may be greater for passenger-initiated evacuation than delays due to evacuation initiated by employees/responders, the rail transit agency may choose to restrict passenger access to interior emergency door releases. In so doing, the agency must have a policy and procedure for identifying, locating and responding to emergencies to evacuate passengers. The hazards and risks associated with the availability or limitation of emergency exit capabilities shall be evaluated and addressed as part of a rail transit agency's Safety Management System and Emergency Preparedness Plan to make sure that adequate risk mitigation measures are in place to ensure that passengers safely evacuate.

## **2. Design requirements for exterior emergency access**

### **2.1 Number and location of emergency access points**

Vehicle side doors shall be used as emergency access points. A minimum of four emergency access points (two per side) shall be provided for each vehicle. On a per-side basis, the distance between one end of the passenger compartment and an emergency access point, as well as the distance between two emergency access points, shall not exceed 30 ft in either direction. A doorway with two separate door panels is considered a single emergency access point. If vehicle design does not provide a sufficient number of doors, then emergency windows may be used to achieve the required number of emergency access points.

### **2.2 Doors equipped for exterior emergency access**

All doors designated as exterior emergency access points shall be designed to be opened manually without the use of a crew key or tool and without vehicle electrical or air power required for normal door operation. Doors designated as emergency access points shall be capable of being fully opened (all panels) to facilitate the ability of emergency responders to enter the rail transit vehicle in emergency situations.

### **2.3 Door exterior emergency releases**

Exterior emergency door releases shall be provided at all doors designated as emergency access points. Emergency releases must be positioned on the rail transit vehicle so that they are easily accessible to emergency responders on the ROW, high and low station platforms, and emergency evacuation platforms.



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Appropriate signage shall be provided to help responders locate and operate the door release mechanisms. Keys shall not be required to access the release mechanisms. As a precaution against unauthorized use, door release mechanisms may be covered. Additional signage may be provided warning against unauthorized use.

Feedback characteristics to the exterior of the rail transit vehicle shall be provided to indicate that the mechanism has been actuated. Examples of such feedback characteristics are movement of the door, orientation of the pull handle, an indicator light, an audible alarm at the door or other means acceptable to the rail transit agency. A car-level diagnostic monitor or annunciation to the operator may be used in addition to the exterior indicator.

The force necessary to actuate the exterior emergency release mechanism shall not exceed 30 lbf using a lever-type mechanism or 50 lbf using a “T” handle-type mechanism. When actuated, the emergency release mechanism shall override any local door isolation locks, and it shall be possible to manually open the released door with a force not to exceed 35 lbf. Forces specified are as measured on flat, level track.

Provision shall be made to allow the door to be moved to the open position after activation of the emergency release mechanism. Examples of such provisions are a gap that provides a minimum 1½ in. clearance, a handle, a recess grab or other means acceptable to the rail transit agency.

## **2.4 Door emergency entry system interlock controls**

Door system controls shall permit a door to be manually opened by the exterior emergency door release when the rail transit vehicle is stopped. Door system controls shall be designed to prevent movement of the vehicle when a door is manually opened after activation of an exterior door emergency release.

## **2.5 Windows equipped for exterior emergency access**

When rail transit vehicle doors are insufficient to meet emergency access point requirements, emergency access windows shall be provided. Emergency access windows shall be designed to permit rapid and easy external opening by emergency responders. Access windows shall be provided with exterior identification markings and instructions.

# **3. Design requirements for interior emergency exits**

## **3.1 Number and location of emergency exit points**

Vehicle side doors shall be used as emergency exit points. If vehicle design does not provide a sufficient number of doors, emergency windows may be used to achieve the required number of emergency exit points. The number and location of emergency exit points shall comply with the criteria provided in Section 2.1 of this standard.

In the event that a hazard analysis for passenger egress demonstrates that a rail transit agency cannot comply with the provided guidance, the agency may consider the use of end doors as emergency exits.

# **4. Doors equipped for emergency exiting**

All doors designated as interior emergency exit points shall be designed to be opened manually without the use of a crew key or tool and without rail transit vehicle electrical or air power required for normal door operation. Doors designated as emergency exit points shall be capable of being fully opened (all panels) to facilitate passenger evacuation in emergency situations.

## **4.1 Door interior emergency releases**

Interior emergency door releases accessible to passengers shall be provided at all doors designated as emergency exit points. Emergency releases must be positioned so that they are easily accessible to passengers near the exit point. Appropriate signage shall be provided to instruct passengers on how to access and operate the mechanisms. Release mechanism access and operation shall not require keys or special tools. Release mechanisms shall be designed to permit manual door opening.

Additional emergency evacuation instruction signage shall be provided at exit locations, informing passengers of emergency procedures to be followed. Signage shall also warn passengers of any risks upon exiting, such as drop-offs to the ROW or roadbed, high voltage, moving rail transit vehicles, and tripping or falling hazards.

As a precaution against unauthorized use, door release mechanisms may be covered, and covers may be equipped with audible and visual alarms that activate when the cover door is opened. Alarm signals may also be transmitted to the operating cab or Operations Control Center, alerting rail transit agency personnel that an emergency exit has been activated. Additional signage may be provided warning against unauthorized use. APTA RT-VIM-S-021-10, "Emergency Signage for Rail Transit Vehicles," provides additional signage guidance.

When activated, an interior emergency release mechanism shall unlatch the door, disengage, or unlock the local door isolation lock (if engaged), remove power from the door operator or controls, and allow the door to be moved freely to the open position.

Feedback characteristics to the interior of the rail transit vehicle shall be provided to indicate that the mechanism has been actuated. Examples of such feedback characteristics are movement of the door, orientation of the pull handle, an indicator light, an audible alarm at the door or other means acceptable to the rail transit agency. A car-level diagnostic monitor or annunciation to the operator may be used in addition to the interior indicator.

The force necessary to actuate the interior emergency release mechanism shall not exceed 20 lbf. When actuated, it shall be possible to manually open the released door with a force not to exceed 35 lbf.

Provisions shall be made to allow the door to be moved to the open position after activation of the emergency release mechanism. Examples of such provisions are a gap that provides a minimum 1½ in. clearance, a handle, a recess grab or other means acceptable to the rail transit agency.

## **4.2 Door emergency exit system interlock controls**

Door system controls shall permit a door to be manually opened by the interior emergency door release when the rail transit vehicle is stopped by any means, that may include normal, penalty or emergency braking; signal or automatic control; or an incident (derailment, collision) causing a vehicle to stop. Door system controls shall be designed to prevent movement of the rail transit vehicle when a door is manually opened after activation of an interior door emergency release.

Door system controls shall prevent a rail transit vehicle in motion from continuing in motion with a door opened by the interior emergency door release. Activation of an interior emergency door release shall send a signal to the operator indicating that the device was activated.

The rail transit agency procuring new transit vehicles for operation on its system shall conduct a hazard assessment to assess risks based on its operating environment and potential incidents requiring emergency

passenger evacuation. The results from the hazard assessment shall be used to determine an acceptable method for the design of the emergency door interlock system.

### **4.3 Windows equipped for interior emergency exit**

When rail transit vehicle doors are insufficient to meet emergency exit point requirements, emergency exit windows shall be provided. Emergency exit windows shall be designed to permit rapid and easy opening from the inside of the rail transit vehicle. At minimum, the overall envelope for the emergency windows shall be 26” horizontally and 24” vertically. Exit windows shall be provided with interior identification markings and instructions for passengers. Signage shall be provided warning against unauthorized opening of emergency exit windows.

As a precaution against unauthorized use, exit windows may be equipped with audible and visual alarms that activate when the window is opened. Alarm signals may also be transmitted to the operating cab or central control, alerting rail transit agency personnel that an emergency window has been opened.

## **5. Required emergency response strategy**

Each rail transit agency shall develop an emergency response strategy consistent with vehicle capability for passenger-initiated emergency exiting. Agency emergency response plans must be developed to halt operations and dispatch personnel in the event of passenger-initiated evacuations. If the operating environment is not designed for self-evacuation, then the emergency response strategy must take this into account. If the rail transit agency determines, through a hazard analysis, that the operating environment presents unacceptable hazards to self-evacuation, then an alternate methodology to self-evacuation must be developed to ensure rapid response by personnel in emergency situations in lieu of allowing passenger-initiated rail transit vehicle emergency exits.

## **6. Maintenance**

Rail transit agencies shall conduct periodic inspections and tests to verify that all rail transit vehicle emergency access and egress components function as intended. These shall include release mechanisms, covers, alarms, signage, vehicle movement sensing and control, manual door opening, and window opening for all equipped doors and windows. Inspection and testing shall be incorporated into existing procedures for vehicle door, communication and control systems.

Defects such as broken, missing or nonoperational components shall be reported and repaired in accordance with established agency procedures and OEM recommendations. An agency’s inspection, testing and maintenance program shall define minimum requirements associated with nonoperational components and missing or defective equipment prior to putting a vehicle into service.

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## Related APTA standards

**APTA RT-VIM-S-020-10**, “Emergency Lighting System Design for Rail Transit Vehicles”

**APTA RT-VIM-S-021-10**, “Emergency Signage for Rail Transit Vehicles”

**APTA RT-VIM-S-022-10**, “Low-Location Emergency Path Marking for Rail Transit Vehicles”

**APTA RT-VIM-S-026-12**, “Rail Transit Vehicle Passenger Emergency Systems”

**APTA PR-M-S-018-10**, “Powered Exterior Side Door System Design for New Passenger Cars”

## References

Federal Railroad Administration, 49 CFR Part 238, Passenger Equipment Safety Standards.

Federal Transit Association 49 CFR Parts 673, 674 Public Transportation Agency Safety Plan (PTASP)

## Definitions

**emergency access points:** Doors or windows that may be opened manually from the vehicle exterior by means of a release mechanism that does not require special tools or keys.

**emergency exit points:** Doors or windows that may be opened manually from the vehicle interior by means of a release mechanism that does not require special tools or keys.

**passenger compartment:** The portion of a rail transit vehicle designed for passenger occupancy having vehicle end doors or interior doors that separate vehicle sections. Open articulation sections are considered a continuation of the passenger compartment.

## Abbreviations and acronyms

<b>CFR</b>	Code of Federal Regulations
<b>lbf</b>	pound-force
<b>PTASP</b>	Public Transportation Agency Safety Plan
<b>ROW</b>	right-of-way

## Document history

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