



APTA STANDARDS DEVELOPMENT PROGRAM

RAIL STANDARD

American Public Transportation Association
1666 K Street, NW, Washington, DC, 20006-1215

APTA RT-VIM-S-026-12

Published: December 2012

Rail Transit Vehicle Inspection and
Maintenance Working Group

Rail Transit Vehicle Passenger Emergency Systems

Abstract: This standard specifies the design requirements of emergency systems for new rail transit vehicles.

Keywords: cameras, communications, covert devices, emergency lighting, emergency preparedness, emergency signage, emergency system, event recorder, low location exit path marking, ventilation

Summary: This document establishes recommended practices, guidelines and requirements for various passenger emergency systems for new rail transit vehicles. Individual rail transit systems shall tailor these requirements to accommodate their specific equipment and mode of operation.

Scope and purpose: This standard specifies the requirements for passenger emergency systems for new rail transit vehicles. Rail transit systems shall consult this standard to determine which passenger emergency systems should be incorporated into the new rail transit vehicle based on the specific equipment they will obtain and the nature of their operations. This standard provides the necessary information for rail transit systems to make informed decisions on various passenger emergency systems as they review and assess the need for such systems when they purchase new rail transit vehicles. When a rail transit system determines that specific passenger emergency systems are required, this standard outlines the requirements for that system.

This *Rail Standard* represents a common viewpoint of those parties concerned with its provisions, namely, transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any standards, practices or guidelines contained herein is voluntary. 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.

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Introduction

(This introduction is not a part of APTA RT-S-VIM-026-12, Standard for Rail Transit Vehicle Passenger Emergency Systems.)

This *Rail Standard* specifies the various passenger emergency systems that rail transit systems (RTS) should consider when purchasing new vehicles. This standard outlines the design requirements for many of these systems. For the passenger emergency systems outlined in this document, the industry determined that for some of these systems it may not be necessary to mandate the requirements given the uniqueness of many of the rail transit systems. For these passenger emergency systems, considerations or guidelines are provided to help the Rail Transit System address the needs or design requirements of such systems.

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.
- 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).

Rail Transit Vehicle Passenger Emergency Systems

1. Emergency exits

New rail transit vehicles shall be designed to provide a means of emergency egress from the car and emergency access into the car in accordance with APTA RT-S-VIM-023-11 “Emergency Egress/Access for Rail Transit Vehicles.”

2. Operator protection

New rail transit vehicles shall be designed to provide adequate protection to the operator in the event of an emergency. This may include areas of crashworthiness, operator cab environment, emergency systems and other protective design features. The guidelines outlined in APTA RT-RP-VIM-025-11 “Operator Protection Features for Rail Transit Vehicles” should be reviewed to determine what operator protection design features should be considered for the type of vehicle and its operating environment.

3. Emergency lighting

New rail transit vehicles shall be designed to have an emergency lighting system to facilitate the ability of passengers, train crewmembers and/or emergency responders to see and orient themselves and to identify obstacles to assist them in safely moving throughout the passenger car and to see outside the passenger car to assess conditions of safety. The emergency lighting system shall comply with the requirements of APTA RT-S-VIM-020-08, “Emergency Lighting System Design for Rail Transit Vehicles.”

4. Emergency signage

New rail transit vehicles shall be designed to have an emergency signage system to provide evacuation guidance for passengers and train crewmembers and rescue access guidance for emergency responders. The emergency signage system shall comply with the requirements of APTA RT-S-VIM-021-08, “Emergency Signage for Rail Transit Vehicles.”

5. Low location exit path marking

New rail transit vehicles shall be designed to have an emergency low location exit path marking (LLEPM) system to identify the location of primary door exits and the exit path to be used to reach such doors by passengers and rail transit personnel under conditions of darkness when normal and emergency sources of illumination are obscured by smoke or are inoperative. The LLEPM system shall comply with the requirements of APTA RT-S-VIM-022-08, “Low-Location Emergency Path Marking for Rail Transit Vehicles.”

6. Emergency tools

The rail transit system shall equip each new vehicle with appropriate emergency tools that can be used by both crew and passengers in the event of an emergency. It should be noted that a detailed and comprehensive listing of specific emergency tools that should be stored and maintained on a rail transit vehicle is not universal across all rail transit systems. The appropriate emergency tools on the vehicles shall be defined in the RTS System Safety Plan (SSP) and will be specific to the type of car and its operating environment.

As a guide to defining needed tools the rail transit system shall consider the following aspects of its vehicle design and operating environment when determining what emergency tools to place on the vehicles:

- Type of power supply and the associated need for protective equipment or insulators to reduce risk associated with human contact of electrical power or power supply fuels:
 - third rail
 - overhead
 - fossil fuel
- Type of car and the associated need for ladders, bridge plates, or other equipment:
 - low-level boarding
 - high-level boarding
 - multiple unit operation
 - single unit operation
 - end doors
- Type of right-of-way and the associated need for direction signs and symbols, hand-held voice amplification systems, hand held light sources, or other related equipment to help direct passengers exiting vehicles:
 - street
 - surface private right-of-way
 - embankment
 - cut or tunnel
 - viaduct or elevated structure
 - clearance between tracks
 - emergency escape routes
- Type of track construction and the associated need to instruct passenger movement across such construction
 - single or multiple tracks
 - ties and ballast
 - embedded
 - direct fixation
- Means of exit from car when it is between stations and the associated need for ladders, bridge plates, and other related equipment
 - level exit ways that are level with trackway or trackway incorporates a walkway at door height
 - high exit ways that are above trackway and require passengers to descend from the car

7. Emergency communications

7.1 Public address system

New rail transit vehicles shall be equipped with a public address (PA) system that provides a means for a crewmember and/or the operations control center (OCC) to communicate to all train passengers in an emergency situation. The PA system shall also provide a means for a crewmember and/or the operations control center to communicate in an emergency situation to people in the immediate vicinity of the train (e.g., on the station platform). The PA system may be part of the same system as the intercom system.

7.2 Intercom system

New rail transit vehicles shall be equipped with an intercom (IC) system that provides a means for passengers and crewmembers to communicate with one another in an emergency situation. The IC stations shall be provided at two locations within the vehicle and at all wheelchair locations. The intercom shall be accessible

to passengers without requiring the use of a tool or other implement. The intercom system may be part of the same system as the PA system.

The location of each intercom intended for passenger use shall be clearly marked with luminescent material. Operating instructions shall be posted at or near each such intercom.

7.3 Cab-to-cab intercommunications

New rail transit vehicles shall be equipped with an operator's cab-to-cab intercommunications system that will permit communications between operators or approved individuals in other vehicle cabs of the same train consist.

8. Covert devices

The requirements for new rail transit vehicles to be equipped with covert devices should be at the discretion of the rail transit system. This standard outlines some of the considerations to be made when procuring new rail transit system with covert devices.

8.1 Silent alarm

A concealed silent alarm switch should be mounted in each cab in a location where the operator can activate the switch without overt action visible or audible to anyone in the passenger compartment. The alarm should send a signal, via the radio, to the OCC or other wayside equipment, to identify vehicle number and location. The silent alarm switch should be capable of being activated at any time, from the cab of either the lead or the driving vehicle.

8.2 Silent alarm indicator

A high-intensity blue flashing (strobe) silent alarm indicator light should be installed on each operating car roof with a corresponding "WHEN FLASHING CALL POLICE" exterior reflective sign. The indicator should be recessed in its housing so as to prevent any reflection in building windows, etc., when activated, while remaining highly visible to helicopter surveillance. The indicator on the vehicle should be illuminated only when the silent alarm button in that cab is activated.

8.3 Cab microphone

A covert microphone should be located in a suitable location in the cab to monitor and to continuously capture interior (and exterior, if desired) sounds on the vehicle video recorder and/or the central control.

9. Cameras and Video Monitors

The requirements for new rail transit vehicles to be equipped with cameras and video monitoring should be at the discretion of the rail transit system. This standard outlines some of the considerations that should be made if a rail transit system should procure new vehicles with camera and monitoring devices.

9.1 Video monitoring

The vehicle exterior and interior should be monitored continuously using video cameras that are equipped on the vehicle. The operator should have the capability to selectively monitor the external and internal cameras from the cab of the train.

9.2 External video cameras

9.2.1 Platform monitoring/rear-view cameras

Externally mounted video cameras should be mounted on both sides of the vehicle at each cab end to allow the operator to perform the following tasks:

- Monitor passengers on the platform during an emergency, close the doors and/or move the train.
- Use the cameras as conventional rear-view mirrors when operating light rail vehicles in street running environments.

9.2.2 Forward-facing cameras

Two forward-facing cameras should be mounted near the front corners at each end of each vehicle near the roof level. These cameras could be installed in the same camera housing utilized for the platform monitoring/rear-view cameras.

The two forward-facing cameras on the lead cab of the consist, in conjunction with the two rear-view cameras at that end, should continuously record all activities in front of and to the side of the vehicle utilizing the digital video recorder. The goal is to provide as complete video coverage as possible within the physical limitations of the vehicle profile and camera housing.

The video recorder may also include an audio track to continuously capture interior and exterior sounds utilizing the covert microphone in the active cab.

All other forward-facing cameras and covert microphones in the consist should be inactive.

9.2.3 Coupling camera

A coupling camera that monitors an area including the coupler head and a distance appropriate for the operator's line of sight should be considered. When coupling to another vehicle, this camera should continuously record all activities in front of the vehicle and provide the operator with a clear view of the vehicle coupler as an operational safety device. The camera output should be displayed only when the coupler camera in the cab is activated and should take priority on the operator's video monitors. At all other times, the camera output should be recorded but should not be displayed.

9.2.4 External cameras and housings

The external camera housings should be of a harmonious, attractive design integrated into the vehicle body side presenting a clean, neat external surface with a minimum of visible fasteners and a maximum of surface continuity. This housing should be finished to match the vehicle carbody.

The external color video cameras should provide for optimal viewing coverage and shall be capable of operating at low illumination levels.

External cameras should have an anti-fog feature and be easily accessible, modular, vandal-resistant, easily cleanable and easily replaceable.

The cameras shall have an easy manual aiming adjustment capability.

In order to capture the activities of an approaching consist, the RTS may want to consider having the forward facing cameras to continue to record their signals when the vehicle is keyed down and connected to its primary power source.

9.3 Internal video cameras and video recording

Internally mounted color video cameras should be provided in each vehicle to allow maximized monitoring of the passenger area. Cameras shall be positioned to include all entryways. Internal cameras should be integrated into the ceiling or bulkheads so as to present a clean, neat, unobtrusive but vandal-resistant installation. The cameras should be placed so that there are limited blind spots in the total camera coverage.

Camera viewing areas should include the passenger-to-operator intercom system. In the event of the activation of an IC or the passenger emergency manual door release handle, the system should automatically select the two internal cameras that best cover this area and display the images on the operator's video display until the operator deactivates the intercom connection or resets the emergency handle. Images displayed and recorded during such events should be in high resolution. Should the use of the IC initiate this coverage, an audio track shall also be added that records both sides of the conversation. In the default mode, these methods of activation shall always override the normal operation of the video monitor in the lead cab. A feature to allow the operator to select specific views after override feature has been initiated should be considered.

Efficient video compression techniques should be utilized to reduce bandwidth requirements and to simplify the transmission of signals through the consist, but maintaining an adequate level of detail and movement that is displayed on the operator's video monitors. Transmission of video signals may be via the trainline or by other suitable means.

9.3.1 Digital video recorders

A digital video recorder or remote video storage capabilities should be provided in each vehicle to continuously record each of the camera inputs in that vehicle whenever the vehicle is in operating service. The recorder should have a removable memory module with a storage capacity of at least 48 hours of incident-free operation, plus one incident of 15 minutes' duration. The process/conditions by which specific information is saved and protected in the memory module should be agreed between the supplier and rail transit system (i.e. upon activation of silent alarm button, the video and audio recording, two minutes before the silent alarm activation and until it is reset, should be saved in a write protected area of the memory module). The recording system should include digital watermarking or equivalent means of preventing editing or other modification of the recorded images.

Local status indicators and test points should be provided to assist in local troubleshooting.

9.4 Video monitors

A pair of color monitors, or alternatively a single larger split screen color video monitor, should be fitted in the cab desk directly in front of the operator for the viewing of all internal and external camera images. The monitor(s) should be as large as possible, with a minimum viewing size of 150 mm (6 in.) diagonally. The monitor(s) should be active only in the selected lead cab. Signals from the left-side camera should be displayed on the left-side monitor or the left side of the screen, and signals from the right-side camera should be displayed on the right. The coupling camera should be displayed on the left.

10. Ventilation control

New vehicles shall be equipped with a means for shutting down ventilation on a complete-train basis from any operator's cab in the train. The system should be designed such that the initiation of the complete train shutdown of the ventilation system must be deliberate and intentional and must minimize the chances of unintentional activation (i.e., breaking a protective seal before activation). Any new non-cab vehicles may also be equipped with the same provision, or with a smoke detector ventilation shutdown system, at the discretion of the rail transit system, but through a means not accessible to passengers.

11. Event recorder

New rail transit vehicles shall be equipped with an event recorder system in compliance with IEEE Std 1482.1, “Standard for Rail Transit Vehicle Event Recorders,” latest revision. An RTS shall determine if each individual vehicle must have a dedicated event recorder or if it can be done on a per-train basis (i.e., located in a cab car only). For non-cab cars, the RTS shall determine whether separate event recorders are required, or whether the security information is to be recorded by event recorders in cab cars.

The crashworthiness requirements of the event recorder shall be considered by the RTS. The crashworthy requirements may be met by the design of the data storage device(s), or by placing the device in a box meeting the requirement, or by judicious placement of the device within the car body envelope (e.g., to take advantage of the crashworthiness and fire-barrier properties of the car body), or by a combination of these approaches.

12. References

American Public Transportation Association, *Rail Transit Standards*:

- APTA RT-S-VIM-020-10, “Emergency Lighting System Design for Rail Transit Vehicles”
- APTA RT-S-VIM-021-10, “Emergency Signage for Rail Transit Vehicles”
- APTA RT-S-VIM-022-10, “Low Location Emergency Path Marking for Rail Transit Vehicles”
- APTA RT-S-VIM-023-11, “Emergency Egress/Access for Rail Transit Vehicles”
- APTA RT-RP-VIM-025-11, “Operator Protection Features for Rail Transit Vehicles”

Institute of Electrical and Electronics Engineers, IEEE Std 1482.1, “Standard for Rail Transit Vehicle Event Recorders.”

13. Definitions

For the purposes of clarity, the following terms and definitions will be used in this document:

consist: One or a group cars acting as one unit and controlled by one operator from the driving cab.

14. Abbreviations and acronyms

APTA	American Public Transportation Association
IC	intercom
LLEPM	Low-Location Emergency Path Marking
OCC	Operations Control Center
PA	public address
RTS	Rail Transit System
VIM	Vehicle Inspection and Maintenance Committee

15. Summary of changes

This is a new document hence no changes are shown.

16. Document history

Document Version	Working Group Vote	Public Comment/ Technical Oversight	CEO Approval	Policy & Planning Approval	Publish Date
First published	August 2012	4Q 2012	4Q 2012	4Q 2012	January 2013