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Vehicle Inspection and Maintenance Working Group

Emergency Signage and Low-Location Exit Path Markings for Rail Transit Vehicles

Abstract: This standard contains minimum requirements for emergency signage and low-location exit path Markings for rail transit vehicles using passive means (non-electrically powered illumination) of marking exit paths to safety.

Keywords: emergency exit path, high performance photoluminescent (HPPL), instructions, low-location exit path marking (LLEPM) system, luminescent, markings, photoluminescent (PL), retroreflective, signs

Summary: This standard was developed to establish minimum requirements for interior and exterior emergency signage to assist in locating and operating emergency exits and access points for rail transit vehicles. This standard also provides minimum requirements for LLEPM systems that provide visual guidance to locate and operate emergency exits and access points during conditions of low visibility or darkness.

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 Vehicle Inspection and Maintenance 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 agency's operations. In cases where there is a conflict or contradiction between an applicable law or regulation and this document, consult with a legal adviser to determine which document takes precedence.

This is a new document incorporating material from both APTA RT-VIM-S-021-10, "Emergency Signage for Rail Transit Vehicles," and APTA RT-VIM-S-022-10, "Low-Location Exit Path Marketing for Rail Transit Vehicles," which are being withdrawn.

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Participants

The American Public Transportation Association greatly appreciates the contributions of the **Vehicle Inspection and Maintenance 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:

Michael Kunkle, *Pittsburgh Regional Transit*, Chair
Claire Patrigeon, *Toronto Transit Commission*, Vice Chair
Austin Scioli, *WSP*, Secretary

Pamela Alexander, *Hatch*
Jose Ballesteros, *King County Metro*
Casey Blaze, *Greater Cleveland RTA*
Bruce Bloomster, *Bohr Electronics*
Stephen Bonina, *WSP*
K'Moy Daye, *Metro-North Railroad*
Paul Denison, *Sound Transit*
John Deppen, *Amsted Rail*
Floyd D'Souza, *Metrolinx (GO Transit)*
Sebastian Durzynski, *TDG International*
Carlos Flores, *LA Metro*
Frank Fowler, *NFTA Metro*
Tom Freeman, *International Name Plate Supplies*
Silvester Fulmore, *Charlotte Area Transit System*
Marc Gagne, *TDG International*
Deepika Gangwani, *Toronto Transit Commission*
Russell Gaus, *GFT*
Christian Gschnitzer-Baernthaler, *Stadler US*
Tina Hall, *Charlotte Area Transit System*
Juan Hernandez, *Mott MacDonald*
Joseph Hopfner, *Regional Transportation District*
Michael Hubbell, *Lone Star TAM*
Reid Hunt, *Knorr-Bremse*
Robert Jacks, *Charlotte Area Transit System*
Robert Jones, *Stadler Rheintal AG*
Srinivas Katreddi, *WSP*
Paul Kovacs, *Lea+Elliott*
Stephen Land, *Houston Metro*
Daniel Lanoix
Marc Laughlin, *Charlotte Area Transit System*
Robert Lawless, *SEPTA*
Brian Ley, *WSP*
Martin Lortie, *Alstom*
John MacEwen, *SEPTA*
Eloy Martinez, *HNTB*
William McClellan, *ACI*
Shawn Merchant, *T.Y. Lin International*
Thomas Muehlbauer, *Stadler US*
Jim Neddo
Pat O'Byrne, *Bosch Engineering GmbH*
Nicolas Pepper, *Maryland Transit Administration*
Matt Pieters, *OC Transpo/City of Ottawa*
Anand Prabhakaran, *Sharma & Associates*
Shushil Ramnaress, *WMATA*
Brandon Reilly-Evans, *Hatch*
Michelle Rodriguez, *SEPTA*
Richard Seaton, *TDG International*
Sean Shim, *NJ Transit*
Jonathan Stark, *ISC Applied Systems*
Talon Turner, *Charlotte Area Transit System*
Raj Wagley, *U.S. Department of Transportation*
Jia Wei, *Houston Metro*
Michael Wetherell, *McKissack & McKissack*
Kenneth Williams, *Hartsfield-Jackson Airport*
Michael Yates, *WSP*

Project team

Bryan Sooter, *American Public Transportation Association*
Tytus Suchotinunt, *American Public Transportation Association*
Terasa Importico, *Hatch*
Benjamin Spears, *Hatch*

Introduction

This introduction is not part of APTA RT-VIM-S-028-26, "Emergency Signage and Low-Location Exit Path Markings for Rail Transit Vehicles."

An effective systems approach uses this standard, as well as APTA RT-VIM-S-020-10, "Emergency Lighting System Design for Rail Transit Vehicles," to provide a means to locate, reach, and operate emergency exits and rescue access points to facilitate safe evacuation in an emergency. Agencies and carbuilders should carefully consider the options available to meet the emergency evacuation requirements presented in these two standards.

This standard describes the minimum requirements for emergency signs and low-location exit path markings on 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 incorporate safety requirements during the design and specification for the procurement, major overhaul or retrofit campaigns of rail transit vehicles. Rail transit agencies and carbuilders should carefully consider the options available to meet emergency evacuation requirements. APTA rail transit agency members have expressed a commitment to increase the effectiveness of safety devices and features present on rail transit vehicles, not only for the passengers but for the operators and emergency personnel.

Scope and purpose

This standard applies to rail transit agencies that are procuring new vehicles, retrofitting existing vehicles or overhauling existing vehicles; it also applies to the inspection and maintenance of these vehicles. This standard provides guidance to rail transit agencies in specifying minimum required equipment and minimum required performance measures for emergency egress and access signage and low-location exit path markings. Complementary emergency systems, such as those providing emergency lighting, emergency egress/access and emergency passenger systems, are covered in separate APTA standards.

Emergency Signage and Low-Location Exit Path Markings for Rail Transit Vehicles

1. General system requirements

Emergency signs/markings designated for emergency egress/access shall be designed to provide evacuation and rescue access guidance.

The emergency low-location exit path marking (LLEPM) system shall be designed to identify the location of emergency exits and the exit path to be used to reach such exits under conditions of darkness when normal and emergency sources of illumination are obscured or are inoperative.

Rail transit agencies shall review the adequacy of emergency egress/access signs and markings as part of their Public Transportation Agency Safety Plan (PTASP) and Safety Management System (SMS).

1.1 Visual identity and recognition

Emergency egress signage, markings and LLEPM systems shall enable the identification of emergency exits.

Each interior sign/marking/LLEPM shall be conspicuous (i.e., clearly recognizable/distinguishable) under the minimum general emergency light illumination levels as specified in APTA RT-S-020-10, “Emergency Lighting System Design for Rail Transit Vehicles,” as well as under total darkness.

All emergency exit, rescue access and LLEPM signage/marking systems shall be designed and installed with consideration for useful field of view (UFOV) to enable identification of the exit path, door exits and rescue access points.

The location of the signs, directional arrow(s) or wording shall provide guidance to and along the emergency exit route (see Section 2.1).

All interior emergency signs, markings and LLEPMs shall operate independently of the cars’ normal and emergency lighting systems for a minimum of 90 minutes after loss of all power for normal lighting.

1.1.1 LLEPMs

The LLEPM system shall be conspicuous within a volume that includes the entire area of the floor, and which extends upward to a horizontal plane at 4 ft (1.22 m), also known as low location.

1.1.2 Emergency exit signage

Signs/markings and instructions shall utilize, to the extent practical, commonly recognized or standardized and internationally used information symbols, icons, graphics and pictograms, as well as standardized color, contrast, content and placement.

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Each interior emergency exit sign and emergency exit locator sign shall be conspicuous (i.e., clearly recognizable and distinguishable) or become conspicuous to passengers and train crew members immediately and automatically upon the loss of power for normal lighting, from a minimum distance of 5 ft (1.52 m).

NOTE: To the extent practicable, HPPL signs/markings should not be installed in shadowed locations.

1.1.3 Rescue signage

Each emergency rescue access sign/marking shall be conspicuous on the exterior of the car. Rescue access signage/marking systems shall enable emergency responders to make positive identification of rescue access points.

1.2 Multilingual signs

At a minimum, any words included in emergency exit/rescue access signage shall be in English. However, when system-specific determinations are made or as otherwise mandated by local, municipal, state or other regulations, signage/instructions shall be written in one or more designated languages in addition to English.

Standardized pictograms can be used to supplement mandatory signage written in English. In addition, the use of universal symbols for signage may serve as an alternative to signage written in other languages.

2. Design requirements, interior

Emergency exit and evacuation information systems on the interior of the rail transit vehicle shall, at a minimum, include the following:

- markings/delineators indicating a path from all aisle seating and compartment locations in the rail transit vehicle to all the exits (see Section 2.1.1)
- exit sign at each door exit, visible from a low location (i.e., extending from the floor upward to 4 ft [1.22 m] and a horizontal distance of 6 ft [1.93 m] from the exit along the exit path) (see Section 2.1.2.1)
- markings along the perimeter of the door or doorframe visible from a low location (i.e., extending from the floor upward to 4 ft [1.22 m], and a horizontal distance of 6 ft [1.93 m] from the exit along the exit path) (see Section 2.1.2.3)
- emergency window exit signs/marking and instructions (see Section 2.1.3).

2.1 Location

2.1.1 Exit path

The requirements in this section apply to LLEPMs and HPPL components thereof, whether installed on walls, floors, seat assemblies or stairs.

The location of the exit path shall be marked using passive HPPL marking/delineators.

The marking/delineator components shall be positioned so as to identify an exit path to all door exits that is clearly visible and easily recognizable from any seat or area in the rail transit vehicle, when normal lighting and emergency lighting are unavailable in conditions of darkness and/or smoke.

The marking/delineator components shall be located on the floor or no higher than 18 in. (45.7 cm) on the seat assembly, or walls/partitions of aisles, passageways or stairways, above the plane of the floor or the nearest stair tread.

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The LLEPM system components shall be properly protected to perform in their intended environment for the expected life of the components.

Changes in the direction of the exit path shall be indicated by the LLEPM. This indication must be placed within 4 in. (10.2 cm) of the change in direction of the exit path.

2.1.1.1 HPPL (passive) systems

The width of each marking/delineator strip for aisles, passageways and interior stairways shall not be less than 1 in. (2.54 cm) and shall be applied either as a continuous or intermittent strip.

As an alternative, intermittently placed discs of not less than 1.25 in. (3.18 cm) in diameter may also be used. Strips with fully radiused ends are permitted, so long as they comply with the minimum 1 in. (2.54 cm) width.

If intermittent strips or discs are used, then they shall be placed on both sides of the aisle, passageway, or stairway and on the floor or no higher than 18 in. (45.7 cm) above the floor. Where practicable, any gaps on either side of the aisle, passageway, or stairway shall be staggered.

2.1.1.2 Aisles and passageways

HPPL marking/delineator material shall be applied continuously on the floor or no higher than 18 in. (45.7 cm) above the floor, to at least one side or down the middle of the aisle/passageway, or intermittently on both sides of the aisle/passageway, to provide a conspicuous delineation of the exit path to a person standing in the aisle/passageway.

A single step in an aisle or passageway that is not part of a multi-step stairway can be treated as part of the aisle for the purposes of this standard.

The width of marking/delineator strips may consist of multiple parallel strips (multi-strip), as long as the sum of the widths of the multiple strips is equal to or exceeds the 1 in. (2.54 cm) wide strip, and the light output (luminous intensity) per unit length of the multiple strips is equal to or exceeds that of the single 1 in. (2.54 cm) wide strip marking placement.

Intermittent marking/delineator strips shall total a minimum of 6 in. (15.2 cm) in length for every 42 in. (107 cm) segment of exit path. An example utilizing oblong discs can be found in Appendix B.11.3.

Discs shall be arranged in a distinctive, recurrent pattern. The sum of the diameters of intermittently placed discs shall total a minimum of 6 in. (15.2 cm) for every 42 in. (107 cm) segment of exit path. Discs shall not have a diameter less than 1 in.

2.1.1.3 Interior stairways

In all interior stairways, HPPL marking/delineator material shall be applied, either as a continuous strip on the walls of both sides of the stairs, or as intermittent strips applied to the riser or tread of each step.

- If the HPPL marking/delineator material is applied to the interior stairway walls, then the marking shall be applied as a continuous strip, to the extent practicable, extending from the lowest to the highest step.
- If the HPPL marking/delineator material is applied to the stairway treads, then a strip shall extend, to the extent practicable, across the full width of each tread near the step nosing.

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One of the following three methods is acceptable if the marking/delineator placement provides a clear and conspicuous visual delineation of the exit path to a person standing at the top and bottom landings:

- 1 in. (2.5 cm) wide L-shaped marking/delineators shall be installed on both sides of each tread nearest to the wall.
- Materials shall be applied to the step risers that consist of a minimum 2 in. (5.2 cm) wide strip or two 1 in. (2.5 cm) wide strips that extend, to the extent practicable, across the full width of the riser and are placed at the lower half of the riser.
- Discs of not less than 1.25 in. (3.18 cm) in diameter, placed either:
    - no more than 2.5 in. (6.35 cm) apart on each stair tread, near the step nosing; or
    - no more than 2.5 in. (6.35 cm) apart and no higher than 18 in. (45.7 cm) from the treads on both sides of the stairway walls/partitions.

Alternative configurations shall match any of the example configurations provided in Appendix B.11 or shall provide a clear and conspicuous visual delineation of the tread, riser, tread nose and edges of the stairway from the top and bottom landing, and all locations on the stairway.

2.1.2 Door exit locators/markings

If a door exit is not within sight of any seat or standee location (e.g., visibly blocked by a bulkhead or divider), then one or more door locator signs shall be provided to identify the location of door exits.

The locator sign(s) shall consist of brief text, graphic arrow(s) or standardized and internationally recognized symbol(s) that are placed on bulkheads, dividers, seat frames/pockets, armrests, luggage racks, ceilings, etc., to direct passengers toward the nearest door that can be used for emergency egress.

2.1.2.1 Door-mounted signs

Each vestibule door, end-frame door and side door leading to the exterior that is intended for emergency egress shall be clearly identified with, at a minimum, two interior exit signs/markings:

An exit sign shall be located on the door or door glazing, or in the immediate proximity. The center of the sign shall be located on or immediately adjacent to the upper half of the door and shall be conspicuous (see Sections 2.2, 2.3, 2.4 and 2.5), containing the wording “EXIT,” “EMERGENCY EXIT,” or other similar wording in capital letters.

An exit sign shall be located on or immediately adjacent to each door and placed between 6 and 18 in. (15.2 and 30.5 cm) above the floor.

2.1.2.2 Routinely locked doors

When a door designated as an exit is locked (such as an end-frame door at the end of the train), additional measures shall be taken to provide emergency opening instructions for the door exit or to direct passengers to an alternative door exit and/or emergency window exit. These measures may include the following:

- PA announcements
- permanent signage or markings

2.1.2.3 Door exit delineators/markings

Each door exit shall be clearly marked/delineated with HPPL marking/delineator material placed in close proximity to or on the door exit.

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A minimum of 1 in. (2.54 cm) wide strips shall be applied to the extent practicable to the left and right sides of the interior of each door exit or doorframe and shall extend from the floor to a minimum height of 12 in. (30.5 cm) above the floor.

If unable to extend HPPL material from the floor directly, the marking/delineator shall start at the lowest location possible (within 6 in. [15.2 cm] of the floor) and extend at least 12 in. (30.5 cm) vertically from that point.

If this is not possible, then sufficient HPPL material shall be placed on the door, doorframe or adjoining wall between the floor and an 18 in. (45.7 cm) vertical limit, so that the total area is at least 12 in² (77 cm²) on both the left and right sides. The markings need not be visible when the door is open. Additional material placed above 18 in. off the floor is permitted but does not count toward this requirement.

2.1.2.4 Door exit control locator signs/markings and instructions

Each door exit handle, latch or operating button shall be marked with HPPL material using one of the following methods:

- outline stripping that is no less than 1 in. (2.54 cm) wide to the extent practicable around the perimeter of the opening device; or
- area wide pad that is applied to the door or doorframe directly behind the handle or latch with no less than 16 in² (103 cm²).

In addition, each door equipped with a separate manual override device intended for emergency egress shall be marked with a sign/marking containing the words “Emergency Door Release,” “Manual Door Release,” or other similar wording. These signs/markings shall be placed at the manual door control or at an appropriate location in its immediate proximity.

Rail transit agencies may use a standardized and internationally recognized pictogram to serve as a supplemental identifier for doors equipped with manual door control for emergency egress.

If it is not obvious where the manual release device is located relative to the door handle, latch or operating button, then a door emergency release locator sign shall be posted. Manual door release locator signs/markings shall consist of brief text, graphic arrow(s), or standardized and internationally recognized symbol(s) to locate the manual door release.

If the method for opening a door intended for exit is not obvious, then operating instructions shall be posted at that door’s control or in its immediate vicinity. The operating instructions shall warn about risk of injury or death if used inappropriately.

Operating instructions shall be posted at or near each manual override device for a door intended for emergency egress.

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2.1.3 Emergency window exits

2.1.3.1 Window exit locator signs/markings

Emergency window exit locator signs/markings directing passengers and crew members to the nearest emergency window exit location(s) shall be provided. The signage/markings shall use the words "EMERGENCY EXIT" or similar wording. Signage/markings may take the form of:

- signage/markings on walls;
- signage/markings on light fixtures located above the emergency window exit; and/or
- signage/markings located on the ceiling, window or seat frames/armrests.

One sign/marking may serve more than one emergency window exit if the sign/marking can readily identify each such exit. If all the side windows installed in the passenger compartment of the rail car can be used for emergency egress, then locator signs are not required.

An emergency window exit sign may serve as a locator sign if it meets the minimum requirements for a locator sign.

2.1.3.2 Exit signs/markings and instructions

Each interior emergency window exit shall be identified with a sign/marking located on or adjacent to each such window.

In addition, instructions, including pictorial diagrams or other standardized and internationally recognized symbols for exiting the window, shall be posted on or adjacent to each such window.

Each emergency window exit equipped with a pull handle shall be identified with an "EMERGENCY EXIT PULL HANDLE" marking, either as an integral part of the handle marking, or with instructions/illustrations applied as a decal in the immediate vicinity, or a combination of these.

Locations that are space-limited, such as the emergency window pull handle, as well as supplemental operating instructions, shall have the characters as large as feasible for the allotted space.

If approved by the rail transit agency, breakable emergency exit windows that require a readily accessible tool appropriate to break the glass shall have a pictogram-type decal prominently displayed next to the tool/window location indicating the intended use of the tool. Each breakable window that is intended as an emergency exit shall have a dedicated removal device. The location of the tool shall be outlined with a 1 in. HPPL strip or equivalent.

2.2 Letter and sign size

2.2.1 Letter size

> **NOTE:** Requirements provided herein do not apply to instructional signage/markings unless otherwise noted.

The letter characters on emergency exit signs and markings and emergency exit locator signs intended to be read by the general public shall have a minimum character height using uppercase letters of:

- 1 in. (2.54 cm) on emergency window exit signs and locator signs; and
- 1.5 in. (3.81 cm) on door exit signs and locator signs.

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In addition, the characters shall have the following characteristics:

- a width-to-height ratio between 3:5 and 1:1;
- a stroke-to-width ratio (i.e., the width of the lines that are combined to produce a letter) between 1:4 and 1:6; and
- spacing between letters of a minimum of one-sixteenth the height of the uppercase letters

NOTE: Raised letter characters may be utilized.

2.2.2 Sign size

A minimum sign area of 16 in^2 (103 cm^2) is required for all end and side door exit signs.

2.3 Color and contrast

Lettering and pictograms utilized on interior emergency exit signage/marking shall be designed to achieve a luminance contrast ratio of not less than 0.7, as measured by a color-corrected photometer.

NOTE: The recommended color contrast choice for all new and replacement signage is either green or red lettering/graphics. In addition, existing signage should comply with the recommendation for either green or red lettering/graphics on a light photoluminescent background, preferably with a matte finish, except for those instances in which bold contrast with the background on which the sign is placed would not be attainable. Green or red may be used if the color scheme is consistently implemented throughout an agency.

A contrasting border around the outer edge of the sign will also enhance visibility.

The more of the HPPL surface that is visible (i.e., not covered with letters, symbols, etc.), the more conspicuous the resulting sign. Graphics or heavy text covering the HPPL material will reduce the light output of the sign letters, and thus the conspicuity and legibility of the signs as well, even though the HPPL material passes the tests required.

2.4 Illuminance/luminance criteria

LLEPM and sign/marking component illumination or luminance levels, as applicable, shall be verified in accordance with Section 4 and tested, maintained and repaired in accordance with Section 6.

HPPL material shall be installed in locations and orientations that provide exposure to adequate charging light.

Additional measures for addressing extenuating circumstances are described below and in Appendix A.

2.4.1 Passive systems

2.4.1.1 Materials

Internal signs, markings and delineators constructed of HPPL material, including LLEPM components, shall be capable of providing a minimum luminance level of 7.5 mcd/m^2 for a duration of 90 minutes after the charging light has ceased.

2.4.1.2 Charging light

The illuminance levels required to provide sufficient charging light vary according to the type of light source used.

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For additional information regarding charging light, see Appendix A.3.

2.5 Component materials

Interior emergency exit signs/markings complying with Sections 2.2 and 2.3 shall be constructed of passive HPPL materials specified in this section.

2.5.1 Vestibule, end-frame and side doors

Emergency exit signs/markings shall identify the location of all vestibule, end-frame and side doors leading to the exterior of the car and intended for emergency egress, using HPPL material, including dual mode.

2.5.1.1 Additional requirements to mark side door exit locations without independently powered emergency lighting

Each side door opening intended for emergency egress leading to the exterior of the car shall be marked with a minimum of 144 in² (929 cm²) of HPPL material placed no higher than 18 in. (45.7 cm) off the floor, with its lowest point no higher than 6 in. (15.2 cm) off the floor.

The marking may be composed of one or more panels placed either on the door and/or in its immediate vicinity.

> **NOTE:** A door with two leaves that open for emergency egress is considered a single door opening. Therefore, 144 in² (930 cm²) of HPPL material is sufficient for that door opening.

To provide some illumination at the floor for passengers and crew members as they exit, to the extent practical, the material should not be placed on a door leaf/panel that is intended to open for emergency egress or on the part of a wall or partition that would be covered by a door leaf/panel in any position (e.g., sliding doors).

Signs and markings used to comply with the LLEPM requirements may be counted toward this requirement to the extent that they meet the criteria noted above (e.g., HPPL door delineators required to meet the LLEPM requirements that are installed on the door 18 in. [45.7 cm] off the floor would count as 36 in² [232 cm²] of the 144 in² [929 cm²]).

3. Design requirements, exterior

Rescue access information systems on the exterior of the car shall, at a minimum, include the following:

- external rescue access door signs/markings (see Section 3.1.1.1)
- rescue access door control locator signs/markings and instructions (see Section 3.1.1.2)
- external rescue access window signs/markings and instructions (see Section 3.1.2)
- external emergency roof access signs/markings and instructions (see Section 3.1.3)

3.1 Location

3.1.1 Rescue access doors

3.1.1.1 Sign/markings

Each door intended for use by emergency responders for rescue access shall be identified with emergency access signs, standardized and internationally recognized symbols, or other conspicuous markings consisting of retroreflective material that complies with Sections 3.3 and 3.4.

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3.1.1.2 Control signs/markings and instructions

Each door intended for use by emergency responders for rescue access shall have operating instructions for opening the door from outside the car placed on or immediately adjacent to the door on the car body. If a powered door does not function with an integral release mechanism, the instructions shall indicate the location of the exterior manual door control.

Each powered door intended for use by emergency responders for rescue access that has a nonintegral release mechanism located away from the door shall have a door control sign/marking placed at the location of this control that provides instructions for emergency operation, either as part of the access sign/marking or as another sign/marking.

Each car equipped with manual doors shall have operating instructions for opening the door from the exterior, either as part of the access sign/marking or as another sign/marking.

All primary identification markings (e.g., emergency door release) shall be made of material consistent with Section 3.4.

3.1.2 Rescue access windows

On rail cars equipped with rescue access windows, each rescue access window shall be identified with a unique retroreflective and easily recognizable sign, symbol or other conspicuous marking that complies with Sections 3.3 and 3.4.

Signs utilizing standardized and internationally recognized symbols or markings shall be placed at the bottom of each such window, on each window or adjacent to each window, utilizing arrows where necessary to clearly designate rescue access window locations. Legible and understandable window access instructions, including any pictogram/instructions for removing the window, shall be posted at or near each rescue access window.

> **NOTE:** An emergency exit window and rescue access window may utilize the same window as long as the window is marked according to Section 2.1.3.1 on the inner face of the window and Section 3.1.2 on the outer face of the window.

3.1.3 Emergency roof access

On rail cars equipped with an emergency roof access, the location of each emergency access point provided on the roof of the rail car shall be clearly marked with retroreflective material of contrasting color that complies with Sections 3.3 and 3.4. Legible and understandable instructions shall be posted at or near each such location.

> **NOTE:** The sign may include the notification of hazards associated with roof evacuation, including but not limited to electric hazards such as a live pantograph.

Signs at the access point shall have a total area of no less than 98 in² (632.3 cm²) and shall contain appropriate text and/or icons for the method of access. The wording and icons on the signs shall have the same orientation and shall be entirely within the confines of the retroreflective border identifying the access point.

> **NOTE:** Concise wording and the use of icons where possible is recommended.

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If emergency roof access is provided by means of a structural weak point:

- The line along which the roof skin is to be cut shall be clearly shown with retroreflective tape of contrasting color.
- A sign plate with a retroreflective border shall also state (unique to the vehicle and to the particular rail transit agency):
    - ⚠"CAUTION: DO NOT USE FLAME CUTTING DEVICES";
    - ⚠"CAUTION: WARN PASSENGERS BEFORE CUTTING. CUT ALONG DASHED LINE TO GAIN ACCESS"; or
    - "ROOF CONSTRUCTION: [state relevant details]"

If emergency roof access is provided by means of a hatch:

- A sign with a retroreflective border, or entirely retroreflective, in either case of a contrasting color, shall be applied to the outside of each hatch. This sign shall, at a minimum, state the following:
    - In large letters: "EMERGENCY ACCESS" or words to that effect
    - In smaller letters, instructions for opening the hatch

3.2 Letter size

All external primary identification markings (e.g., emergency door release) shall have letters no less than ⅜ in. in height. All external instructional signs shall have letters no less than $^{3}/_{16}$ in. in height.

3.3 Color and contrast

Exterior signs/markings shall provide a lettering-to-sign background and sign-to-substrate luminance contrast ratio of not less than 0.7, as measured by a color-corrected photometer.

Characters and their background shall have a non-glare finish. Characters shall contrast with their background, with either light characters on a dark background or dark characters on a light background.

> **NOTE:** A contrasting border around the outer edge of the sign may also enhance visibility.

3.4 Materials

Exterior emergency rescue access locator signs/markings shall be constructed of retroreflective material that conforms to the specifications for Type I material sheeting, as specified in ASTM D4956, "Standard Specification for Retroreflective Sheeting for Traffic Control." Retroreflective material shall be compatible with the type of mounting surface.

In order to maintain optimum retroreflective properties of the base material, any retroreflective markings that have ink or pigment applied shall utilize a translucent or semitranslucent ink, as per the manufacturer's instructions. This may include a UV clear coat to prevent fading. Signs utilizing protective coatings or other materials for the enhancement of sign durability shall meet the retroreflectivity requirements.

4. Evaluation measurements and tests

4.1 Interior signs/marking

To verify that emergency signage system component design complies with the requirements of Section 2.4, a qualification test shall be conducted on at least one representative passenger car/area of each signage system layout in accordance with this section.

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For equipment ordered on or after the adoption of this standard, the first car to have the system installed may be tested, and this test shall be completed prior to the car's release for operation in revenue service.

Rail transit agencies shall confirm that emergency exit signage system components comply with the minimum required illumination or luminance criteria, as applicable, for the specified duration.

4.1.1 HPPL (passive) systems

4.1.1.1 Material luminance

Manufacturer-/supplier-provided independent laboratory-certified test results shall show that all tested samples of passive HPPL material, as used in the finished component configurations (including any cover or protective coating, if used, but not including text or graphics) comply with the minimum luminance criterion of 7.5 mcd/m² after 1.5 hours, when tested according to the provisions of ASTM E2073, "Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings."

The manufacturer/supplier is required to have a minimum of one batch of material for signs/markings/delineators of a given type certified. Signs/markings/delineators of the same certified type of material can be sold to multiple customers, even with minor changes in text or typography.

The manufacturer shall have an independent laboratory recertify the performance of the material at a maximum time period of five years from the date of the previous certification.

4.1.1.2 Ambient light charge

To verify that the LLEPM system component design complies with Appendix A.3, a qualification test shall be conducted on at least one representative car of each LLEPM layout operated by the rail transit system in accordance with this section.

To confirm that HPPL emergency sign/marking components are installed in locations that receive adequate charging light, illuminance measurements shall be taken in accordance with Appendix A.3, as applicable. This requirement applies to each representative car tested.

The sensor and the readout device of the illuminance meter must be held in a manner so that the sensor is not affected by the observer's shadow. If light diffusers are used on the light fixtures, then the measurements shall be made with the light diffusers in place. This requirement applies to each representative car/area tested.

More information on representative samples can be found in Appendix A.4.

The charging light shall consist only of that provided by the car's normal lighting system. All natural or other external light shall be excluded. For suggested methods for eliminating extraneous light sources, see Section 3.1 of APTA RT-VIM-S-020-10, "Emergency Lighting System Design for Rail Transit Vehicles."

If the ambient light cannot be reduced to 0.01 fc, see Appendix A.3.

To take the measurement readings, the sensor is placed on the area of the HPPL sign/marking surface location where the light is brightest (or on the floor location as permitted in Appendix A.3). The observer records the reading(s) using a data collection form (see Appendix A.5).

If light diffusers are used on the light fixtures, then the measurements shall be made with the light diffusers in place.

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NOTE: If the ambient (normal charging light) illuminance is less than the required criteria specified (see Section 2.4.1.2), then rail transit agencies can take several actions described in Appendix A.2 to increase the charging light levels.

4.1.2 Testing equipment

To ensure accurate illuminance measurements including measurements on vertical surfaces at which the angle of incident light is large, the light meter must be designed to take such measurements and possess all of the following:

- **Basic accuracy:** ±3% of reading ±1 digit or better
- **Resolution:** 0.01 fc or better
- **Cosine error:** No more than 6%, measured at 50°
- **Color correction:** Correction to CIE photopic curve

For additional HPPL material considerations, see Appendix A.

4.2 Exterior signs/markings

Rail transit agencies shall ensure that retroreflective material is certified by an independent test laboratory to be in conformance with ASTM E810, “Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting Utilizing the Coplanar Geometry.”

4.3 Recordkeeping

Rail transit agencies shall retain a copy of the car manufacturer- or supplier-provided independent laboratory certified test report results showing that the illuminance or luminance measurements, as appropriate, on the active area of the signage/marking component comply with the criteria specified in Section 2.4 of this standard. Such records shall be kept until all cars with those components are retired, transferred, leased or conveyed.

Rail transit agencies shall retain a copy of the certified independent laboratory test report results that certify that the retroreflective material complies with Type I materials per ASTM D4956 until all cars containing the retroreflective material are retired, transferred, leased or conveyed to another rail transit agency. A copy of such records shall be provided to the accepting rail transit agency, along with any cars that are transferred, leased or conveyed.

5. Survivability requirements

All LLEPMs and emergency signs/markings shall be designed to operate without failure under the conditions typically found in rail transit vehicles.

All LLEPM and emergency signage system components shall be designed so that the signs/markings remain conspicuous, notwithstanding the failure of any individual sign, material segment, single light fixture, or battery or other power source.

All emergency signage shall be designed to operate without failure under the conditions typically found in rail transit vehicles, including expected mechanical vibrations, shock and electromagnetic interference.

For rail cars ordered on or after the adoption of this standard, emergency signs/markings shall continue to function after the standby power and any other stages of load shedding have terminated, independently of the main car battery, so that illumination at the minimum levels is maintained for at least 1.5 hours after loss of normal power.

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6. Inspection and Maintenance

6.1 Daily inspections

Rail transit agencies that conduct daily inspections shall visually inspect all emergency signage system components, except those for roof access, during those inspections to determine that sign/marking components are present and conspicuous, and that signs and instructions are legible.

6.2 Periodic inspections and tests

Rail transit agencies shall conduct periodic inspections and tests to verify that all emergency signage and LLEPM components, including power sources, function as intended. Rail transit agencies shall test a representative sample of passenger rail cars considering the deployment of different batches of signs.

6.2.1 HPPL (passive) systems

Rail transit agencies shall also conduct tests specified in this section to verify that all HPPL (passive) interior emergency signage system components receive sufficient illuminance from the charging light to provide the required luminance for the required duration (see Section 4.1.1.1). Charging light shall be photometrically tested as appropriate to the type of light source.

If the normal lighting system of a car type is reconfigured, the illumination levels shall be retested on at least one example of all affected areas.

Rail transit agencies shall conduct periodic illuminance tests to confirm that HPPL components receive adequate charging light. These shall occur no less frequently than once every eight years, with the first test conducted no later than eight years after the car was placed in service for the first time, for only the following HPPL components:

- HPPL signs/markings/delineators placed in areas designed or maintained with normal light levels of less than 5 fc

If the HPPL system design or lighting system design does not change, and at the same time components are replaced with like kind, then the testing of the HPPL system will not require reverification of minimum charging illumination levels.

If all the illuminance levels in the first two randomly selected representative sample cars exceed the minimum required to charge the HPPL components required by this standard by at least a factor of two, then no further testing is required for the cars represented by the sample car tested for the periodic test cycle.

6.3 Defect reporting, repair and recordkeeping

Illegible, broken, damaged, missing or nonfunctioning components of emergency signage or LLEPM systems shall be reported and repaired in accordance with established rail transit system procedures and OEM recommendations.

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Related APTA standards

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

References

American National Standards Institute:

ANSI Z535.4, American national standard for product safety signs and labels
ANSI/ASQC Z1.9, Sampling procedures and tables for inspection by variables for percent nonconforming

ASTM International:

ASTM D4956, "Standard Specification for Retroreflective Sheeting for Traffic Control"
ASTM E810, "Standard Test Method for Coefficient of Retroreflection of Retroreflective Sheeting Utilizing the Coplanar Geometry"
ASTM E2073, "Standard Test Method for Photopic Luminance of Photoluminescent (Phosphorescent) Markings"

International Standards Organization:

ISO 3864-1, Graphical symbols – Safety colors and safety signs – Part 1: Design principles for safety signs and safety markings
ISO 3864-3, Graphical symbols – Safety colors and safety signs – Part 3: Design principles for graphical symbols for use in safety signs
ISO 3864-4, Graphical symbols – Safety colors and safety signs – Part 4: Colorimetric and photometric properties of safety sign materials
ISO 7010, Graphical symbols – Safety colors and safety signs – Registered safety signs
ISO 17724, Graphical symbols – Vocabulary

Definitions

auxiliary power system: An onboard source of electrical power (e.g., alternator/generator/car battery) typically used under normal operating conditions to supply such functions as lighting, air conditioning, etc.

candela: A unit of luminous intensity in both the SI and English measurement systems. 1 candela is 1 lumen per steradian (lm/sr). It is similar to the obsolete unit called the candle.

color temperature: A numerical descriptor of the hue of a light source. It is expressed in terms of degrees on the Kelvin scale and refers to the temperature of a black-body radiator that produces light of the same hue as the source specified. Low color temperatures correspond to reddish sources, such as candle flames or incandescent lamps, whereas higher color temperatures are associated with bluish (or cool) color sources.

emergency exit locator signs: Conspicuous emergency marking/signage used to identify and/or direct passengers to the nearest emergency exit location(s).

emergency signage: Textual and graphic messages designed to assist passengers and train crew members in locating and using rail car emergency exits and to assist emergency responders in gaining access to rail cars using doors and windows from the exterior.

foot-candle: A unit of illuminance. 1 foot-candle is 1 lumen per square foot (lm/ft^2). In the international system (SI), the units of illuminance are lux (1 fc = 10.76 lux).

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high-performance photoluminescent (HPPL) material: A photoluminescent material capable of emitting light at a very high rate and for an extended period of time. For this standard, the minimum luminance value for HPPL is 7.5 millicandela per square meter (mcd/m²), for 1.5 hours after removal of the charging light source. Unless otherwise permitted in this standard, the charging light source is specified as a fluorescent lamp with a color temperature of 4000 to 4500 K that provides an illuminance of no more than 1 fc on the test sample for a duration of no more than 1 hour.

icon: A sign or representation that stands for an object by virtue of a resemblance or analogy to it.

illuminance: The amount of light (luminous flux) falling on a specific unit surface area (e.g., 1 ft²). English units are foot-candles (fc) or lumens per square foot (lm/ft²). International units (SI) are lumens per square meter (lm/m²) or lux (lx). 1 fc equals 10.76 lux.

independent power source: A sealed battery or other energy storage device located within the car body designed to power one or more emergency light fixtures or other devices when the normal head-end power, main car battery, auxiliary power and/or wayside power are unavailable.

integral release mechanism: A mechanically actuated device that functions as a door release.

lighting, emergency: A lighting mode that is available whenever power for the normal lighting is unavailable. The main car battery or one or more independent power sources can be used to supply the power to operate the fixtures that provide emergency lighting.

lighting, normal: A lighting mode available when the car is in operation with the normal power system.

lumen: The international unit of luminous flux, or the rate of flow of light.

luminaire (light fixture): A device to produce, control and distribute light. A complete unit consists of one or more lamps, sockets to hold and protect the lamps, optical devices to direct the light, and circuitry to provide the required electrical power to the lamps.

luminance: The amount of light reflected from a unit area or surface, or the amount of light emitted from a surface, e.g., EL or LED material. English units are foot-lamberts (fl). International units (SI) are candela per square meter (cd/m²) (also called “nits”) and millicandela per square meter (mcd/m²). (1 fl = 3.426 cd/m² or 3426 mcd/m².)

luminance contrast: Refers to the relationship or difference between the object and its immediate background, defined by the following ratio:

$$\frac{L_1 - L_2}{L_1}$$

Where: L_1 = luminance of background
L_2 = luminance of the object in question (e.g., lettering, pictogram, symbol)

luminescence: The emission of light other than incandescent, as in phosphorescence or fluorescence, by processes that derive energy from essentially nonthermal sources through excitation by radiation.

lux: The international unit of illuminance (1 lux = 0.0929 fc).

marking/delineator: A noticeable sign, symbol, line or trace.

passive illumination: Illumination that is generated without the use of direct electrical energy.

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photoluminescent (PL) material: Material having the property of emitting light that continues for a length of time after excitation by visible or invisible light has been removed (i.e., self-illuminating).

pictogram: A pictorial sign or symbol.

reflectance factor: The ratio of the luminous flux reflected by a surface to the luminous flux it receives.

representative car/area: A car/area that shares the relevant characteristics as the car(s)/area(s) it represents (i.e., same signage/marking layout, charging light system, and normal car lighting levels for passive systems or luminance/illuminance for electrically powered systems).

representative sample: A small quantity, part or subset of a larger set or entity that has the same properties as the population it represents.

retroreflective material: A material capable of reflecting light rays back to the light source.

sign: A display board, poster, placard or marking/delineator using text and/or graphics to convey information or direction.

spatial average: The average of all samples taken in the vicinity of a specific location. The area of a spatial average varies. For a stairway, it comprises only the area of the stair step(s). For an aisle, the entire length of the aisle is included.

symbol: A letter, figure, other character, arrow or mark, or any combination thereof, used for designating something else by association, resemblance or convention.

useful field of view (UFOV): The sensory, perceptual and attentional processes that address the ability to attend to one's surroundings, detect information and identify that which demands action. In terms of behavior, UFOV includes information that can be extracted from a glance.

Abbreviations and acronyms

EL	electroluminescent
fc	foot-candle
fl	foot-lambert
HPPL	high-performance photoluminescent
K	Kelvin
LED	light-emitting diode
LLEPM	low-location exit path marking
lm	lumen
mcd	millicandela
OEM	original equipment manufacturer
PA	public address
PL	photoluminescent
PTASP	Public Transportation Agency Safety Plan
SI	Système International d'unités
SMS	Safety Management System
sr	steradian
UFOV	useful field of view
UV	ultraviolet
W	watt

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Appendix A (informative): HPPL material technical considerations

A.1 Variables

Five variables that affect the visibility of the HPPL material/component:

- location of the material in relation to the activating charging light
- illuminance charging levels provided by ambient light
- amount of time the HPPL material component is exposed to light
- type of activating light source
- energy-storage efficiency of the HPPL material

The location of the HPPL material in relation to the activating light source and any objects that cast shadows on the material have a great impact on the illuminance provided by the charging light. Accordingly, HPPL material should not be located in shadowed areas.

Cool-white fluorescent lamps producing an illuminance level of 2 fc have been shown to provide sufficient charging light for materials meeting the former definition of HPPL used in passenger railcars. Adequate charging light for HPPL materials/components is generally available at most locations, except directly under the seats, or if there are overhangs or other obstructions that block light from reaching the material/component. Signs/markings certified according to the former definition of HPPL require at least twice as much illuminance as the currently defined HPPL material to deliver the same luminance. HPPL materials certified to the former definition were usually designed with a large safety factor so they do not actually require five times as much light for charging as the HPPL material as per the current definition.

Another variable is the available HPPL charging time. The adequate charging time at 1 fc is at least 30 min from dark storage until departure.

The type of charging light that is used will affect the amount of illumination required to charge the emergency sign and LLEPM components adequately. Most of the visible spectrum (red, orange and yellow) of a light source is not useful for charging PL materials. Short-wavelength ultraviolet light is the most effective part of the light spectrum for charging PL materials. Photons of longer wavelength do not have enough energy to excite the electrons of the PL material. For example, 1 fc of illumination from a commonly available cool-white fluorescent lamp will provide sufficient illumination to meet the HPPL luminance criterion. However, 1 fc of illumination from commonly available warm-white fluorescent and incandescent lamps will not. If warm-white fluorescent lamps are used, then the minimum charging light level must be at least 50% higher. If incandescent lamps are used, then the minimum charging light level will be more than three times higher than is sufficient with cool-white fluorescent lamps.

White LED light contains a higher proportion of short-wavelength light and is thus somewhat more effective than cool-white fluorescent light for charging. In addition, since LEDs are fundamentally unidirectional light emitters, luminaires that use them must be specifically designed to disperse light through the use of multiple emitters pointing in different directions, reflectors and/or diffusers. Therefore, it is important that procurement documents explicitly state the illuminance levels required on the surface of the PL signs/markings.

In addition to these five variables, an important consideration is the type of light meter used to measure the charging light illuminance and the placement of the meter sensor in relation to the HPPL material, both of which will have an impact on the ability to accurately measure the illuminance level provided by the activating light source. Light meters are designed to respond to light the same as the human eye does and thus measure only the visible light emitted by both the charging source and the PL material. Although invisible ultraviolet light is the most effective part of the light spectrum for charging PL materials, standard light meters do not register the ultraviolet light emitted by the charging light. Moreover, the weighting factor for

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visible violet and blue light is small. Therefore, light meter readings of charging light can be misleading if the light source is different from the specified cool-white fluorescent source used for certification (i.e., laboratory) testing.

A.2 Alternatives to increase charging light output

If, during the interior verification tests or periodic inspections, the normal charging light fails to meet the minimum illuminance criterion using normal lighting, there are several actions that can be taken to increase the charging light levels:

- Check the light fixtures near the test samples to ensure proper working order.
- Clean light fixtures and check to ensure that the diffusers are not yellowed with age. Old, dirty fixtures have been measured with less than half the light output of clean ones with new diffusers.
- Check fluorescent tubes to ensure that they are not near the ends of their service lives, when light output drops significantly.
- Relocate signs/markings/delineators.
- Replace warm-white fluorescent lamps with cool-white fluorescent lamps.
- Replace/supplement incandescent luminaires with fluorescent or LED luminaires.
- Replace frosted light diffuser lenses with clear lenses.
- Replace existing fluorescent tubes with those of recent design that provide 10% to 15% more light for the same wattage rating and double the service life.
- If the charging light performance criterion cannot be met after taking the above actions, then install either:
    - PL signs/markings/delineators verified by the manufacturer/supplier-provided independent laboratory certified test result to exceed HPPL requirements sufficiently that they can provide a luminance of 7.5 mcd/m^2 after 90 minutes, as applicable, after charging with whatever normal lighting is available at the sign/marking/delineator location in question; or
    - dual-mode or actively illuminated components with an independent power supply.

A.3 Charging light

The difference between the physical characteristics of electrically powered light fixtures/strips and HPPL materials has an impact on their visibility and thus the performance criteria and installation location within various rail car configurations.

If the ambient light can’t be reduced to 0.01 fc, then there are two alternative measurements that can be used to meet the requirements:

1. Measure the ambient light at each location and subtract that value from the value measured with the charging light system operating.
2. If the charging light system is at least twice the required levels in **Table A.1** plus the ambient light reading, consider the required levels to be met.

If the ambient (normal charging light) illuminance is less than the required criteria specified, railroads can take several actions described in this appendix to increase the charging light levels.

Unless the floor measurement value is known to be at least five times the value in **Table A.1**, a 6.5 ft (1.98 m) separation between the sensor head and the display must be used to ensure that the proximity of the person taking the measurements does not affect the readings.

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TABLE A.1
Minimum Illuminance Values for Charging HPPL Materials

Illuminance Value, fc (lux)	Type of Luminaire (Charging Light)
0.8 (8.6)	Cool-white LED (6500 ºK)
0.9 (9.7)	Warm-white LED (4700 ºK)
1.0 (10.8)	Cool-white fluorescent (4000–4500 ºK)
1.5 (16.1)	Warm-white fluorescent (3000–3500 ºK)
3.5 (37.7)	Incandescent (2900 ºK)

HPPL materials certified by an independent test laboratory to meet **Table A.1** requirements with the lower amount of charging light are permitted for use at that location, as long as the specified amount of light is available. HPPL signs/markings installed in shadowed locations should be avoided to the extent practicable.

HPPL signs/markings certified by an independent test laboratory to be capable of meeting the minimum performance specifications of HPPL as defined in this standard that are located in partitioned vestibules/ compartments/passageways no longer than 5 ft (1.52 m) longitudinally (including partially portioned vestibules) are not subject to the illuminance requirements in **Table A.1**.

To ensure that the normal lighting system provides an adequate charge to the HPPL system, luminaires shall be oriented to ensure that the HPPL material is adequately exposed to charging light. This appendix contains information that railroads can use to ensure that sufficient light is available.

Luminaires located in the proximity of each HPPL component shall be specified such that their light-dispersion patterns provide the above listed minimum illuminance levels at the surface of the component.

The manufacturer/supplier is required to have a minimum of one batch of material for signs/markings/ delineators of a given type certified. Signs/markings/delineators of the same certified type of material can be sold to multiple customers, even with minor changes in text or typography.

Several methods can be used to eliminate ambient light for accurate data collection (e.g., work at night with cars parked away from bright yard lights; locate cars in a dark, windowless shop or car wash; mask windows and vestibules with roofing paper, flooring paper or similar opaque materials; or drape cars with opaque tarps).

To take the measurement readings, the sensor is placed on the area of the HPPL sign/marking surface location where the light is brightest. The observer records the reading(s) using a data collection form.

The sensor and the readout device of the illuminance meter must be held in a manner so that the sensor is not affected by the observer's shadow. If light diffusers are used on the light fixtures, then the measurements shall be made with the light diffusers in place.

A.4 Representative sample sizes

Either of the following two sampling methods is acceptable.

A.4.1 ANSI/ASQ

The American National Standards Institute (ANSI) and the American Society for Quality (ASQ) have developed detailed procedures for calculating the size of a representative sample depending on population

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size, variance and required levels of statistical confidence. These may be found in “Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming” (ANSI/ASQC Z1.9-1993). The ANSI/ASQC minimum sample size for a population of up to eight units is three units. Specification of minimum sample sizes for fleets of more than eight cars requires previous knowledge of the variance in the test parameter of interest. In the absence of such knowledge, a common rule of thumb is to plan to test 15 units and conduct a running analysis of variance as the test proceeds. If the variance among samples is small, then it is usually possible to establish 95% confidence with a total of 5 to 10 samples.

A.4.2 Simplified sampling method

A simplified method of conducting the tests consists of the following:

1. Select five cars/areas at random from each car/area:
    - Inspect cars/areas to ensure that there are no defects, such as burned out lamps, weak batteries, etc.
    - Follow the test preparation procedures described in Section 4.
2. Take all the measurements described in Section 4.
3. If all five cars/areas comply with all minimum criteria required by Sections 2, 3 and 4, then no further action is required.
4. If one or more cars/areas fail to meet minimum criteria:
    - Determine and document the extent and cause of the failure and perform repairs to car(s)/area(s).
    - Continue taking measurements on cars/areas randomly selected without replacement (not previously tested) until at least 10 successive cars/areas or all cars/areas comply with all minimum criteria in Sections 2, 3 and 4.
    - If a pattern of failures becomes apparent, (i.e., occurs repeatedly), then determine the cause and document and implement a fleet-wide redesign/repair to correct the defect.
    - Inspection/testing may be interrupted until this repair has been completed.
    - Confirm correction of failure/defect by inspecting/testing a sample of 10 repaired cars/areas (or all cars/areas) to verify that they comply with all the minimum criteria in Sections 2, 3 and 4.
5. Retain records for possible FRA inspection.

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A.5 Sample illuminance charging light survey forms

A.5.1 Signage/marking sample illuminance/charging light survey form

Railroad Property/Location:		
Car Builder:		
Car Type/Series/Configuration/Year:		
Car Plate #:		
Date:		
Data Collector's Name:		
Light Meter Used:		
Start Time:	End Time:	
MEASUREMENTS (all measurements are expressed in foot-candles)		
Locations	**A-End**	**B-End**
End door sign/control/instructions		
Side door sign, location 1		
Side door sign, location 2		
Side door sign, location 1		
Side door sign, location 2		
Window exit locator signs (describe location and record measurement at each sign)	**Left Side**	**Right Side**

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A.5.2 LLEPM sample illuminance/charging light survey form

Railroad Property/Location:		
Car Builder:		
Car Type/Series/Configuration/Year:		
Car Plate #:		
Date:		
Data Collector's Name:		
Light Meter Used:		
Start Time:	End Time:	
MEASUREMENTS (all measurements are expressed in foot-candles)		
Locations	**A-End**	**B-End**
End-frame door sign/control/instructions		
Vestibule door, location 1		
Vestibule door, location 2		
Stairs, location 1		
Stairs, location 2		
Aisle, location 1		
Aisle, location 2		
Crew area (if any)		
Other special area		
Passageway, if any		

A.5.3 Notes form

Use the following to describe the make /model/wattage rating/cleanliness, etc., of the emergency charging light fixtures, etc.

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Appendix B (informative): Photographic examples of interior signage

B.1 Exit locator signage

FIGURE B.1.1
Door Exit Locator (MBTA – Type 9 – CAF USA)

B.2 Emergency door exit signage

FIGURE B.2.1
Emergency Door Exit (NYCT – R-143 – Kawasaki)

FIGURE B.2.2
Emergency Door Exit (PATH – PA-5 – Kawasaki)

B.3 End door signage

The variation of signage used by rail transit agencies is apparent in the range of end door signage drawings and photographs provided by agencies. The signs feature different phrases, including "No Exit," "Emergency

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Use Only," "No Passing Through," "Keep Door Closed," and "Do Not Open." The messaging for some signs discourages standing, riding or moving between cars.

FIGURE B.3.1
No Exit – Emergency Use Only Door Exit
(NYCT – R-160 – Alstom)

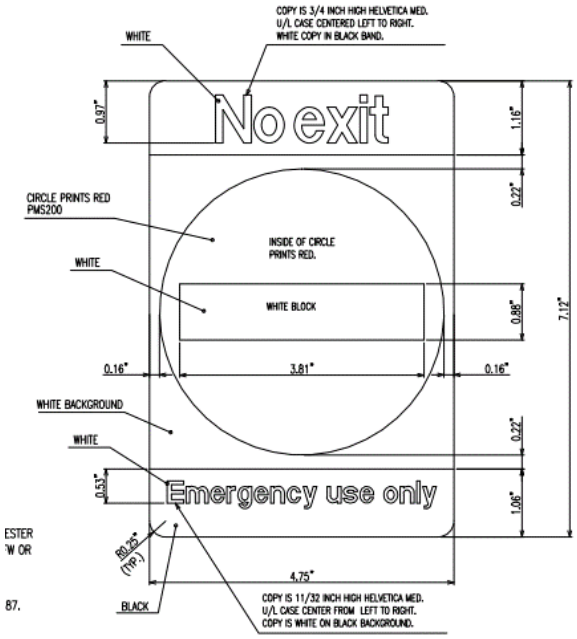

FIGURE B.3.2
Emergency Use Only Door Exit, No Passing Through
(NYCT – R-160 – Alstom)

FIGURE B.3.3
No Passing Through (NYCT – R-143 – Kawasaki)

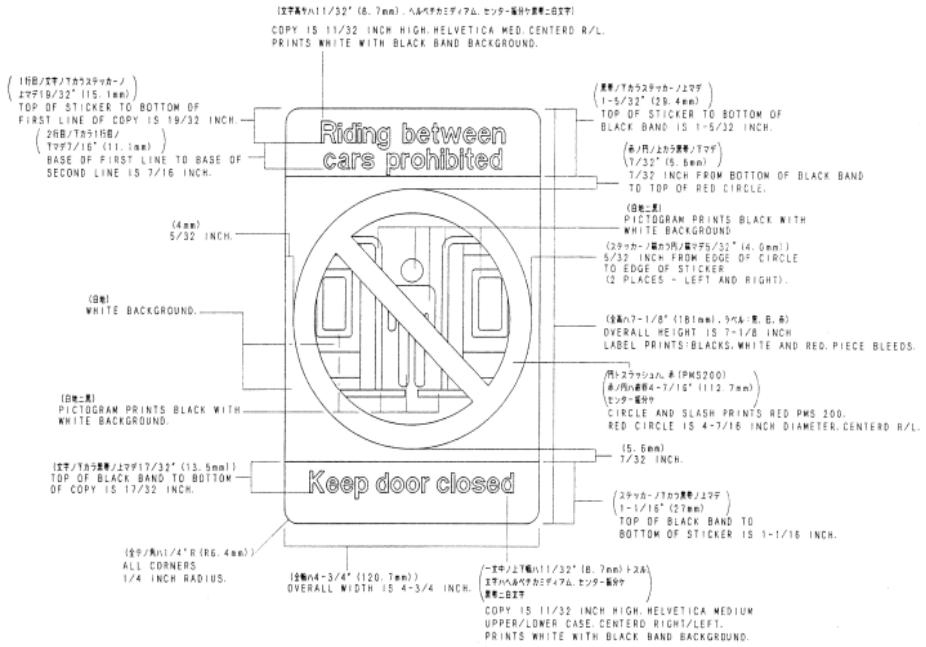

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FIGURE B.3.4
Emergency Use Only Door Exit, No Passing Through (LACMTA – A650 – BREDA)

FIGURE B.3.5
Emergency Use Only Door Exit
(LACMTA – A650 – BREDA)

FIGURE B.3.6
No Passing Through
(MBTA – 0600 – Hawker Siddeley Canada)

FIGURE B.3.7
Emergency Use Only Door Exit, No Passing Through
(CTA – 3200 – Morrison-Knudsen)

FIGURE B.3.8
No Passing Through
(CTA – 3200 – Morrison-Knudsen)

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FIGURE B.3.9
No Passing Through
(SEPTA – B-IV – Kawasaki)

FIGURE B.3.10
No Passing Through
(SEPTA – M-4 – AdTranz)

FIGURE B.3.11
Emergency Use Only Door Exit (GCRTA – Tokyu Car Corporation)

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FIGURE B.3.12
Emergency Use Only Door Exit (WMATA – 7k – Kawasaki)

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B.4 Exit window signage

FIGURE B.4.1
Emergency Window Exit Locator and Instructions (TTC – Flexity Outlook – Bombardier)

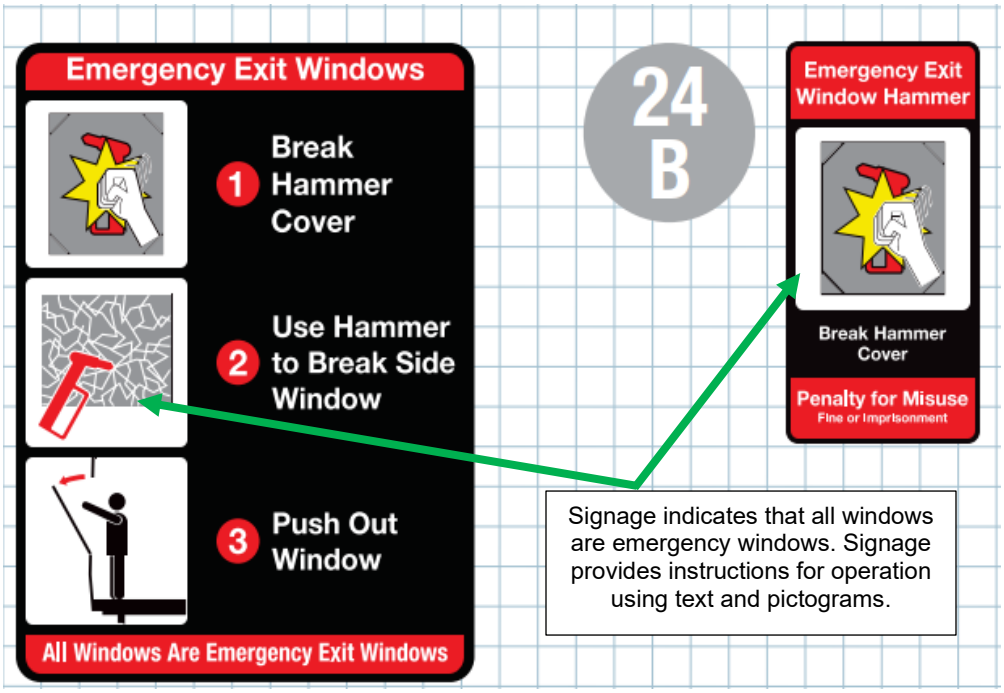
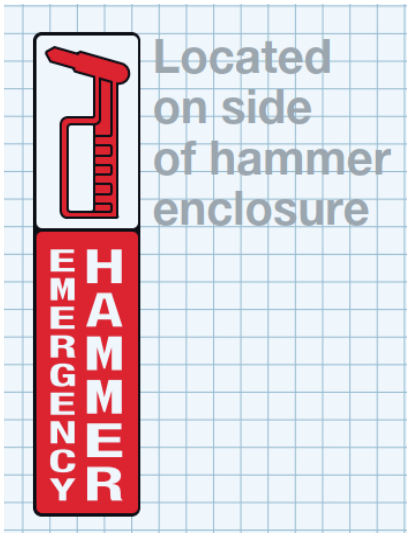


FIGURE B.4.2
Emergency Window Exit Equipment (TTC – Flexity Outlook – Bombardier)



B.5 Manual door release signage

The range of signage used by rail transit agencies is also apparent in the provided decal renderings and photographs. Some signs feature instructive text and pictograms, while others provide only text instructions or text used to locate the manual door release mechanism.

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FIGURE B.5.1
Manual Door Release Locator and Instructions (with Standardized Internationally Recognized Pictogram)

FIGURE B.5.2
Manual Door Release Locator and Instructions
(TTC – Flexity Outlook – Bombardier)

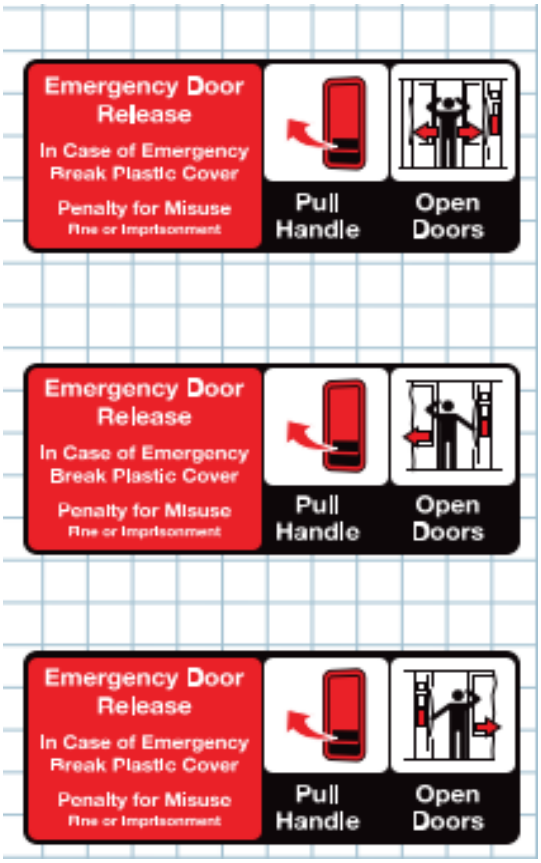

FIGURE B.5.3
Manual Door Release Locator and Instructions
(PAAC – SD-400 – Siemens)

FIGURE B.5.4
Manual Door Release Locator
(PAAC – SD-400 – Siemens)

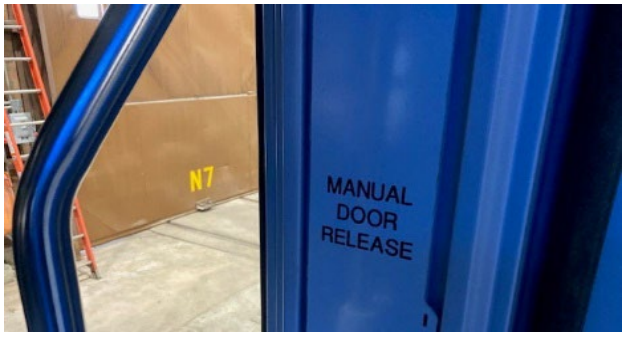

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FIGURE B.5.5
Manual Door Release Locator and Instructions (MBTA – Type 9 – CAF USA)

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FIGURE B.5.6
Manual Door Release Locator
(CATS – S70 – Siemens)

FIGURE B.5.7
Manual Door Release Locator and Instructions
(VMR – Tempe Streetcar – Brookville)

FIGURE B.5.8
Manual Door Release Locator
(LACMTA – P3010 – Kinki Sharyo)

FIGURE B.5.9
Manual Door Release Locator
(LACMTA – A650 – BREDA)

VMR manual door release instructions and LACMTA manual door release locator signage feature bilingual text.

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B.6 Passenger emergency intercom and assistance alarm signage

Again, some of the signage depicted in the decal renderings and photographs features instructive text and pictograms, while other signage examples provide only text instructions or text used to locate the passenger intercom.

FIGURE B.6.1
Passenger Emergency Intercom Locator and Instructions
(MBTA – Type 9 – CAF USA)

FIGURE B.6.2
ADA Passenger Emergency Intercom Locator and Instructions (MBTA – Type 9 – CAF USA)

FIGURE B.6.3
Passenger Emergency Intercom Locator
(TTC – Flexity Outlook – Bombardier)

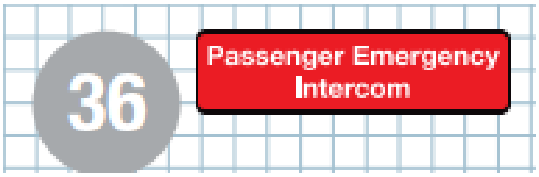

FIGURE B.6.4
Passenger Emergency Intercom Instructions
(TTC – Flexity Outlook – Bombardier)

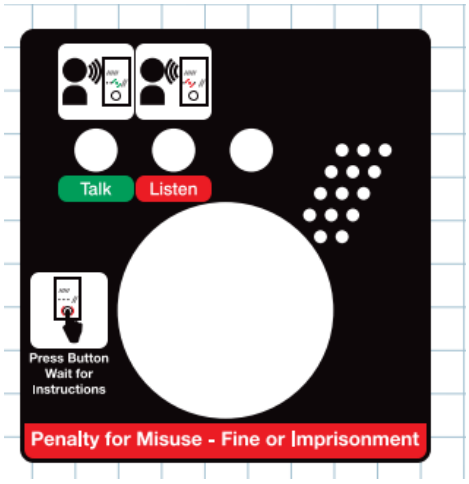

FIGURE A.6.5
Passenger Emergency Intercom Instructions
(TTC – Flexity Outlook – Bombardier)

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FIGURE B.6.6
Passenger Emergency Alarm Locator and Instructions (TTC – Flexity Outlook – Bombardier)

FIGURE B.6.7
Passenger Emergency Intercom Locator
(CATS – S70 – Siemens)

FIGURE B.6.8
Passenger Emergency Intercom Locator
(PAAC – SD-400 – Siemens)

FIGURE B.6.9
Passenger Emergency Intercom Locator and Instructions
(LACMTA – A650 – BREDA)

FIGURE B.6.10
Emergency Assistance Intercom Locator and Instructions
(LACMTA – P3010 – Kinki Sharyo)

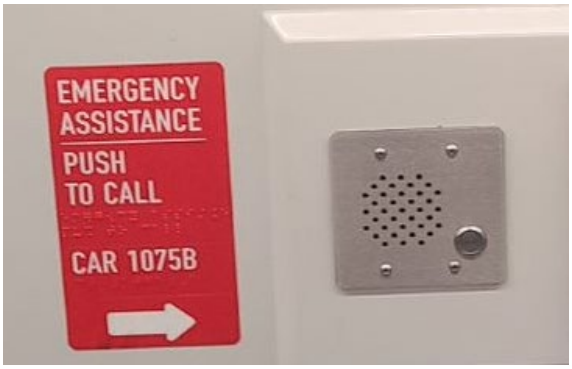

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FIGURE B.6.11
Emergency Assistance Intercom Locator and Instructions (SEPTA – M-4 – AdTranz)

FIGURE B.6.12
Passenger Emergency Intercom Locator and Instructions (LACMTA – P2550 – BREDA)

FIGURE B.6.13
Passenger Emergency Intercom Locator and Instructions (MBTA – #12 Main Line – Hawker Siddeley Canada)

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FIGURE B.6.14

Passenger Emergency Intercom Locator and Instructions (VMR – Tempe Streetcar – Brookville)

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B.7 Emergency instructions signage

Provided emergency instructions signage drawings and photographs mostly incorporated pictograms with text and reference hazards associated with the right-of-way.

FIGURE B.7.1
Emergency Instructions (NYCT – R-143 – Kawasaki)

References to right-of-way hazards highlighted in green.

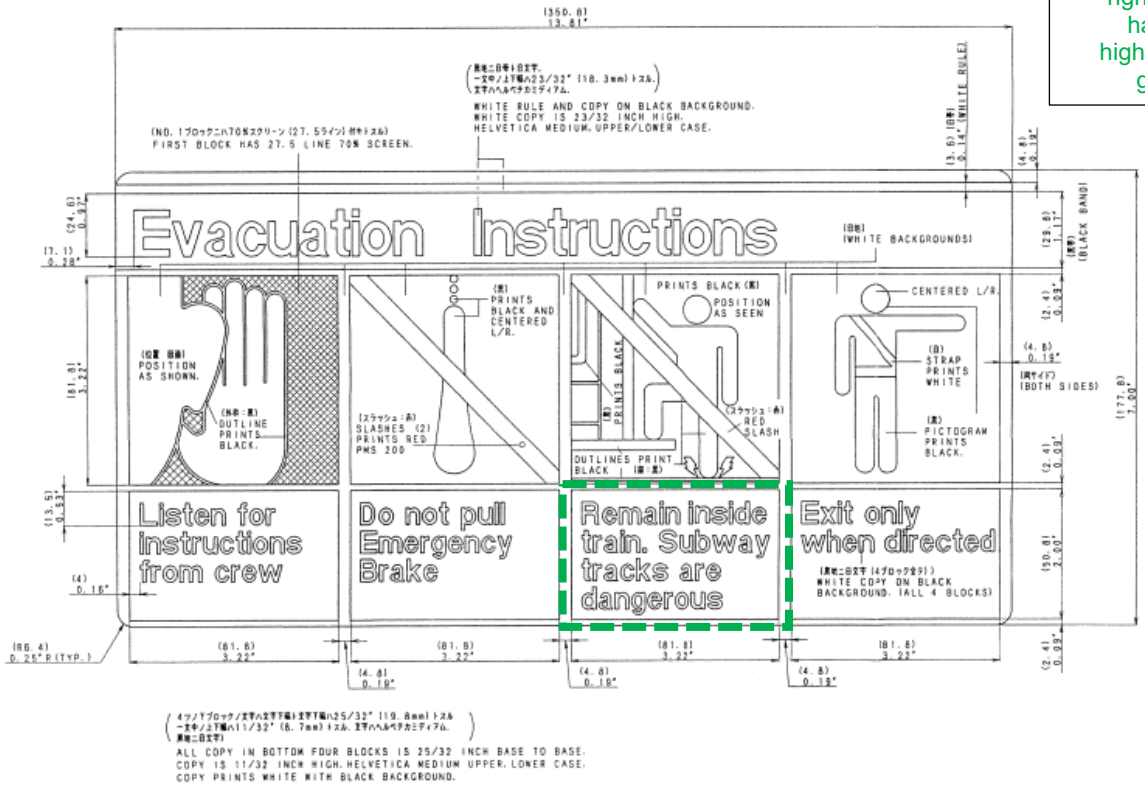

FIGURE B.7.2
Emergency Instructions
(SEPTA – M-4 – AdTranz)

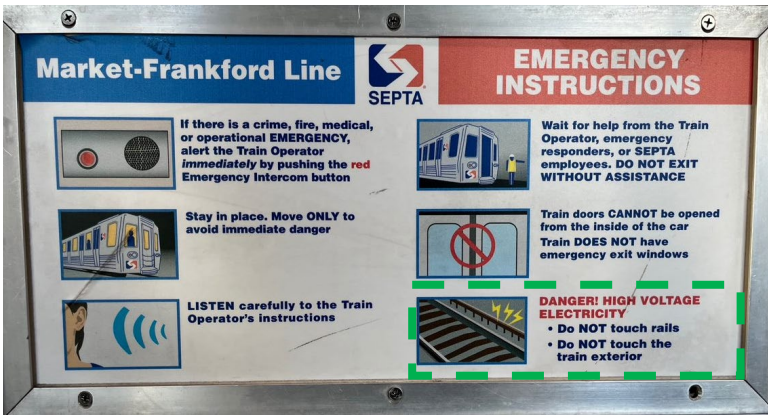

FIGURE B.7.3
Emergency Instructions
(CTA – 3200 – Morrison-Knudsen)

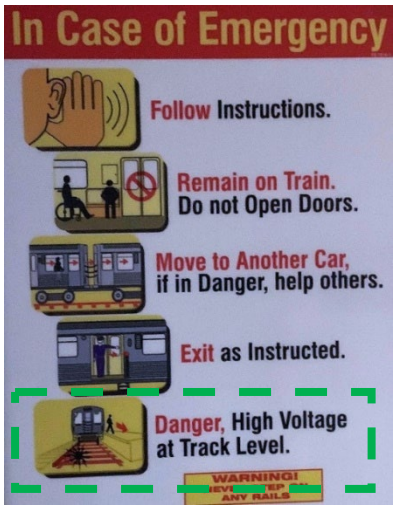

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FIGURE B.7.4
Emergency Instructions (SEPTA – N-5 – Asea Brown Boveri)

FIGURE B.7.5
Emergency Instructions (LACMTA – P3010 – Kinki Sharyo)

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FIGURE B.7.6
Emergency Instructions (LACMTA – A650 – BREDA)

B.8 Emergency equipment signage

FIGURE B.8.1
Emergency Equipment
(TTC – Flexity Outlook – Bombardier)

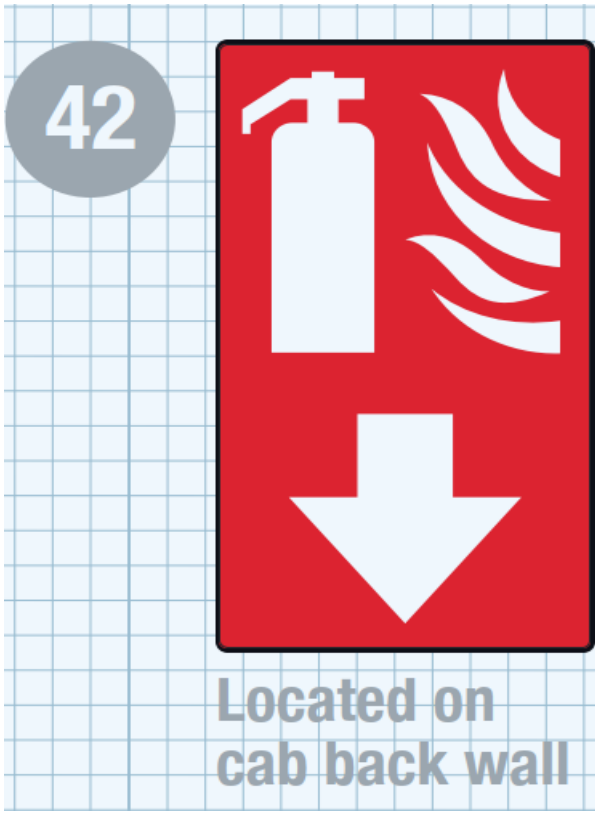

FIGURE B.8.2
Emergency Equipment
(VMR – Tempe Streetcar – Brookville)

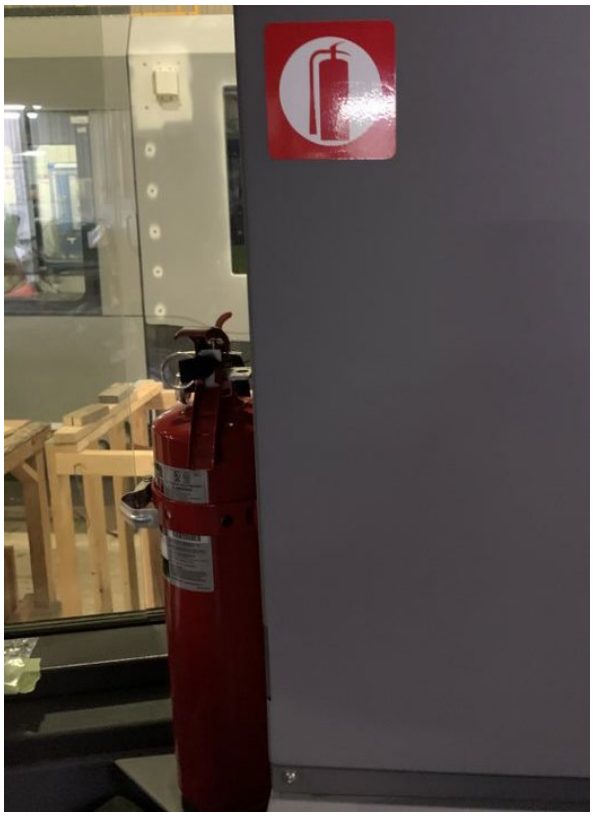

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FIGURE B.8.3
Emergency Equipment
(LACMTA – P3010 – Kinki Sharyo)

FIGURE B.8.4
Emergency Equipment
LACMTA – P2000 – Kinki Sharyo)

B.9 Electric hazard warning signage

FIGURE B.9.1
Hazard Signage (VMR – Tempe Streetcar – Brookville)

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B.10 Emergency brake application/stop signage

FIGURE B.10.1
Emergency Brake (NYCT – R-160 – Alstom)

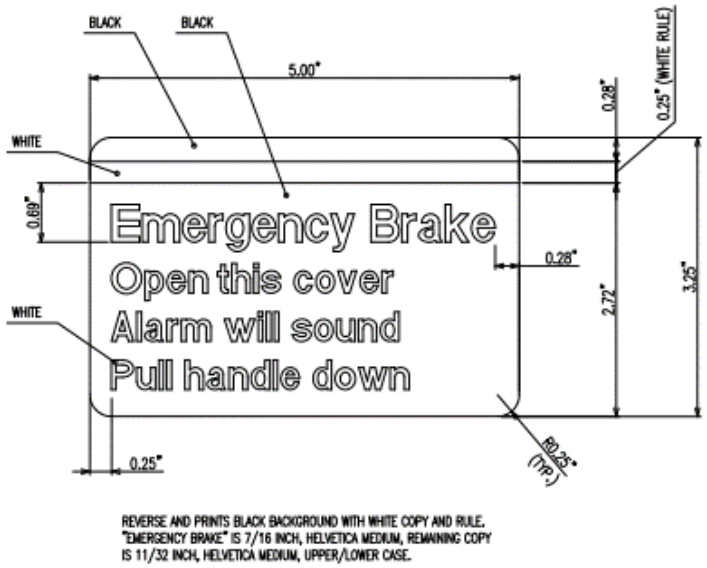
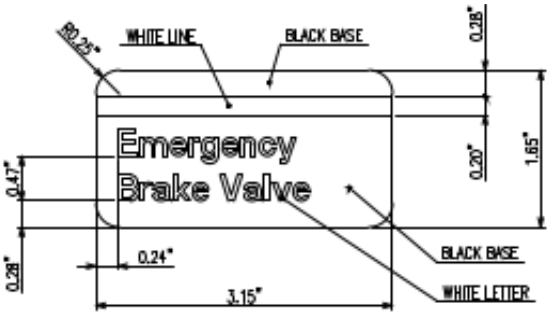
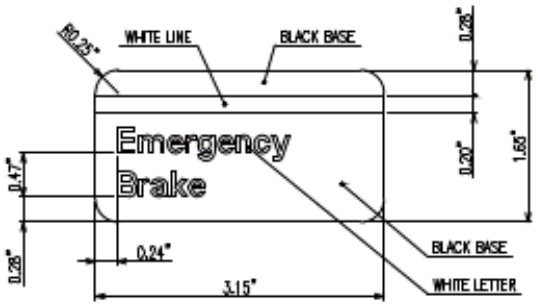


FIGURE B.10.2
Emergency Brake Valve (NYCT – R-160 – Alstom)



NAME PLATE–GENERAL
(Emergency Brake Valve)
39001–04804–
R160–1120 (18)

FIGURE B.10.3
Emergency Brake (NYCT – R-160 – Alstom)



NAME PLATE–GENERAL
(Emergency Brake)
39001–04799–
R160–1120 (13)

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FIGURE B.10.4
Emergency Brake Application (MBTA – 0600 – Hawker Siddeley Canada)

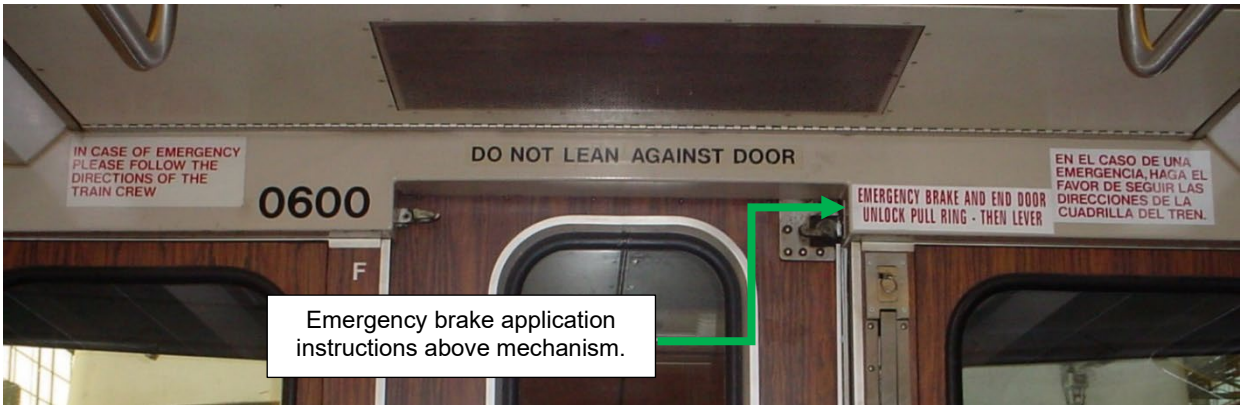
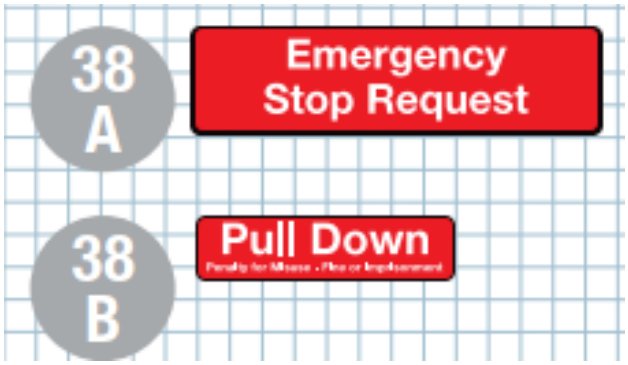


FIGURE A.10.5
Emergency Stop Request (TTC – Flexity Outlook – Bombardier)



B.11 Stairway markings

B.11.1 L-shaped markings

1 in. (2.5 cm) wide L-shaped marking/delineators shall be installed on both sides of each tread nearest to the wall.

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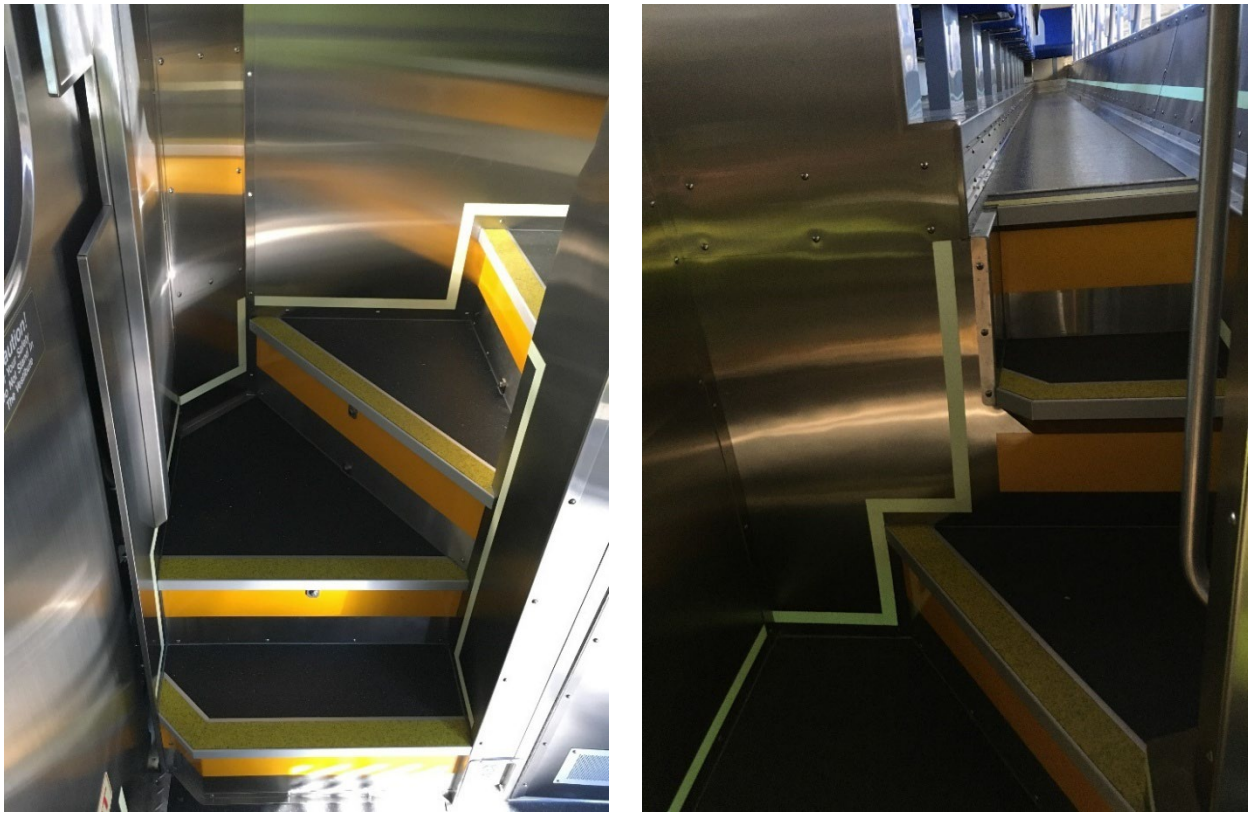
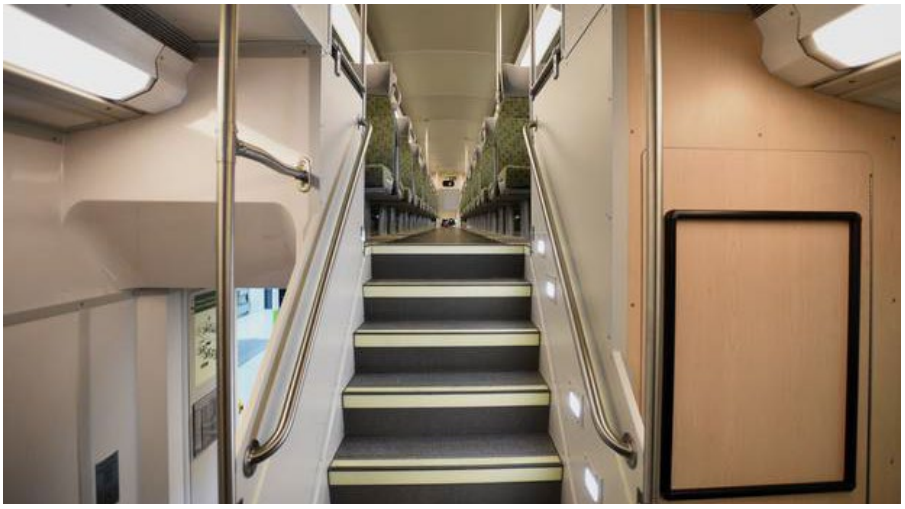
FIGURE B.11.1
L-Shaped Stairway LLEPM Example (Nippon Sharyo)



B.11.2 Material on step risers

Materials applied to the step risers that consist of a minimum 2 in. (5.08 cm) wide strip or two 1 in. (2.54 cm) wide strips that extend, to the extent practicable, across the full width of the riser and placed at the lower half of the riser.

FIGURE B.11.2
Wide Strip and Diagonal LLEPM Stairway Configuration (Bombardier)



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B.11.3 Discs

Discs of not less than 1.25 in. (3.18 cm) in diameter, placed either: 1) no more than 2½ in. (6.35 cm) apart on each stair tread, near the step nosing, or 2) no more than 2½ in. (6.35 cm) apart and no higher than 18 in. (45.7 cm) from the treads on both sides of the stairway walls/partitions.

FIGURE B.11.3
Disc LLEPM Stairway Configuration (Bombardier)

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Appendix C (informative): Photographic examples of exterior signage

C.1 Exterior signage

FIGURE C.1.1
Emergency Shutdown Closed
(MBTA – Type 9 – CAF USA)

FIGURE C.1.2
Emergency Shutdown Open
(MBTA – Type 9 – CAF USA)

FIGURE C.1.3
High Voltage Hazard (MBTA – Type 9 – CAF USA)

FIGURE C.1.4
High Voltage Hazard (MBTA – Type 9 – CAF USA)

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FIGURE C.1.5
Emergency Door Release (MBTA – Type 9 – CAF USA)

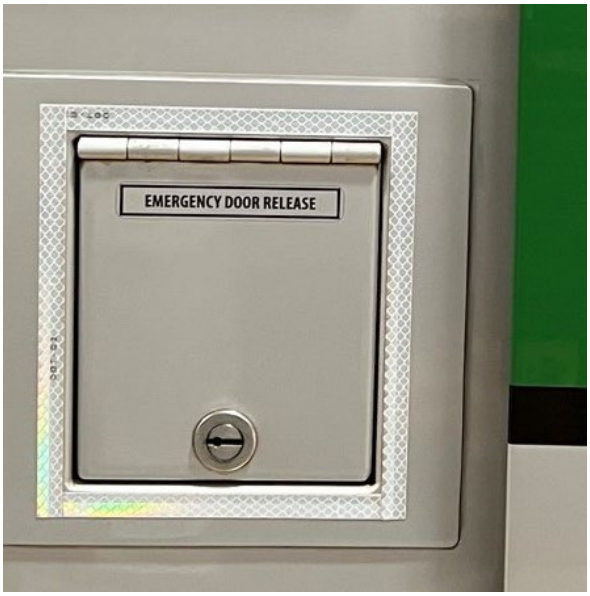

FIGURE C.1.6
Emergency Release
(VMR – Tempe Streetcar – Brookville)

FIGURE C.1.7
Manual Door Release
(PAAC – SD-400 – Siemens)

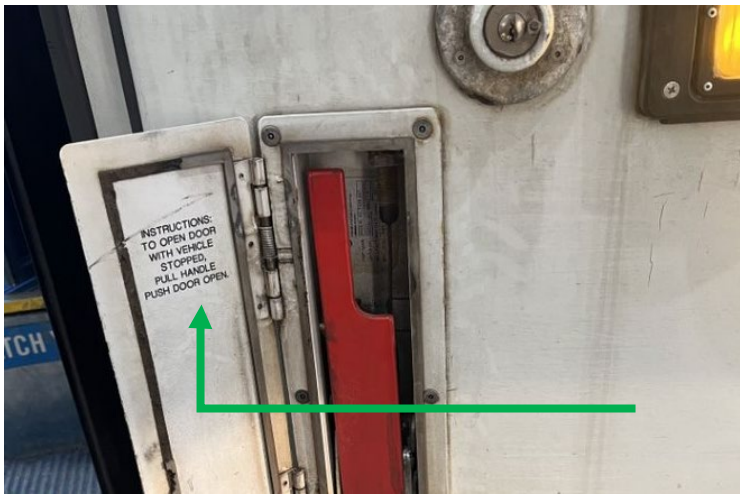

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FIGURE C.1.8
Emergency Brake Release Locator (LACMTA – P2000 – Kinki Sharyo)

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Appendix D (informative): Photographic examples of roof access signage

FIGURE D.1.1
Roof Access Hazard Signage (SEPTA – Unknown – Unknown)

FIGURE D.1.2
Interior Emergency Exit Roof Access Signage Inside Locomotive Cab (SEPTA – Unknown – Unknown)

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FIGURE D.1.3
Interior Emergency Exit Roof Access Signage (SEPTA – Unknown – Unknown)

FIGURE D.1.4
Exterior Emergency Roof Access Signage (SEPTA – Unknown – Unknown)

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