ASME RT-2026

(Revision and Consolidation of ASME RT-1–2020 and ASME RT-2–2021)

Safety Standard for Structural Requirements for Heavy Rail Transit Vehicles, Light Rail Vehicles, and Streetcars

AN AMERICAN NATIONAL STANDARD



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FOREWORD

On March 18, 1998, The American Society of Mechanical Engineers (ASME) formed the Rail Transit Vehicle (RTV) Standards Committee.

The RTV Standards Committee develops and maintains standards that cover safety, functional, performance, and operability requirements, as well as mechanical systems, components, and structural requirements for rail transit vehicles. These vehicles include streetcars, conventional subway (rapid) transit rail vehicles, and light rail vehicles and excludes freight, commuter, high-speed, or any other rail vehicles under the jurisdiction of the Federal Railroad Administration.

The RTV Standards Committee is responsible for developing a series of safety standards within its Charter under the designation of RT. The purpose of the RT standards is to provide the rail transit industry with safety standards that address vehicle mechanical systems, components, and structural requirements, so as to enhance public safety. Principles, recommendations, and requirements included in these standards promote good engineering judgment as applied in designing rail transit vehicles for safety. The standards are subject to revisions that are the result of the Committee's consideration of factors such as technological advances, new data, and changing environmental and industry needs.

Both SI and U.S. Customary units are used in this Standard, with the latter placed in parentheses. These units are noninterchangeable, and, depending on the country as well as industry preferences, the user of this Standard shall determine which units are to be applied. Parameters are derived from the "Standard for Use of the International System of Units (SI): The Modern Metric System," IEEE/ASTM SI 10-2016, or the latest revision.

This Standard is a consolidation into a single document of the previously issued standards ASME RT-1–2020, Safety Standard for Structural Requirements for Light Rail Vehicles and Streetcars, and ASME RT-2–2021, Safety Standard for Structural Requirements for Heavy Rail Transit Vehicles.

This Standard is on continuous maintenance. ASME RT-2026 was approved by the American National Standards Institute on February 23, 2026.

ASME RTV COMMITTEE
Rail Transit Vehicles

(The following is the roster of the committee at the time of approval of this Standard.)

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Revisions and Errata. The committee processes revisions to this Standard on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive email notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

Cases. The committee does not issue cases for this Standard.

Interpretations. Upon request, the committee will issue an interpretation of any requirement of this Standard. An interpretation can be issued only in response to a request submitted through the online Inquiry Submittal Form at https://go.asme.org/InterpretationRequest. Upon submitting the form, the inquirer will receive an automatic email confirming receipt.

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INTRODUCTION

Safety of rail transit operations is a system characteristic. As do all transportation options in a given corridor, the operation of rail vehicles has certain risks, including derailment and collision with another vehicle. The risks are mitigated by the design of the signal system and other systems elements, by operating and maintenance procedures, and by the design of the vehicle. Risks are further mitigated by the elimination of grade crossings and the provision of safety barriers. Active safety systems on the vehicle include train control, communication, and propulsion and braking subsystems. The vehicle carbody, if properly designed, may be considered a passive safety device, and this Standard is intended to address the performance of the carbody in collisions.

This Standard draws from existing requirements for the design of the carbody of rail transit vehicles, and represents the minimum design requirements. It also considers recent developments in the design of rail carbody structures intended to optimize the structure performance under the conditions of an overload, such as might occur during a collision. This topic is commonly identified as crash energy management (CEM). The intent of CEM is to better manage the dissipation of the portion of the energy of a collision that can reasonably be expected to be absorbed by the deformation of the carbody. CEM design, when appropriately applied, may reduce risk of injuries to occupants of the rail vehicle due to loss of survivable volume and due to secondary collisions of occupants with the car interior. Specific portions of the carbody are designed for controlled deformation and energy absorption and are located in the structure so as to limit the damage to, and acceleration of, occupied volumes. This Standard requires the incorporation of CEM principles in the design of rail transit vehicles. For multiple unit operation, distributing structural energy absorption through the train has been shown to be beneficial.

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SAFETY STANDARD FOR STRUCTURAL REQUIREMENTS FOR HEAVY RAIL TRANSIT VEHICLES, LIGHT RAIL VEHICLES, AND STREETCARS

1 SCOPE

This Standard defines structural performance requirements for rail transit vehicles (railcars) including heavy rail, light rail, and streetcars. The objectives are to reduce injury risk and equipment damage resulting from railcar collisions by providing a means of protection when other preventive measures, such as signaling, have failed. This Standard defines protection for occupants of railcars by preserving vehicle structural integrity, preserving passenger occupied space, reducing risk of vehicle-to-vehicle override, and limiting collision accelerations experienced by occupants. In addition, this Standard defines design features that address the risk of entrapment for passengers of motor vehicles struck by light rail vehicles (LRVs) or streetcars, the risk of structural penetration of motor vehicles by railcar front-end equipment, and the risk to pedestrians and bicyclists if accidentally struck by a LRV or streetcar. This Standard does not address the design of railcar interior structures beyond limiting collision accelerations and consequential secondary impact velocities of passengers colliding with interior surfaces.

1.1 Subjects Not Addressed by This Standard

There are several design considerations related to safety that are not addressed in this Standard, such as, but not limited to

(a) structural repairs
(b) fatigue
(c) corrosion
(d) fire protection
(e) interior vehicle design
(f) emergency egress from vehicle
(g) inspection and maintenance

1.2 Effective Date

This Standard applies to newly constructed heavy rail transit vehicles, LRVs, and streetcars for transit passenger service ordered six months following the date of issuance of this Standard by the Rail Transit Vehicle (RTV) Standards Committee and ASME.

2 DEFINITIONS

This Standard relies, where practical, on terms already in use by ASME, the American Public Transportation Association (APTA), and the Institute of Electrical and Electronics Engineers (IEEE). For the purposes of this Standard, the following definitions apply:

anticlimber: a structural member or mechanism located at each end of the vehicle that is used to engage an opposing vehicle, coupled or not, to resist relative vertical travel between the two carbodies during a collision.

antitelescoping plate: for heavy rail transit vehicles, a single structural member that spans the full width of the carbody at the top of the end frame, that is attached to the tops of the collision and corner posts, and is designed to transmit the collision and corner post top reaction loads to the carbody sides and roof.

NOTE: While this term is no longer used in this Standard, the design and effectiveness of the antitelescoping plate is included through reference to the roof structure in this Standard.

articulation: a rotating connection at the intermediate ends of carbody sections to allow negotiation of tracks with various vertical and horizontal profiles.

average collision acceleration: the rate at which each car module's (for light rail vehicles and steetcars) and car's (for heavy rail transit vehicles) longitudinal velocity changes and is then averaged over the duration of the collision event. Average collision acceleration is to be computed at a sample rate of no less than 1 kHz and processed using a simple moving average with a length in time (block) of 100 ms. Alternatively, average collision acceleration may be computed from the change in velocity over a length in time (block) of 100 ms but shall represent the time block that results in the highest average acceleration. Upper limit on the magnitude of average collision acceleration is the maximum average acceleration magnitude, computed across all time blocks of the processed data, for any car module (streetcars and light rail vehicles) or car (heavy rail transit vehicle).

belt rail: a longitudinal structural member of the carbody located on each side of the carbody below the passenger side windows. The distance between opposite belt rails