

**HIGH-SPEED RAIL CARS,
MONORAILS AND SYSTEMS**

Technical Assistance Manual

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Introduction

This technical assistance document is one of a series provided to help in understanding the background and underlying rationale of the Americans with Disabilities Act Accessibility Guidelines for Transportation Vehicles (Vehicle Guidelines) and how the guidelines may apply in a particular case. The documents in this series are:

- o Buses, Vans & Systems
- o Rapid Rail Vehicles & Systems
- o Light Rail Vehicles & Systems
- o Commuter Rail Cars & Systems
- o Intercity Rail Cars & Systems
- o Over-the-Road Buses & Systems
- o Automated Guideway Transit Vehicles & Systems
- o High-Speed Rail Cars, Monorails & Systems
- o Trams, Similar Vehicles & Systems

The information in this document is based on the preamble published with the Vehicle Guidelines, augmented with material developed in response to questions which have been posed to the Architectural and Transportation Barriers Compliance Board (Access Board) since publication of the guidelines. The Department of Transportation (DOT) has issued standards for vehicles based on the guidelines. The guidance in this document does not constitute a determination of compliance with the DOT standards or with your rights or responsibilities under the ADA and is not binding on DOT.

Background

The Americans with Disabilities Act (ADA) [P.L. 101-336, 42 U.S.C. 12101, *et seq*], signed into law by President Bush on July 26, 1990, is landmark legislation to extend civil rights protection to people with disabilities. The ADA prohibits discrimination on the basis of disability in employment, State and local government services, public transportation, public accommodations, commercial facilities, and telecommunications.

Title II of the ADA prohibits discrimination on the basis of disability in services, programs, and activities provided by public entities, including units of State and local government and the National Railroad Passenger Corporation (Amtrak). Title II addresses public transportation and contains provisions specifically addressing the following types of transit systems: fixed route bus, rapid rail, light rail, commuter rail, and intercity rail. Under title II, transit systems of these types which are owned or operated by public entities, and persons under contract with such entities, must be made readily accessible to and useable by individuals with disabilities, including individuals who use wheelchairs. With respect to public entities, title II requires that:

New Vehicles. New vehicles purchased or leased after August 25, 1990, must be accessible.

Used Vehicles. If used vehicles are purchased or leased after August 25, 1990, good faith efforts must be made to obtain accessible vehicles.

Remanufactured Vehicles. If vehicles are remanufactured after August 25, 1990, to extend their useful life for 5 years or more in the case of buses and rapid and light rail vehicles, or for 10 years in the case of commuter and intercity rail cars, then the vehicles must be made accessible to the maximum extent feasible.

"One-Car-Per-Train" Rule. At least one vehicle or car in each train of two or more cars must be accessible as soon as practicable but in no event later than July 26, 1995, in the case of rapid, light, commuter, and intercity rail systems.

Demand Responsive Systems. New vehicles purchased or leased after August 25, 1990, for use in a demand responsive system operated by a public entity, or by a person under contract with such an entity, must be accessible unless the system, when viewed in its entirety, provides to individuals with disabilities a level of service equivalent to that provided to other members of the general public.

Title III of the ADA prohibits discrimination on the basis of disability in public accommodations and services provided by private entities. Under title III, public transportation services (other than by aircraft) provided by private entities must also be made readily accessible to and usable by individuals with disabilities, including individuals who use wheelchairs. Under title III, the following requirements apply to private entities that are primarily engaged in the business of transporting people and whose operations affect commerce:

New Vehicles. New vehicles purchased or leased after August 25, 1990, must be accessible unless the vehicle is to be used solely in a demand responsive system that, when viewed in its entirety, provides to individuals with disabilities a level of service equivalent to that provided to other members of the general public. This requirement does not apply to automobiles, vans with a seating capacity of less than 8 passengers, or over-the-road buses.

Vans. New vans with a seating capacity of less than 8 passengers purchased or leased after February 25, 1992, must be accessible, unless the system for which the van is being purchased

or leased, when viewed in its entirety, provides to individuals with disabilities a level of service equivalent to that provided to other members of the general public.

Rail Cars. New rail passenger cars purchased or leased after February 25, 1992, must be accessible. Rail passenger cars remanufactured after February 25, 1992, to extend their useful life for 10 years or more must be made accessible to the maximum extent feasible.

For private entities not primarily engaged in the business of transporting people but whose operations affect commerce, such as hotels, shopping centers, and recreational facilities which operate shuttle service for customers or patrons, title III requires that:

New Vehicles for Fixed Route Systems. New vehicles with a seating capacity of more than 16 passengers purchased or leased after August 25, 1990, for use in fixed route systems must be accessible. This requirement does not apply to over-the-road buses. New vehicles with a seating capacity of 16 passengers or less purchased or leased after August 25, 1990, for use in a fixed route system must also be accessible unless the system, when viewed in its entirety, provides to individuals with disabilities a level of service equivalent to that provided to other members of the general public.

New Vehicles for Demand Responsive Systems. New vehicles with a seating capacity of more than 16 passengers, purchased or leased after August 25, 1990, for use in a demand responsive system must be accessible unless the system, when viewed in its entirety, provides to individuals with disabilities a level of service equivalent to that provided to other members of the general public.

Operation of Demand Responsive Systems. Demand responsive systems must be operated in such a manner that after July 26, 1990, the system, when viewed in its entirety, provides to individuals with disabilities a level of service equivalent to that provided to other members of the general public.

Over-the-Road Buses. Title III specifically addresses over-the-road buses operated by private entities. The Office of Technology Assessment (OTA) is responsible, under title III of the ADA, for studying the access needs of individuals with disabilities to over-the-road buses and the most cost-effective methods for providing such access. In view of this mandated study, over-the-road buses covered by title III are not required to be accessible to wheelchair or mobility aid users until July 26, 1997, for small providers and July 26, 1996, for other providers. Over-the-road buses purchased or leased after January 26, 1992, but before July 26, 1996 or 1997 may be

required to include accessibility features which do not involve structural changes or use of boarding devices.

Regulations

The Department of Transportation is responsible for issuing regulations to implement the transportation provisions of the ADA, including accessibility standards for transportation vehicles. The ADA required the Access Board to develop guidelines to provide guidance to DOT on establishing the accessibility standards for transportation vehicles. DOT published interim standards on October 4, 1990 (55 FR 40762). Those standards apply to vehicles purchased after August 26, 1990, but before October 7, 1991.

The Access Board published its minimum guidelines, known as the ADA Accessibility Guidelines for Transportation Vehicles on September 6, 1991, in the Federal Register (56 FR 45530). The provisions for lifts, ramps, and securement devices were drawn primarily from a series of guidelines developed as part of a project sponsored by the Federal Transit Administration (FTA), formerly the Urban Mass Transportation Administration (UMTA), in 1986: Guideline Specifications for Passive Wheelchair Lifts, Guideline Specifications for Active Wheelchair Lifts, Guideline Specifications for Wheelchair Ramps and Guideline Specifications for Wheelchair Securement Devices. Provisions from the Guideline Specifications were supplemented with additional material derived from common accessibility standards, such as the Uniform Federal Accessibility Standards (UFAS) and the American National Standards Institute (ANSI) A117.1-1980 specifications, research sponsored by the Access Board, and industry practice. Some provisions for Automated Guideway Transportation (AGT) "people movers" and rapid rail systems were derived from Los Angeles Downtown People Mover: Handbook on Accessibility for the Elderly and Handicapped (UMTA, November 1980). In addition, the guidelines incorporated provisions of 49 CFR Part 609 for buses, light rail and rapid rail systems published by UMTA in 1976.

These guidelines, codified at 36 CFR Part 1192, are not, in and of themselves, the standards for vehicles but rather form the minimum requirements for standards issued by DOT. DOT has adopted the substance of the guidelines (with minor editorial differences) as the accessibility standards for transportation vehicles. The final DOT regulation establishes effective dates for the accessibility standard and address when the standards are to be applied to vehicles for which a solicitation closes after October 6, 1991.¹ See 49 CFR 37.7. The manuals in this series will deal only with the requirements for vehicles procured after this date.

¹The requirements for the size of platform lifts and minimum door height for buses over 22 feet in length apply to solicitations closing on or after January 26, 1992. See 49 CFR 37.13 and the December 9, 1991, Federal Register (56 FR 64214).

Vehicles Covered

The Board's Vehicle Guidelines primarily address new and remanufactured vehicles instead of existing vehicles since the ADA does not necessarily require vehicle retrofit. Existing buses, for example, are not required to be retrofitted to meet the standards of Part 38 of the DOT regulation. Even compliance with the "one-car-per-train rule" and the mobility aid seating requirements for intercity rail cars can be met by the purchase of new vehicles. However, some entities which do not plan to purchase a sufficient number of new vehicles before the compliance date for the "one-car-per-train" rule may choose to retrofit existing vehicles. For these entities, the Board has included provisions in the appropriate general sections concerning such retrofitted vehicles.

Operations

The Vehicle Guidelines cover the design, manufacture and alteration of vehicles, not their operation. Operational requirements are within the purview of DOT, not the Board, and are covered by Part 37 of the DOT rule, especially subparts B and G. Except for the possibility of operational procedures allowed under the equivalent facilitation provision, discussed below, the Board's statutory mandate is to ensure accessibility of the built environment, including instances in which operational procedures might fail. For example, the Board cannot assume that the strength, agility and attention of a driver will be sufficient to prevent a heavy wheelchair from rolling off a lift. Thus, the Board has included a requirement for lift platform barriers. Neither is it appropriate, as one transit operator suggested, to assume that fellow passengers will have the strength or skill to assist persons with disabilities to board vehicles. It is just as inappropriate to expect other passengers to lift a wheelchair user into a vehicle as it is to assume others should lift a wheelchair over a curb or carry someone up a flight of stairs to enter a building. Therefore, specific vertical and horizontal gaps for rail vehicles are specified.

Wheelchair and Mobility Aid Standards

Neither the ADA, nor any other statute, confers upon the Board the authority to set standards or minimum requirements for wheelchairs and mobility aids. The ADA does, however, provide a clear mandate to the Board to set the minimum requirements for vehicles. The Board has attempted to carry out this charge in the fairest, most cost effective manner possible consistent with the statute.

Minimum Requirements

It should be noted that these Vehicle Guidelines, and the DOT standards based on them, are minimum requirements. Standards or specifications which provide greater access are permitted. In addition, there are sections which expressly permit alternatives (e.g., rear-facing securement). The word "may" is used where alternatives are permitted and should not be

construed as a requirement. Also, an appendix has been included in the guidelines which contains non-mandatory, advisory guidance to assist in applying the rule. The material from that appendix has been generally incorporated into the discussion material in this document.

Periodic Revisions

The Board intends to conduct periodic updates and revision of the Vehicle Guidelines so that future technologies and practices can be incorporated into them. As noted in the following discussions, the Board feels that additional data and study are needed regarding certain issues and it intends to further revise and modify these guidelines based on its review of collected data and study results. Also, some variations determined to provide equivalent facilitation may be explicitly incorporated in future updates.

In addition, the Board plans to revise and update these technical manuals as new information or technology surfaces or as the Vehicle Guidelines themselves are changed. In some places in these manuals, notation is made of drafting errors or sections where the regulation itself is unclear. Several non-substantive changes in the regulation may be made in the future and these changes will be reflected in revised editions of these manuals.

How These Manuals are Organized

Each of these manuals deals with a separate transportation mode or vehicle type, based on a particular subpart of the final regulation (e.g., subpart B - Buses, Vans and Systems; subpart C - Rapid Rail Vehicles and Systems; etc.). However, since subpart A applies to all vehicles, it is included at the beginning of each manual. Each manual is self-contained so that reference to other manuals is not necessary. Where the provisions of the Vehicle Guidelines refer to other modes, or where the DOT regulation requires one type of vehicle to comply with the requirements of another type, the relevant sections are repeated.

The portions of this document which appear in **bold** are the provisions as they appear in the final Vehicle Guidelines. The text immediately following is a discussion of the rationale. For purposes of this document, the section numbers correspond to the provisions as they appear in Title 36 of the Code of Federal Regulations. The numbering system of DOT's regulation follows the same format with the exception of the prefix number (i.e., §1192.23(b)(6) is substantively identical to §38.23(b)(6), etc.). Some of the provisions, particularly the requirements for horizontal gaps and vertical displacement between vehicles and platforms, must be read in conjunction with the station design requirements in 36 CFR Part 1191, which are included as Appendix A of the DOT regulation at 49 CFR Part 37.

Other Publications

The Access Board has also made available a checklist based on its ADA Accessibility Guidelines (ADAAG) for Buildings and Facilities. ADAAG contains requirements for transit facilities, including bus stops and terminals, fixed facilities and stations, and airports. The Board also publishes technical bulletins on certain sections in ADAAG. These publications are available from the Access Board.

Subpart A -- General

§1192.1 Purpose.

This part provides minimum guidelines and requirements for accessibility standards to be issued by the Department of Transportation in 49 CFR Part 37 for transportation vehicles required to be accessible by the Americans with Disabilities Act (ADA) of 1990, 42 U.S.C. 12101 et seq.

This section merely sets forth the purpose of the guidelines which is to establish the minimum requirements for standards issued by DOT. Section 504 of the ADA requires the Access Board to issue minimum guidelines and requirements for vehicles and facilities. In turn, DOT must issue standards which are consistent with these guidelines. The DOT standards could be more strict than the guidelines but could not provide a lesser degree of accessibility. This format is similar to that under the Architectural Barriers Act of 1968 in which the Board issued the Minimum Guidelines and Requirements for Accessible Design which sets the baseline for the Uniform Federal Accessibility Standards (UFAS). As discussed previously, the standards themselves have been issued by DOT and are codified at 49 CFR Part 38.

§1192.2 Equivalent facilitation.

Departures from particular technical and scoping requirements of these guidelines by use of other designs and technologies are permitted where the alternative designs and technologies used will provide substantially equivalent or greater access to and usability of the vehicle. Departures are to be considered on a case-by-case basis by the Department of Transportation under the procedure set forth in 49 CFR 37.7.

The Board and DOT agree that there is a need for some flexibility to address unique and special circumstances and to facilitate the application of new technologies. Therefore, an "equivalent facilitation" provision has been included that is similar to the provision in the buildings and facilities guidelines. DOT has established procedures under which an entity (e.g., transit agencies, providers, etc.) may pursue alternative means of providing accessibility with respect to specific requirements of the standard. The FTA or Federal Railroad Administration (FRA) Administrator will determine on a case-by-case basis whether equivalent facilitation is provided. See 49 CFR 37.7 for the detailed procedures which must be followed as part of an application to the Administrator for an equivalent facilitation determination. DOT intends to consult with the Board in making determinations of equivalency.

The Board wishes to point out that equivalent facilitation does not constitute a waiver from any accessibility requirement and is not a lesser standard of accessibility. Alternate

designs and technologies may be used only where they will provide substantially equivalent or greater access to, and usability of, a vehicle. The Board encourages that, when considering alternative designs and technologies, entities consult with individuals with disabilities and their organizations at the earliest possible stage of the process. The Board is available to provide technical assistance regarding equivalent facilitation.

In developing an equivalent facilitation proposal, an entity should consider the intent of the guideline or standard requirement. For example, large buses are required to have a doorway height of 5'8" from the raised lift platform. This height, although it accommodates only about 70% of the adult male population, is intended to provide some minimum head clearance for standees.

This clearance is especially important where a standee would be positioned outside the vehicle door when the lift is down but is moved up and through the door as the lift is raised. Other models of lifts do not move the standee through the door, but the individual would need to pass through the door after the lift is raised. While it is not practicable to provide clearance for the 90th percentile standee, it is desirable to provide as much head room as possible, since ducking to clear the doorway may be more difficult for persons with ambulatory disabilities than for other members of the general population. A greater height was not specified because information supplied by vehicle manufacturers indicated that this height was consistent with that needed to accommodate overhead door opening mechanisms and roof lines.

However, some lifts are designed such that the motion is entirely vertical ("elevator" type lifts) and a standee is positioned at the full inboard edge and is raised fully within the vehicle, clear of the door lintel. In this case, the FTA Administrator has determined that the intent of the doorway height requirement is being met by the particular lift configuration, provided the location of the handrails is such that the full inboard standing position is viable.

§1192.3 Definitions.

***Accessible* means, with respect to vehicles covered by this part, compliance with the provisions of this part.**

***Automated guideway transit (AGT) system* means a fixed-guideway transportation system which operates with automated (driverless) individual vehicles or multi-car trains. Service may be on a fixed schedule or in response to a passenger-activated call button. Such systems using small, slow moving vehicles, often operated in airports and amusement parks, are sometimes called "people movers".**

***Bus* means any of several types of self-propelled vehicles, other than an over-the-road bus, generally rubber tired, intended for use on city streets, highways, and busways,**

including but not limited to minibuses, forty- and thirty-foot transit buses, articulated buses, double-deck buses, and electric powered trolley buses, used to provide designated or specified public transportation services. Self-propelled, rubber tire vehicles designed to look like antique or vintage trolleys or street cars are considered buses.

Common wheelchairs and mobility aids means belonging to a class of three or four wheeled devices, usable indoors, designed for and used by persons with mobility impairments which do not exceed 30 inches in width and 48 inches in length, measured 2 inches above the ground, and do not weigh more than 600 pounds when occupied.

Commuter rail car means a rail passenger car obtained by a commuter authority (as defined by 49 CFR 37.3) for use in commuter rail transportation.

Commuter rail transportation means short-haul rail passenger service operating in metropolitan and suburban areas, operated by a commuter authority whether within or across the geographical boundaries of a State, usually characterized by reduced fare, multiple ride, and commutation tickets and by morning and evening peak period operations. This term does not include light or rapid rail transportation.

Demand responsive system means any system of transporting individuals, including the provision of designated public transportation service by public entities and the provision of transportation service by private entities, including but not limited to specified public transportation service, which is not a fixed route system.

Designated public transportation means transportation provided by a public entity (other than public school transportation) by bus, rail, or other conveyance (other than transportation by aircraft or intercity or commuter rail transportation) that provides the general public with general or special service, including charter service, on a regular and continuing basis.

Fixed route system means a system of transporting individuals (other than by aircraft), including the provision of designated public transportation service by public entities and the provision of transportation service by private entities, including but not limited to specified public transportation service, on which a vehicle is operated along a prescribed route according to a fixed schedule.

High speed rail means an intercity-type rail service which operates primarily on a dedicated guideway or track not used, for the most part, by freight, including, but not limited to, trains on welded rail, magnetically levitated (maglev) vehicles on a special guideway, or other advanced technology vehicles, designed to travel at speeds in excess of those possible on other types of railroads.

Intercity rail passenger car means a rail car intended for use by revenue passengers obtained by the National Railroad Passenger Corporation (Amtrak) for use in intercity rail transportation.

Intercity rail transportation means transportation provided by Amtrak.

Light rail means a streetcar-type vehicle railway operated on city streets, semi-private rights-of-way, or exclusive private rights-of-way. Service may be provided by step-entry vehicles or by level-boarding.

New vehicle means a vehicle which is offered for sale or lease after manufacture without any prior use.

Over-the-road bus means a vehicle characterized by an elevated passenger deck located over a baggage compartment.

Rapid rail means a subway-type transit vehicle railway operated on exclusive private rights-of-way with high-level platform stations. Rapid rail may also operate on elevated or at-grade level track separated from other traffic.

Remanufactured vehicle means a vehicle which has been structurally restored and has had new or rebuilt major components installed to extend its service life.

Specified public transportation means transportation by bus, rail, or any other conveyance (other than aircraft) provided by a private entity to the general public, with general or special service (including charter service) on a regular and continuing basis.

Tram means any of several types of motor vehicles consisting of a tractor unit, with or without passenger accommodations, and one or more passenger trailer units, including but not limited to vehicles providing shuttle service to remote parking areas, between hotels and

other public accommodations, and between and within amusement parks and other recreation areas.

Used vehicle means a vehicle with prior use.

The definitions in this section are consistent with the definitions included in the DOT final rule. This set of definitions, however, does not include some terms which are included in the DOT rule, primarily those which concern operational issues not addressed by the guidelines. Notice that the term "accessible" means compliance with the provisions of the guidelines (or the DOT standards in 49 CFR Part 38) which includes any determinations of equivalent facilitation.

§1192.4 Miscellaneous instructions.

(a) Dimensional conventions. Dimensions that are not noted as minimum or maximum are absolute.

(b) Dimensional tolerances. All dimensions are subject to conventional engineering tolerances for material properties and field conditions, including normal anticipated wear not exceeding accepted industry-wide standards and practices.

(c) Notes. The text of these guidelines does not contain notes or footnotes. Additional information, explanations, and advisory materials are located in the Appendix.

(d) General terminology. The terms used in this part shall have the following meanings:

(1) *Comply with* means meet one or more specification of these guidelines.

(2) *If, or if...then* denotes a specification that applies only when the conditions described are present.

(3) *May* denotes an option or alternative.

(4) *Shall* denotes a mandatory specification or requirement.

(5) *Should* denotes an advisory specification or recommendation and is used only in the appendix to this part.

This section contains several provisions designed to reduce some confusion which became evident in the responses to the original proposal. It contains miscellaneous instructions, including dimensional conventions and tolerances, and general terminology. An appendix was also added to the final guidelines that contains additional information, explanations, and advisory materials. That material is summarized in the discussion sections of this document, where appropriate.

With respect to dimensional tolerances, certain materials expand or contract due to variations in temperature or during the process of "curing" or drying. As a result, even close tolerances during construction or manufacture cannot ensure continued conformance to a given standard. For example, a cable-driven historic inclined system has been modified to be generally accessible. However, the cable is subject to uncontrollable stretching during the day, especially in hot weather. The cars generally provide level entry in the morning, but may be significantly out of alignment by the end of the day. Such variation, even in a new system, resulting from material variations beyond the control of the operator would not be deemed in violation of the guidelines. Furthermore, unlike buildings and facilities which are essentially stationary objects, vehicles move and have dynamic as well as static "envelopes". Springs lose their elasticity, steel rails and wheels wear down, and supposedly "fixed" objects settle due to dynamic stress. The allowance for normal wear, however, is only to be applied in accordance with accepted industry standards and practices, not simply an agency policy. If the industry, including designers, engineers, manufacturers, operators, and recognized professional associations agree that a specific adherence can be achieved above that allowed by an agency policy or practice, it is the industry standard which is to be applied, not the agency policy.

Reliance on dimensional tolerances, however, is not an excuse for improper or deferred maintenance, or poor design or construction methods. For example, the claim of "dimensional tolerances" could not be made for a lift which fails to meet the vehicle floor within the limits specified in these guidelines, simply because an adjustment which could have been reasonably made to a control system or limit switch was not made. Neither could a rail operator be excused from compliance because it accepted vehicles from a manufacturer which did not meet the operator's bid specification. Nor could a group of manufacturers, operators or designers, for example, simply get together to adopt a lower "standard" solely for the purpose of relaxing compliance. Such a change would need to be acknowledged by a significant segment of the industry to constitute an "accepted industry standard or practice." Moreover, dimensional tolerances apply to the construction, manufacture or operation of a system, not to the design. An entity cannot issue vehicle specifications which are less stringent than those required by the guidelines; nor could it justify a wider horizontal gap as being within dimensional tolerances because it did not specify its vehicles to be within achievable limits for sway or stability.

Subpart H – Other Vehicles and Systems

§1192.171 General.

(a) New, used and remanufactured vehicles and conveyances for systems not covered by other subparts of this part, to be considered accessible by regulations issued by the Department of Transportation in 49 CFR Part 37, shall comply with this subpart.

The Americans with Disabilities Act (ADA) requires new or used vehicles that are purchased or leased after August 25, 1990, to be accessible. Vehicles that are remanufactured after this date to extend their usable life for 5 years or more in the case of rapid rail and light rail and 10 years or more in the case of commuter rail and intercity rail are also required to be accessible. On October 4, 1990, DOT issued an interim set of requirements for such vehicles.

The guidelines discussed in this technical assistance document are substantively identical to standards issued by DOT on September 6, 1991, at 49 CFR Part 38 which replace the interim rules. The DOT rule at 49 CFR Part 37 further outlines the applicability and effective dates of these requirements. Questions as to whether certain vehicles are subject to these standards and specific effective dates should be directed to DOT.

(b) If portions of the vehicle or conveyance are modified in a way that affects or could affect accessibility, each such portion shall comply, to the extent practicable, with the applicable provisions of this subpart. This provision does not require that inaccessible vehicles be retrofitted with lifts, ramps or other boarding devices.

This provision is similar to existing requirements of all common accessibility codes and should be viewed as an "opportunity" clause. That is, when modifications are made for any reason, the opportunity should be explored to provide the maximum access feasible. When a vehicle is modified, each element that is part of the modification must be brought into compliance with the applicable sections of these requirements where practicable. For example, if a vehicle's floor is resurfaced and its electrical system rewired, the new floor surface should be slip resistant at aisles and areas used by standees and mobility aid users. If existing audible signals are replaced or rewired, the installation of audible and visual door signals would also be required as part of the modification project. The intent of this provision is to ensure that elements of a vehicle will be made accessible when the opportunity to do so exists in the regular course of modifying or upgrading vehicles. However, those elements of the vehicle not affected by the modification plan would not have to be brought into conformance with these requirements. Under any modification plan, the installation of a bridge plate or other boarding device is not required, even if the entrance of a vehicle is modified.

(c) Requirements for vehicles and systems not covered by this part shall be determined on a case-by-case basis by the Department of Transportation in consultation with the U. S. Architectural and Transportation Barriers Compliance Board (Access Board).

This provision does not pertain to high-speed rail or monorail systems but to those types of vehicles or systems that cannot be easily classified under any of the transit modes defined by the guidelines. Examples might include the Johnstown or Mongahela inclines, skyways and cable drive aerial tramways, and future systems with designs or operational features based on new technologies. DOT, in consultation with the Access Board, will determine which requirements apply to such vehicles or systems on a case-by-case basis.

§1192.175 High-speed rail cars, monorails and systems.

(a) All cars for high-speed rail systems, including but not limited to those using "maglev" or high speed steel-wheel-on-steel-rail technology, and monorail systems operating primarily on dedicated rail (i.e., not used by freight trains) or guideway, in which stations are constructed in accordance with subpart C of 49 CFR Part 37, shall be designed for high-platform, level boarding and shall comply with §1192.111(a) for each type of car which is similar to intercity rail, §§1192.111(d), 1192.113(a) through (c) and (e), 1192.115(a) and (b), 1192.117(a) and (b), 1192.121 through 1192.123, 1192.125(d), and 1192.127 (if applicable). The design of cars shall be coordinated with the boarding platform design such that the horizontal gap between a car door at rest and the platform shall be no greater than 3 inches and the height of the car floor shall be within plus or minus 5/8 inch of the platform height under all normal passenger load conditions. Vertical alignment may be accomplished by car air suspension or other suitable means of meeting the requirement. All doorways shall have, when the door is open, at least 2 footcandles of illumination measured on the door threshold.

Paragraph (a) specifically applies certain requirements for intercity rail systems (subpart F) to high-speed rail cars, including those of monorail systems and those using "maglev" or steel-wheel-on-steel-rail technologies. The term "high-speed rail" applies to those systems with vehicles designed to travel at speeds in excess of those possible on other types of railroads (i.e., 150 mph). At the time these requirements were developed, no high-speed rail system had been constructed yet in the United States, but several systems were in various stages of planning by a variety of public and private entities. The systems being planned will generally be designed to operate only on dedicated track or special guideways since, in most cases, existing freight track is unsuitable for high-speed. Since the systems envisioned will not be affected by station platform set-back requirements needed along freight train lines, this section requires level boarding from high platforms. Except for certain specific provisions for seating capacity which

apply to intercity rail cars operated by the National Railroad Passenger Corporation (Amtrak), the ADA is explicit that all new vehicles be accessible. Therefore, suggestions from some operators that only the first and last cars in a train be accessible are precluded by the statute itself.

High-speed rail cars and monorail cars are closer in design to intercity rail cars than to the other types of rail cars covered by the Board's guidelines for transit vehicles and the planned service may have characteristics similar to intercity rail. Consequently, this section applies many of the requirements developed for intercity rail cars to high-speed rail and monorail cars. These requirements, which are reprinted below, include:

- o General requirements for new, used, and remanufactured rail cars (1192.111(a)), including requirements for single-level passenger coaches and food service cars, single-level dining and lounge cars, bi-level dining cars, bi-level lounge cars, and sleeper cars. This provision applies the requirements for these specific types of intercity rail cars to high-speed rail cars of the same nature. For example, bi-level dining cars on a high-speed rail system would be subject to the requirements for intercity bi-level dining cars contained in section 1192.111(a)(3). (Since high-speed rail systems are new in the United States, requirements for existing or retrofitted cars have not been referenced.)
- o Requirements for the minimum number of wheelchair or mobility aid seating and storage locations (1192.111(d)).
- o Requirements for entrances, including the clear width of doorways (1192.113(a)), passageways leading to accessible seating (1192.113(b)), audible and visual signals at car entrances (1192.113(c)), and designation of accessible entrances (1192.113(e)).
- o Requirements for handrails within cars (1192.115(a) and (b)). Specifications for handrails at stepped entrances (1192.115(c)) are not referenced since high-speed rail systems must provide level boarding.
- o Requirements for steps, floors and thresholds (1192.117).
- o Requirements for public information systems (1192.121).
- o Requirements for restrooms, where provided (1192.123).
- o Requirements for wheelchair or mobility aid seating and storage spaces (1192.125(d)). Specifications for boarding devices such as lifts and ramps (1192.125(b) and (c)) have not been referenced since level boarding is required.
- o Requirements, where applicable, for sleeping compartments (1192.127).
In addition, paragraph (a) also requires that:
- o All cars be aligned with the boarding platform so that the horizontal gap does not exceed 3 inches and the vertical tolerance is within plus or minus 5/8 inches.

- o All doorways have, when the door is open, at least 2 footcandles of illumination measured on the threshold. This requirement, which is consistent with a similar provision applicable to intercity rail cars, is based on existing FTA requirements for other transit modes and pertains only to the interior lighting provided at entrances. While a maximum lighting level is not specified, it should be noted that high levels may increase the time necessary for the vision of exiting passengers to adjust to a darker, nighttime environment.

These requirements, as developed specifically for intercity rail cars, are reprinted below along with explanatory information on their application to high-speed rail and monorail systems. Additionally, the ADA contains certain provisions that are specific to intercity rail systems which do not apply to high-speed rail systems, monorail systems, or other systems addressed by this section. This manual explains how certain provisions intended for intercity rail cars may not apply to high-speed rail and monorail systems.

(b) All other high-speed rail cars shall comply with the similar provisions of subpart F of this part.

Paragraph (b) addresses those systems and elements in such systems which may incorporate designs or future technologies not specifically addressed by the specific car configurations in paragraph (a). Under this provision, the requirements for intercity rail cars or elements would be applied according to the design, technology, and other features of the system on a case-by-case basis. For example, conventional intercity rail dining cars do not have doors to the platform but are entered only from adjacent cars. A dining car in a high-speed rail system which had doors to the platform through a vestibule similar to a conventional coach car would be subject to the provisions for doors and vestibules otherwise applied to intercity rail coach cars. It is recommended that operators of such systems consult with the Access Board and the Department of Transportation for assistance in determining which requirements should be met with respect to a specific system.

Subpart F -- Intercity Rail Cars and Systems

[NOTE: Only those requirements applicable to high-speed rail and monorail systems are reprinted here along with a discussion that explains each requirement as it applies to high-speed and monorail systems. Persons interested in the full set of requirements for intercity rail cars should consult the manual for intercity rail systems (subpart F), which is also available from the Access Board.]

§1192.111 General.

(a) New, used and remanufactured intercity rail cars, to be considered accessible by regulations issued by the Department of Transportation in 49 CFR Part 37, shall comply with this subpart to the extent required for each type of car as specified below.

This provision, like section 1192.171(a), requires new or used rail cars that are purchased or leased after October 6, 1991, to comply with the specific technical requirements of this part. In addition, this section outlines requirements that are specific to different types of rail cars, including passenger coaches, food service cars, dining and lounge cars, and sleeper cars. Since it is conceivable that these types of cars may be provided in high-speed rail or monorail systems, this section has been applied to such systems. A chart outlining these requirements in relation to each type of car is provided at the end of this section on page 27.

While there is no specific section on bi-level coach cars, which are more commonly used in commuter rail systems, the ADA requires all new rail cars to be entered and used by persons with disabilities. Bi-level coach cars which can be entered directly from the station platform, as opposed to bi-level cars which can only be entered from an adjacent car, are subject to standards for single-level coaches pertaining to doors, passageways, steps and thresholds, etc. Accessible spaces should be provided on the level which can be directly accessed from the platform, usually the lower level.

(1) Single-level rail passenger coaches and food service cars (other than single-level dining cars) shall comply with §§1192.113 through 1192.123. Compliance with §1192.125 shall be required only to the extent necessary to meet the requirements of paragraph (d) of this section.

Single-level passenger coaches and food service cars must comply with all the requirements of this subpart except those of section 1192.127, which apply to sleeping compartments.

For the purposes of these guidelines and the determination of the minimum number of accessible seating and wheelchair storage locations, it should be noted that the term "food service car," defined as any car in which food or drink is served, includes dining and lounge

cars. Such cars, as discussed below, are required to provide at least one table for accessible seating and one wheelchair storage space.

(2) Single-level dining and lounge cars shall have at least one connecting doorway complying with §1192.113(a)(2), connected to a car accessible to persons using wheelchairs or mobility aids, and at least one space complying with §1192.125(d)(2) and (3), to provide table service to a person who wishes to remain in his or her wheelchair, and space to fold and store a wheelchair for a person who wishes to transfer to an existing seat.

This provision is tailored specifically to intercity rail single-level dining and lounge cars. These cars typically do not have entrances directly serving the platform and are entered from adjacent cars through end doors. The ADA requires that, unless not practical, intercity rail systems must have an accessible coach car adjacent to the end of the dining car so that individuals with disabilities can enter the coach car and go through the vestibule to the dining car. Consequently, this provision requires that at least one end door connected with an accessible car have a minimum clear opening width of 32 inches to the extent allowed by regulations issued under the Federal Railroad Safety Act of 1970.

With respect to high-speed and monorail systems, this provision applies only to single-level dining and lounge cars that are not entered directly from the boarding platform. If single-level dining and lounge cars are entered directly from the platform, those entrances would have to be accessible according to the requirements in section 1192.113 that are applied to high-speed rail and monorail systems in general. These requirements include: at least one entrance with 32 inches of clear width (1192.113(a)), accessible routes and passageways connecting the accessible entrances to accessible seating (1192.113(b)), audible and visual signals at car entrances (1192.113(c)), and designation of accessible entrances where not all entrances are accessible (1192.113(e)).

Based on the legislative history of the ADA, the Board strongly recommends that single-level dining and lounge cars also comply with those sections that apply to passenger coaches and food service cars, including requirements for interior circulation and hand rails (1192.115(a) and (b)), floor surfaces (1192.117(a)), and public information systems (1192.121).

(3) Bi-level dining cars shall comply with §§1192.113(a)(2), 1192.115(b), 1192.117(a), and 1192.121.

This provision addresses bi-level dining cars which, in intercity rail systems, can only be entered from the upper level of an adjacent bi-level car. (The lower level is occupied by food preparation equipment). The ADA does not require intercity bi-level dining cars to be wheelchair accessible. However, as explained in the legislative history, they must incorporate

accessibility features such as adequate doorway clearances (1192.113(a)(2)) and slip-resistant floor surfaces (1192.117(a)) for individuals with semi-ambulatory disabilities, and public information systems (1192.121) for individuals with hearing and vision impairments. It is also required that, where handrails and stanchions are provided, they "permit safe boarding, on-board circulation, seating and standing assistance, and alighting by persons with disabilities" (1192.115(b)). In addition, the Board strongly recommends that such handrails and stanchions meet the specifications for diameter and clearance (1192.115(a)). High-speed rail and monorail bi-level dining cars are subject to these same requirements provided they are of a similar design (i.e., entered only from the upper level of an adjacent bi-level car). Under section 1192.175(b), bi-level dining cars designed to provide dining services on the lower level and which have doors to the platform would be subject to the requirements for doorways (1192.113) as well as interior requirements for single-level dining cars in paragraph (2) above.

(4) Bi-level lounge cars shall have doors on the lower level, on each side of the car from which passengers board, complying with §1192.113, a restroom complying with §1192.123, and at least one space complying with §1192.125(d)(2) and (3) to provide table service to a person who wishes to remain in his or her wheelchair and space to fold and store a wheelchair for a person who wishes to transfer to an existing seat.

In intercity rail systems, bi-level lounge cars are often placed in trains with bi-level dining cars. The lower level of intercity lounge cars can be entered directly from the platform and usually provide restrooms and areas where drinks are served. The ADA requires that, whenever a new intercity bi-level lounge car is operated in conjunction with a bi-level dining car, table service be provided to persons with disabilities in the lower level of the lounge car essentially equivalent to that which other passengers could obtain in the dining car. Consequently, the bi-level lounge cars must have at least one entrance on the lower level and a passageway that is accessible (1192.113), an accessible restroom, if restrooms are provided for other members of the general public (1192.123), and wheelchair seating and storage requirements (1192.125(d)) on the lower level that are accessible from the accessible entrance. These requirements would also pertain to high-speed rail and monorail bi-level lounge cars.

In addition, it is also strongly recommended that bi-level lounge cars comply with the requirements for interior circulation (1192.115(a) and (b)), floors, steps and thresholds (1192.117), and public information systems (1192.121).

(5) Restrooms complying with §1192.123 shall be provided in single-level rail passenger coaches and food service cars adjacent to the accessible seating locations required by paragraph (d) of this section. Accessible restrooms are required in dining and lounge cars only if restrooms are provided for other passengers.

The ADA requires that single-level passenger coaches and food service cars in intercity rail systems provide at least one restroom that is accessible. This restroom must be located adjacent to spaces where wheelchairs may be positioned or stored. If restrooms are provided on high-speed rail or monorail coaches or food service cars, then at least one restroom must be accessible. Single-level dining cars, single-level lounge cars, and the lower level of bi-level lounge cars are required to provide wheelchair accessible restrooms only if restrooms are provided for all passengers.

(6) Sleeper cars shall comply with §§1192.113(b) through (d), 1192.115 through 1192.121, and 1192.125, and have at least one compartment which can be entered and used by a person using a wheelchair or mobility aid and complying with §1192.127.

Sleeper cars are fully subject to all sections applicable to high-speed rail and monorail cars except for those requirements pertaining to doorway (1192.113) and wheelchair seating and storage spaces (1192.125(d)). Although the section on restrooms is not referenced by this provision, the section on sleeping compartments (1192.127) requires that accessible compartments contain a restroom complying with 1192.123 which can be entered from the compartment. Section 1192.113(a) is not referenced because it relates directly to entrance doors adjacent to the spaces required by 1192.111(d) which are not included on sleeper cars in intercity rail systems. Nevertheless, the ADA makes it clear that sleeper cars must be able to be entered and used. Therefore, the platform entrance doors located closest to the accessible sleeping compartment should comply with 1192.113(a).

(d) Passenger coaches or food service cars shall have the number of spaces complying with §1192.125(d)(2) and the number of spaces complying with §1192.125(d)(3), as required by 49 CFR 37.91.

The ADA specifically addresses the number of wheelchair seating and storage locations required in intercity rail cars according to the length of trains.² Basically, under these

² 49 CFR 37.91 of the DOT rule is based on provisions of the ADA requiring that Amtrak trains provide a number of spaces for parking wheelchairs (for individuals who wish to remain in their wheelchairs) and a number of spaces for folding and storing wheelchairs (for individuals who wish to transfer to a seat) in single-level passenger coaches and food service cars equal to: (a) one half the number of coaches in the train by July 26, 1995; and (b) the total number of coaches in the train by July 26, 2000. No more than two wheelchair seating locations may be located in any passenger coach or food service car. This would allow some passenger and food service cars not to provide wheelchair seating locations or spaces if the total number required for the

requirements, not all passenger or food service cars need to have accessible wheelchair seating or storage locations as long as the overall total number required for the train is met. This was allowed, in part, to facilitate compliance with respect to existing intercity rail cars and to reduce the level of retrofit. By statutory definition those requirements apply only to rail service provided by Amtrak. This provision does not apply to high-speed rail or monorail systems which are new and can easily be designed so that each car contains an accessible seating and storage location. Consequently, each high-speed rail or monorail passenger or food service car must be accessible and have at least one wheelchair seating space (for individuals who wish to remain in their wheelchairs) and at least one wheelchair storage space (for individuals who wish to transfer to a seat) according to section 1192.125(d).

train were met (such as by providing two such seats or spaces in a car instead of one).

REQUIREMENTS FOR HIGH-SPEED RAIL AND MONORAIL CARS

	1192.113 Doorways	1192.115 Interior Circulation	1192.117 Floors, Steps & Thresholds	1192.121 Public Info. Systems	1192.123 Restrooms	1192.125(d) Wheelchair seating/ storage	1192.127 Sleeping Compartments	1192.175 Level Boarding & Lighting
Passenger & Food Service (single level)	full compliance except with (d)	compliance with (a) & (b) req'd.	full compliance	full compliance	full compliance if restroom provided for general public; req'd location near access. seating	at least 1 wheelchair space <u>and</u> 1 storage space	N/ A	full compliance
Dining & Lounge (single level)	full compliance except with (d) for doorways directly serving platform*	(recommend compliance of interior handrails (a) & (b))	(recommend compliance of floors (a))	(recommend full compliance)	full compliance if restroom is provided for general public	at least 1 wheelchair space <u>and</u> 1 storage space	N/ A	full compliance for doorways directly serving platform
Dining (bi-level)	full compliance except with (d) for doorways directly serving platform*	compliance with (b) for on- board cir. req'd; (recommend compliance with (a))	slip resistant floor surfaces as required by (a)	full compliance	full compliance if restroom is provided for general public	N/ A	N/ A	full compliance for doorways directly serving platform
Lounge (bi-level)	full compliance except with (d) (lower level doors only)	(recommend compliance with (a) & (b))	(recommend full compliance)	(recommend full compliance)	full compliance if restroom is provided for general public	at least 1 wheelchair space <u>and</u> 1 storage space	N/ A	full compliance
Sleeper	compliance with (b)-(c) req'd; (recommend compliance with (a))	compliance with (a) & (b) req'd.	full compliance	full compliance	full compliance for restroom serving compartment	N/ A	at least one compartment in full compliance	full compliance

* If doorways only connect with adjacent cars and do not lead directly to the platform, then at least one end door must provide at least 32 inches of clear width.

§1192.113 Doorways.

(a) Clear width. (1) At least one doorway, on each side of the car from which passengers board, of each car required to be accessible by §1192.111(a) and where the spaces required by §1192.111(d) are located, and at least one adjacent doorway into coach passenger compartments shall have a minimum clear opening width of 32 inches.

Only one entrance on each side of the car from which passengers board is required to provide a minimum clear opening of 32 inches. If boarding only occurs from one side, only that side is required to have an accessible door. Interior doorways into passenger compartments, which are common to intercity rail cars, must also provide 32 inches of clear width. Accessible seating locations should be located as close as possible to this compartment doorway. This will ensure that an accessible route is provided from the entrances on both sides of a car at one end to accessible seating locations, which are to be placed near the accessible entrances.

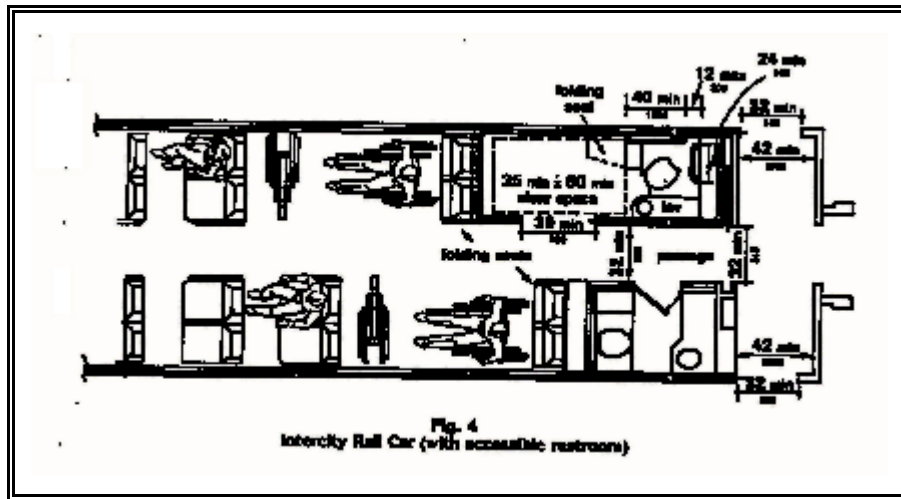
The 32-inch door width does not pertain solely to wheelchair or wheeled mobility aid users. Rather, the dimension is designed to accommodate the crutch-tip-to-crutch-tip distance for a typical crutch user. Also, the requirement is for a "clear opening." Providing a wide doorway with a vertical stanchion in the center does not meet this requirement. Obviously, accessible doorways and passageways are also needed in accessible sleeper cars.

(2) Doorways at ends of cars connecting two adjacent cars, to the maximum extent practicable in accordance with regulations issued under the Federal Railroad Safety Act of 1970 (49 CFR Parts 229 and 231), shall have a clear opening width of 32 inches to permit wheelchair and mobility aid users to enter into a single-level dining car, if available.

The 32-inch clear width is specified for end doors to ensure access between single-level coaches, food service cars, and dining cars. This provision also applies to bi-level rail cars, although such cars are usually entered on the upper level which is inaccessible to wheelchair and other mobility aid users. However, the ADA requires that bi-level intercity rail cars be accessible, though not necessarily for wheelchair users. Consequently, end doors located on the upper level of bi-level cars shall provide 32 inches of clear width since this width, as noted above, is based on the minimum space needed for crutch users and other persons who are semi-ambulatory, not just those who may use wheelchairs. This provision, including its application to bi-level cars, also applies to high-speed rail and monorail systems. However, if bi-level cars of such systems provide access between cars at the lower level, then the end doors on that level shall provide 32 inches of clear width.

This provision recognizes that the necessary structural modification in providing 32-inch end doors on new cars may conflict with safety requirements issued under the Railroad Safety Act of 1970. Consequently, this provision applies only where there is no conflict with these safety regulations. Where there is conflict, the end doors must provide the maximum clear width allowed.

(b) Passageway. Doorways required to be accessible by paragraph (a) of this section shall permit access by persons using mobility aids and shall have an unobstructed passageway at least 32 inches wide leading to an accessible sleeping compartment complying with §1192.127 or seating locations complying with §1192.125(d). In cars where such doorways require passage through a vestibule, such vestibule shall have a minimum width of 42 inches. (See Fig. 4)



This section, in conjunction with paragraph (a)(1), ensures that an accessible route is provided to accessible seating locations. Paragraph (a)(1) addresses entrances and doors that are located on such routes, while this provision covers passageways. Intercity rail cars with entrance vestibules typically have routes that require a right-angle turn into the compartment door. Due to the maneuvering involved, this provision requires that such vestibules be at least 42 inches wide so that enough clear space is provided for wheelchair and mobility aid users to negotiate such turns. The 42-inch dimension is based on existing accessibility standards for buildings and facilities and is considered the absolute minimum amount of space necessary for turns at doorways. This requirement would only apply to one vestibule for each car located at the same end where accessible entrances and compartment doors are located. Figure 4 illustrates these requirements.

(c) Signals. If doors to the platform close automatically or from a remote location, auditory and visual warning signals shall be provided to alert passengers of closing doors.

Audible signals usually activate before the doors begin to close and thus provide advance warning that the doors are about to close. Without visual signals, persons with hearing impairments are not afforded any equivalent advance warning and can only detect closings as the doors actually begin to close. According to information received during the development of these guidelines, the addition of audible and visual warning signals for

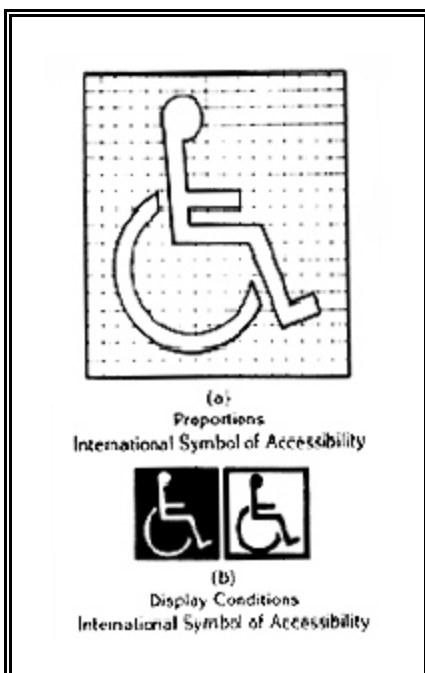
automatically-operated doors of new cars is feasible and represents only a modest cost increase for a chime, light and associated electrical controls at each doorway. These signals are not required to be provided on existing cars or those that are retrofitted. Since proposed requirements for door closing force and speed have been removed, the Board considers the provision of audible and visual indicators to be of even greater importance.

The term "passengers" means persons within the transit system including those who are on the train and those waiting to board. Therefore, warning signals must be visible from both inside and outside the car. This can be achieved by equipping the entrances of new cars with both an interior and exterior light indicator. Also, it is conceivable that a single light indicator, by either its illumination level, design, or placement may be specified so that it is visible both inside and outside the car. Either method of addressing this requirement is acceptable so long as it provides a visual warning that doors are about to close. Further, visual indicators should be synchronized with audible signals so that equivalent advance notification of door closure is provided to all persons, including those with hearing or visual impairments.

Notice that the requirement for audible and visual warning signals applies only to doors which close automatically or are closed from a remote location.

(d) Coordination with boarding platforms. - [Not applicable to high-speed rail or monorail systems; see section 1192.175(a).]

(e) Signage. **The International Symbol of Accessibility shall be displayed on the exterior of all doors complying with this section unless all cars and doors are accessible and are not marked by the access symbol. (See Fig. 6) Appropriate signage shall also indicate which accessible doors are adjacent to an accessible restroom, if applicable.**



Accessible entrances are required to be designated using the International Symbol of Accessibility (access symbol) shown in the figure below. This applies to those systems in which not all cars or doors are accessible. In fully accessible systems, designation of accessible entrances is not required nor recommended since the Board considers the access symbol to be at times subject to over-use. Above all, consistency is important so that if all cars are accessible, as should be the case in high-speed rail or monorail systems, then every car should either be designated or not designated by the access symbol.

Signage for accessible restrooms is also required. Since restrooms are not necessarily provided on all rail cars, signage must be placed at the entrance so that persons may determine before boarding which car offers an accessible restroom. This signage should be located at the accessible entrances closest to such restrooms or those accessible entrances one would be expected to use to reach the restrooms. Currently, there is no standard symbol or sign for indicating that an accessible restroom is provided at a certain location. The content of such signs are left to the discretion of operators. Such signs might include written information, such as "Accessible Restroom Available," and any appropriate or assistive symbols.

NOTE: The DOT regulation at 49 CFR 38.113 contains a typographical error in which this section is designated as "3" rather than "e."

§1192.115 Interior circulation, hand rails and stanchions.

(a) Where provided, hand rails or stanchions within the passenger compartment shall be placed to permit sufficient turning and maneuvering space for wheelchairs and other mobility aids to reach a seating location, complying with §1192.125(d), from an accessible entrance. The diameter or width of the gripping surface of interior handrails and stanchions shall be 1-1/4 inches to 1-1/2 inches or shall provide an equivalent gripping surface. Hand rails shall be placed to provide a minimum 1-1/2 inches knuckle clearance from the nearest adjacent surface.

This provision does not require hand rails or stanchions but stipulates that where they are provided, they must not obstruct the accessible route connecting accessible entrances to accessible seating locations. Handrails or stanchions cannot encroach upon the 32 inches of clear width for accessible routes or the 42 inches of clear width necessary for right-angle turns at vestibule doorways.

Most car handrails are made of pipe. In the building industry, pipe size typically specifies inside diameter so that a 1-1/2 inch pipe handrail actually has a larger outside diameter, sometimes up to 2 inches. Such handrails have not posed any known problem. Thus, the 1-1/2 inch diameter requirement can result in a handrail of approximately 2 inches under current building industry practices.

(b) Where provided, handrails and stanchions shall be sufficient to permit safe boarding, on-board circulation, seating and standing assistance, and alighting by persons with disabilities.

This provision is a general performance requirement in order to allow as many options as possible in the design of accessible cars.

§1192.117 Floors, steps and thresholds.

(a) Floor surfaces on aisles, step treads and areas where wheelchair and mobility aid users are to be accommodated shall be slip-resistant.

A specific measure, or static coefficient of friction, has not been specified for slip-resistance. Slip resistance is based on the frictional force necessary to keep a shoe heel or crutch tip from slipping on a walking surface under conditions likely to be found on the surface. While the dynamic coefficient of friction during walking varies in a complex and non-uniform way, the static coefficient of friction, which can be measured in several ways, provides a close approximation of the slip resistance of a surface. Contrary to popular belief, some slippage is necessary for walking, especially for persons with restricted gaits. A truly "non-slip" surface could not be negotiated.

The Occupational Safety and Health Administration recommends that walking surfaces have a static coefficient of friction of 0.5. A research project sponsored by the Board conducted tests with persons with disabilities and concluded that a higher coefficient of friction was needed by such persons. A static coefficient of friction of 0.6 is recommended for steps, floors, and lift platforms and 0.8 for ramps.

The coefficient of friction varies considerably due to the presence of contaminants, water, floor finishes, and other factors not under the control of transit providers and may be difficult to measure. Nevertheless, many common materials suitable for flooring are now labeled with information on the static coefficient of friction. While it may not be possible to compare one product directly with another, or to guarantee a constant measure, transit operators or car designers and manufacturers are encouraged to specify materials with appropriate values. As more products include information on slip resistance, improved

uniformity in measurement and specification is likely to develop. The Board has published a brochure, "Slip Resistant Surfaces," available at no cost, which provides additional information and advisory guidelines on slip resistant surfaces.

A variety of common materials used on transit vehicle floors can provide adequate slip resistance. Common rubberized matting may be slip resistant depending on the orientation of the grooves. Carpet is more variable depending on pile and weave and should probably be tested before it is specified.

(b) All step edges and thresholds shall have a band of color(s) running the full width of the step or threshold which contrasts from the step tread and riser or adjacent floor, either light-on-dark or dark-on-light.

The band of contrasting color required by this provision must span the full length of the threshold and steps along the nosing. However, a minimum width for the band itself is not specified. The Board recommends a minimum of three inches, although the actual size is left to the discretion of operators. While a minimum level of contrast for this band is not specified, it is recommended that the following formula be used in determining the contrast level:

$$\text{Contrast} = [(B_1 - B_2) / B_1] \times 100$$

where B_1 = light reflectance value (LRV) of the lighter area
and B_2 = light reflectance value (LRV) of the darker area.

Note that in any application both white and black are never absolute; thus, B_1 never equals 100 and B_2 is always greater than 0.

§1192.119 Lighting. - [Not applicable to high-speed rail or monorail systems; see section 1192.175(a).]

§1192.121 Public information system .

(a) Each car shall be equipped with a public address system permitting transportation system personnel, or recorded or digitized human speech messages, to announce stations and provide other passenger information. Alternative systems or devices which provide equivalent access are also permitted.

This provision requires cars to be equipped with a public address system that provides either recorded or digitized human speech messages or announcements made by drivers or other transit personnel. Digitized human speech uses spoken sounds and words arranged digitally and rearranged for customized messages. While other systems that provide equivalent access to information are permitted, the use of synthetic speech is not recommended. According to Board-sponsored research, synthetic speech, which is generated electronically, has not yet been proven to be as easily recognized or understood as recorded or digitized human speech. Information received by the Board during the development of these guidelines did not contradict this assessment.

(b) [Reserved]

These guidelines do not currently contain requirements or specifications for the provision of public information in a format that is accessible to persons with hearing impairments. Such a requirement has been reserved pending further study of the options that are available in making such information fully accessible; the Board expects to include some requirements in the future. However, general prohibitions of discrimination in the DOT rule require, in essence, that information necessary for the operation or use of a transit system be made available to persons with hearing impairments. Thus, it is recommended that the information for passengers contained in audible announcements also be made available to persons with hearing loss or who are deaf. Of course, announcements intended only for system personnel are not part of the information needed by passengers. DOT is assessing available and soon-to-be available technology during a study to be conducted during Fiscal Year 1992. Entities are encouraged to employ whatever services, signage or alternative systems or devices that provide equivalent access and are available.

Information can be provided in different ways, some of which are relatively simple and inexpensive. For example, one transit system has a policy of flashing interior train lights to indicate to passengers who are deaf that the train is malfunctioning and that all passengers must exit the train at the next station. Of course, the meaning of this signal must be conveyed in advance to potentially affected passengers for it to be useful and may not be useful to

persons unfamiliar with the system, such as tourists. A prominent sign in the vehicle also would be helpful. In general, such information should be included in the brochures and guides available to the public rather than only in a "special services" brochure intended for persons with disabilities. Access to some information may also be conveyed by a system of signage providing information routinely conveyed in announcements (e.g., no smoking, fares, hours of operation) while information provided in special announcements (e.g., changes in schedule, elevators not in service) could be posted in strategic areas, such as at entrances to the station or at information kiosks.

More sophisticated solutions could include visual display systems and electronic message boards. Visual display systems provide information through electronic message boards or video monitors and can accommodate persons who are deaf as well as those with hearing loss. Electronic message boards using a light emitting diode (LED) or "flip-dot" display are currently provided in some transit stations and terminals and may be usable in cars. One transit system is testing the feasibility of on-board visual displays for next-station announcements and even points of interest, news headlines and weather reports. Paid advertisements may be used to support the system. Such visual displays can supplement audio announcements. These devices may be used to provide real time or pre-programmed messages. However, real time message displays require the availability of an employee for keyboard entry of the information to be announced.

Video monitor systems, such as visual paging systems provided in some airports (e.g., Baltimore-Washington International Airport), are another alternative. The Board can provide technical assistance and information on these systems, including a free pamphlet, "Airport TDD Access: Two Case Studies."

Assistive listening systems may possibly provide another alternative although they benefit a narrower population of people with hearing loss. These types of systems are intended to augment standard public address and audio systems by providing signals which can be received directly by persons with special receivers or their own hearing aids and which eliminate or filter background noise. Magnetic induction loops, infra-red and radio frequency systems are types of listening systems which are appropriate for various applications. These systems, however, are not usable by persons who are deaf. Further, the feasibility and cost of installing such devices on cars remain uncertain. The Board has published a pamphlet,

"Assistive Listening Systems," available at no cost, which lists demonstration centers across the country where technical assistance can be obtained in selecting and installing appropriate systems. The state of New York has also adopted a detailed technical specification which may be useful.

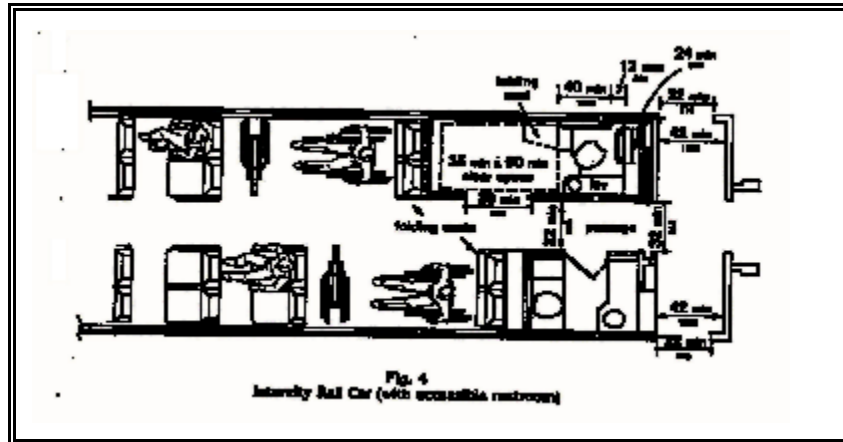
§1192.123 Restrooms.

(a) If a restroom is provided for the general public, and an accessible restroom is required by §1192.111(a) and (e), it shall be designed so as to allow a person using a wheelchair or mobility aid to enter and use such restroom as specified in paragraphs (a)(1) through (5) of this section.

This provision applies only to cars equipped with restrooms for the general public.

(1) The minimum clear floor area shall be 35 inches by 60 inches. Permanently installed fixtures may overlap this area a maximum of 6 inches, if the lowest portion of the fixture is a minimum of 9 inches above the floor, and may overlap a maximum of 19 inches, if the lowest portion of the fixture is a minimum of 29 inches above the floor. Fixtures shall not interfere with access to and use of the water closet. Fold-down or retractable seats or shelves may overlap the clear floor space at a lower height provided they can be easily folded up or moved out of the way.

This section outlines the absolute minimum amount of maneuvering space necessary and many mobility aid users will not be able to use such restrooms very easily. These dimensions have been required by previous DOT regulations since 1978. Permanently installed fixtures may overlap the 35 by 60 inch clear floor area so long as the specified toe and knee clearances are provided as noted. Figure 4 illustrates these requirements and those contained in the following provisions.



(2) The height of the water closet shall be 17 inches to 19 inches measured to the top of the toilet seat. Seats shall not be sprung to return to a lifted position.

(3) A grab bar at least 24 inches long shall be mounted behind the water closet, and a horizontal grab bar at least 40 inches long shall be mounted on at least one side wall, with one end not more than 12 inches from the back wall, at a height between 33 inches and 36 inches above the floor.

(4) Faucets and flush controls shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls shall be no greater than 5 lbf (22.2 N). Controls for flush valves shall be mounted no more than 44 inches above the floor.

(5) Doorways on the end of the enclosure, opposite the water closet, shall have a minimum clear opening width of 32 inches. Doorways on the side wall shall have a minimum clear opening width of 39 inches. Door latches and hardware shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.

A larger clear width is required at side doors to accommodate the greater maneuvering space required for turns through doorways. A clear width of 42 inches is preferable, and

generally considered essential at such doors, but in view of the confined space involved in a rail car, a clear width of 39 inches is allowed.

(b) Restrooms required to be accessible shall be in close proximity to at least one seating location for persons using mobility aids complying with §1192.125(d) and shall be connected to such a space by an unobstructed path having a minimum width of 32 inches.

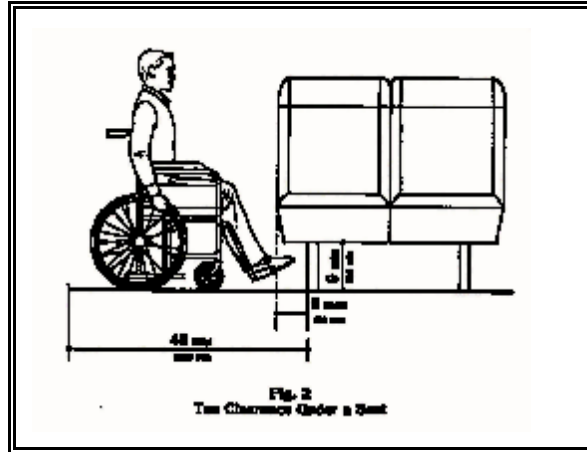
Restrooms are usually located at the ends of cars. Accessible seating locations should be provided at the same end. Under typical design configurations, the 32-inch wide route that must be provided to accessible seating locations would serve as the same route serving accessible restrooms.

§1192.125 Mobility aid accessibility. - [Requirements for level-change mechanisms or boarding devices (e.g., lift, ramp or bridge plate) complying with section 1192.125(b) or (c) do not apply since high-speed rail and monorail systems must provide level boarding; see section 1192.175(a).]

(d) Seating. - (1) Requirements. All intercity rail cars required to be accessible by §1192.111(a) and (e) of this subpart shall provide at least one, but not more than two, mobility aid seating location(s) complying with paragraph (d)(2) of this section; and at least one, but not more than two, seating location(s) complying with paragraph (d)(3) of this section which adjoin or overlap an accessible route with a minimum clear width of 32 inches.

This requirement and its statutory basis are discussed under section 1192.111(d).

(2) Wheelchair or mobility aid spaces. Spaces for persons who wish to remain in their wheelchairs or mobility aids shall have a minimum clear floor area 48 inches by 30 inches. Such space may have fold-down or removable seats for use when not occupied by a wheelchair or mobility aid user. (See Fig. 2)



(3) Other spaces. Spaces for individuals who wish to transfer shall include a regular coach seat or dining car booth or table seat and space to fold and store the passenger's wheelchair.

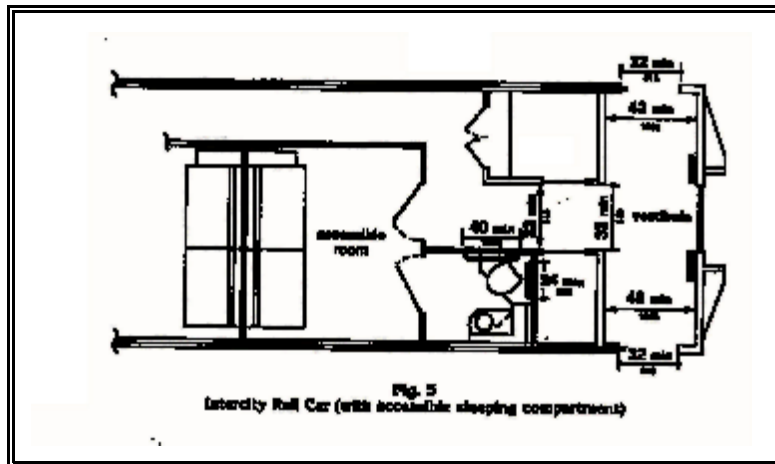
This provision is based on specific requirements in the statute for intercity rail cars but has also been applied to high-speed rail and monorail systems. Minimum dimensions for wheelchair storage spaces are not provided in part because of the various types of wheelchairs that must be accommodated. It is recommended that storage spaces be sized according to the typical dimensions of a standard folding wheelchair. Note that wheelchair or mobility aid securement devices are not required.

§1192.127 Sleeping compartments.

(a) Sleeping compartments required to be accessible shall be designed so as to allow a person using a wheelchair or mobility aid to enter, maneuver within and approach and use each element within such compartment. (See Fig. 5)

(b) Each accessible compartment shall contain a restroom complying with §1192.123(a) which can be entered directly from such compartment.

This restroom is not required to have the full 35 by 60 inch maneuvering space so long as this amount of clear space is provided in the adjoining sleeping compartment and a straight approach from the compartment to the water closet is provided. Under this configuration, a wheelchair user may exit the restroom by backing out through the door and into the maneuvering space provided in the sleeping compartment.



(c) Controls and operating mechanisms (e.g., heating and air conditioning controls, lighting controls, call buttons, electrical outlets, etc.) shall be mounted no more than 48 inches, and no less than 15 inches, above the floor and shall have a clear floor area directly in front a minimum of 30 inches by 48 inches. Controls and operating mechanisms shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.

The 15 to 48 inch mounting height range is derived from existing accessibility standards for building and facilities; these measurements are based on the lowest and highest frontal reaches determined for persons using wheelchairs.

This provision applies to permanently installed mechanisms and not to portable devices or accommodations, which are addressed by the DOT rule. Assistive equipment and accommodations, such as visual alarms, are considered "auxiliary aids," which are covered by DOT's rule, not these guidelines. Operators should be aware that even though such devices are not required when acquiring new cars, they may need to be provided under certain provisions contained in the DOT rule.