

Part 4

Facilities and Structural Considerations

— 2020 —

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SECTION 4.1 GENERAL INFORMATION

4.1.1 REGULATORY REQUIREMENTS (2020)

- a. Most passenger rail facilities are publicly funded at the federal, state, provincial or local level, or some combination of these. Stations funded via public private partnerships or even fully privately funded will also fall under certain governmental jurisdictions and guidelines / recommended practices. Hence there may be regulatory requirements regarding safety, hiring practices, material origin and manufactured goods sourcing “Buy America” requirements, local wage rate conformance, environmental regulations such as the National Environmental Protection Act (NEPA) regulations (see section 4.4 Environmental Requirements for more details), accessibility, land use and zoning such as the various Americans with Disabilities Act (ADA) requirements (see section 4.1.2 ADA Requirements for more details), and a host of other issues of which the designer, builder, operator, and owner should consider.

The source of the funding may also carry specific requirements contractual provisions in a grant agreement. As example, Federal Railroad Administration (FRA) and Federal Transit Administration (FTA) fund projects for stations and related rail infrastructure, yet each have individual requirements that must be followed.

One or a combination of these issues may significantly affect the design and project costs and generally are necessary as a condition of funding or operation.

A designer will be required to demonstrate familiarity with the applicable governmental regulations as part of the process. of being selected to design the facilities.

- b. Unlike the railroad related work on and immediately adjacent to the right of way, station design is subject to local regulation although elements of FRA and FTA regulations, such as platform elements and passenger information systems, will apply as well. Local zoning laws and ordinances will need to be evaluated to determine specific requirements that must be incorporated into the design of the station.
- c. The options of where a station may be located may be determined by the zoning laws, although most zoning rules have procedures for obtaining variances. Additionally, most of the local regulations will stipulate requirements for lot size, setbacks, vehicle access and control, signage, and illumination. Control of water runoff from the station will also need to be considered. As the local regulations can vary greatly, the station designer should investigate the local requirements as part of the conceptual site selection and design process.

4.1.2 ACCESSIBILITY REQUIREMENTS (2020)

The design of stations should provide convenient access for all passengers, including those with disabilities. This is good business practice as well as legally required by federal and state law and regulations. Examples of applicable regulations are the Americans with Disability Act (ADA) of 1990 and the Architectural Barriers Act of 1968 the Accessible Canada Act (Bill C-21 of 2019). Accessibility regulations are promulgated by the US Access Board and the Canadian Transportation Agency, subject to change, and designers must check the current regulations for current requirements. References to ADA requirements noted in this section are given to alert the designer of likely Accessibility-related issues, but are not intended to be a substitute for reference to current accessibility regulations. As In the United States, the accessibility regulations are subject to private law suits with treble damages under the Civil Rights Act. and have become more stringent over time, the designer should consider making provision for future incorporation of accessibility features such as high level boarding, covered walkways, elevators, and pedestrian bridges if not incorporated into the current design.

Additional information on accessibility issues related to facilities can be found at the United States Access Board's website on the topic of "ADA Standards for Transportation Facilities". The FTA currently requires that all cars within the train consist are fully accessible and that level boarding must be achieved at the door threshold

4.1.3 SUSTAINABILITY (2017)

Passenger stations and facilities offer an opportunity to introduce the concept of sustainable design. Energy efficient systems, recyclable materials and other measures can reduce both the initial capital costs and the long-term operating costs of the facility. Improved sustainable building design can be obtained using the LEED (Leadership in Energy Efficient Design) guidelines. Information on sustainable and LEED design can be found at the U.S. Green Building Council --- <http://www.usgbc.org>.

Stations should be designed with continuous changes in technology in mind. Cable trays should be accessible for installing new types of communication cable for antenna systems that support public communication and operation systems along with other possible interagency communication systems that might make use of radio towers and switch gear located at the station. Plumbing for public toilets should include a wall chase instead of wet wall to allow for easy access to piping without having to shut down restrooms to the public.

4.1.4 SAFETY AND SECURITY (2017)

When developing transit projects, it is important to identify elements that must be included in the design that address the overall safety and security of the facility, the employees and contents of the facilities. As an example on FTA funded projects, the FTA requires that the Grantee of funds for all eligible transit projects that receive a full funding grant agreement develop a project specific Safety and Security Management Plan (SSMP) as a part of the project's Project Management Plan (PMP). Requirements for the SSMP can be found in FTA Circular 5200.1A, Chapter II, Section 6, and is available on the FTA's website (www.FTA.DOT.gov).

For potential emergency response, unobstructed locations for ambulance loading and unloading may be included so that individuals suffering medical emergencies or a mass casualty event can be evacuated to the nearest treatment facility quickly without having to compete with pedestrian and vehicle traffic.

4.1.5 OWNERSHIP AND RESPONSIBILITY (2017)

It needs to be clearly determined and documented in legal agreements (memorandum of understanding or agreement) as to which entity actually "owns" the station facility and what entity(ies) has responsibility for the maintenance and/or upgrade of the various station components. This should be done regardless of who undertakes the construction of the facility or how it is funded.

This is especially important as regards the budgeting process for undertaking maintenance and administration of the operating station. Without this documentation in place it will soon be unclear as to who has what responsibility.

SECTION 4.2 PASSENGER FACILITIES

4.2.1 GENERAL (2020)

- a. The purpose of this section is to provide supplemental information related to the design of passenger stations and support facilities for developing new services or expanding or renovating existing systems.
- b. Additional design guidelines for rail passenger stations are in Chapters 6 and 14 of the AREMA Manual. All Manual Chapters should be considered in an integrated manner when developing criteria for a station design program.

The railroad owning and controlling the tracks and the party providing rail car maintenance may also have their own requirements that must be incorporated in the design program.

4.2.2 FUNCTIONAL REQUIREMENTS (2020)

- a. General Considerations

For commuter rail, the station complex typically includes a parking lot, platform(s), and sometimes a station building or shelters. Tickets are purchased on the train or through a vending machine or retail outlet. At larger stations, such as at a major terminal, having a ticket agent should be considered.

For intercity rail, a station building structure is usually provided. Unlike commuter rail, baggage handling is often provided at intercity rail stops. In addition, an enclosed heated waiting area is an expected amenity among intercity rail patrons because the train frequency may be low. A comfortable waiting facility is necessary to accommodate passengers, especially along the lines with low frequency. Other amenities, such as restrooms, phones, and food and beverage service of some sort, are typically provided.

For HSR operations, it is likely that the high speed trains would only stop at major city locations. Therefore, a complete station complex would generally be provided and would typically include all the elements of the intercity station noted above. In addition, it would be expected that a ticket agent would be available. Additionally, HSR trains that don't stop at stations may be passing through at very high speeds causing objects to be dislodged from the tracks or station walls. Additional attention should be given to anchoring objects such as sign boards to walls. Additional information on high speed rail is found in AREMA Manual Chapter 17.

Security needs to be considered at all stations. For stations open 24 hours per day, an additional consideration is the need to control loitering and allowing only persons using the train services within the station and on the station property.

- b. Station Interior Space Requirements

For commuter rail stations, space may include a waiting area, restrooms, and retail service. Ticketing services are optional since many commuter rail patrons purchase multi-ride tickets, or buy the ticket on the train. Fare collection is evolving and paperless ticketing in the form of Easy Pass, electronic transit pass, and other similar systems improve fare collection and access for passengers. On some systems, commuter rail station buildings are often only open during rush hour periods because of the expense of staffing and policing of the facility.

For intercity rail, the interior space requirements include ticketing, waiting areas, restrooms, and sometimes baggage, food and beverage service, as well as retail space. Details on waiting areas, concourses, ticketing, baggage, and restroom facilities are found in Chapters 6 and 14 of the AREMA Manual. Recommended station design criteria may also be established by the owner or operator of the train service and these criteria should be utilized as required.

To establish a 'brand identity', some systems may stipulate that a single "kit-of-parts" design be used repeatedly for a number of stations. The use of a single design will require that the rail operating entity identify existing, or develop in advance, the design criteria to be used for the "kit-of-parts" station. If multiple train operators share a station, integrated brand identity markings and directions should be developed so passengers can easily locate their rail operator's facilities.

For High-Speed Rail, the stations will likely be similar to conventional intercity rail stations except that there may be stricter platform access controls and wider circulation paths to expedite boarding to reduce station dwell time. There would be little difference in the interior except that there may be a separate waiting areas for the premium fare passengers to expedite boarding. Additional information on high-speed rail is in AREMA Manual Chapter 17.

c. Intermodal Interfaces

Many times, rail passengers need to connect with other transportation modes to complete their trip. Thus, stations should accommodate means for connection to other transportation options including rental cars, bus or transit services, taxi stands, car-hire apps, "kiss-n-ride", or transfer from express trains to a local or shuttle-type train and vice-versa. The bus mode requires locations for drop off and pick up. Sometimes the station can serve as both a bus and train station with combined ticketing and information services. Local buses may stop at the train station so that a transfer from bus to rail or rail to bus can take place. Chapter 6, Part 8 provides additional guidance on bus facilities.

d. Signage

Way-finding signage should be designed for the person who has never been at the station. Signage on platforms and in the station must be well thought out and well placed. A station name sign should be visible to a person seated on the train and be visible from every coach in the train. It is better to have too many station name signs than too few, but not so much as to create confusion, impair visibility, or affect safety and security.

Train information boards must employ a technology that allows for frequent updating of information. Station signage should also include local street map graphics and related transit and bus route maps so passengers can determine their transfer routes. For busy stations, the use of electronic message boards should be considered. Electronic signage can include detailed messages announcing delays, arrivals, departures, or schedule or track changes.

Interior signage should include exits accentuated with the names of streets that are associated with each exit. The interior signage should focus on directing passengers to the various exits and available transportation options. ADA compliant exits must also be identified, since not every exit may be accessible.

Signs should be made out of durable material that is tamper resistant. Signs, such as system maps and timetables that change often, should be produced on a medium that allows for frequent yet economical replacement or updating.

Illumination of signs should be considered. Illumination of standard signs needs to be considered as part of the integrated overall illumination design.

ADA requires tactile Braille signs. be included at stations as specified in the Code of Federal regulations.

e. Accessibility

Both new and renovated stations must be accessibility compliant. The costliest component of this is the required elevators that allow disabled passengers to use track over or under passes. The cost of accessibility compliance work to an existing station facility should be evaluated against the cost of a new facility.

Both new and renovated stations and vehicle floor-level station platforms must be designed to be accessible. The U.S. Code of Federal Regulations has different requirements for different types of rail service and the appropriate section of the Code should be consulted. The configuration and dimensions of the station platforms will be defined by the passenger cars using the station. If more than one type of car is used, the platform dimensions that are the least

4.2.3 BOARDING PLATFORMS (2020)

4.2.3.1 Platform Location

In planning a passenger station it is important to devise a coordinated arrangement between the track layout, platforms, and to provide facilities that result in passenger convenience, corporate identity, economy of operations, and long-term durability. A station platform is a structure or area adjacent to tracks for passenger to board or alight.. Design of the platform dimensional relationships to top of rail and centerline of track are dependent upon the type of passenger cars serving the station, state railroad clearance regulations, accessibility regulations for accommodating the disabled, and the host operating railroad's clearance requirements. Where different passenger railcar designs are operated, it may be necessary to have multiple platform configurations or multiple station tracks with differing platform dimensions to accommodate each type of railcar.

Platforms should be located on tangent track whenever possible in order to provide the train crew with a clear view of the passengers, and to allow the passengers a view of oncoming trains. When curved platforms are unavoidable, a limitation of 1°40' of curvature or one inch of superelevation is desirable. If curvature or elevation of the outside rail exceeds the criteria, alternative platform locations should be considered. Also, platforms should be located clear of switches and outside of controlled areas of an interlocking.

Other design considerations include:

- a. For commuter stations the length of platform should consider the peak train ridership and accommodate the longest routinely operated train length. In designing a platform layout, consideration for lengthening platforms at a future time should be made. For intercity stations, the platform length may be less than the full train length if multiple stops are acceptable. Public access to the platform(s) should generally be in the center third of the platform to reduce crowding upon exiting.
- b. For a high ridership stations with track level below or above the primary station floor level, combined platforms could be installed sufficient in length to permit stopping the passenger carrying cars in the center zone leaving the end zones clear for service vehicles. Passengers would reach or leave the platforms via ramps, stairways or escalators at the middle third of the platforms and service vehicles would reach or leave the platforms by elevators or ramps, at or near the platform ends.

- c. Platforms located between two tracks used exclusively for passengers should have a minimum width of 17 feet, which is sufficient to accommodate the passengers from one arriving train, one line of travel for passengers to a departing train, and a row of columns or platform furnishings in the center of the platform. This width will normally meet most requirements for through passenger train operation. Additional platform width may be required for terminal stations where an entire train discharges passengers simultaneously to the end of the platform. Regulations require a width of no less than six feet between the edge of the platform and the face of structures, columns, and furnishings to permit service carts and wheelchairs to safely pass.
- d. Platforms for small and medium size stations should be no less than 8 feet wide depending upon the passenger occupancy at peak times, platform fixtures, canopy supports, passenger shelters, signage, and other objects that impede passage of pedestrians and service vehicles. Regulations require a width of no less than six feet between the edge of the platform and the face of structures, columns, and furnishings to permit service carts and wheelchairs to safely pass. Platforms should slope away from the track edge to direct storm water away from the track and ballast section.
- e. Platform fencing and guardrails should be located along the back side of the platform where ever there is a vertical drop of 12 inches or more, where active railroad tracks are located behind a platform, where there is a sloped embankment, and/or at any location deemed a hazard to pedestrians. Care must be exercised to review state clearance regulations to insure that fencing does not impose a hazard to railroad employees performing switching or train inspection activities.
- f. Canopies should be considered for exposed platforms where adverse weather or extreme heat is a regular occurrence. If funds do not allow full platform coverage, then short sections of canopy or enclosed shelters should be considered at points where most passengers are expected to wait on the platform prior to boarding. Additional guidance can be found in Chapter 6, Part 8.
- g. Ramps are a preferred means for movement of passengers to and from station platforms if they can be so installed as not to increase materially the distance traveled by passengers, nor materially decrease the space on the station platform available for the accommodation of trains. Good results can be accomplished in many cases by the use of both stairways and ramps. Ramps are preferred over elevators from a maintenance perspective. Ramp slopes and configuration must comply with accessibility regulations; recommended slope is 1:12 with landings every 30 feet.
- h. Elevators are required for the use by disabled patrons and provide added convenience for all passengers. Elevators should be considered for any vertical change in excess of 15 feet. If only one elevator is installed, an alternate accessible path needs to be identified, perhaps under the supervision of an employee, to allow the disabled and mobility impaired to access the platform. If handling baggage carts and passengers on the same elevator, a "hospital cab" elevator should be considered.
- i. Ramps are the preferred means of providing vertical transportation for trucking (non-passenger) operations. The ramp surface should be finished with a non-slip material. The minimum clear width for trucking ramps designed to accommodate one line of traffic is 6 feet.
- j. Stairways should be a minimum of 48 inches wide using a maximum riser of 7 inches complying with accessibility rules and local code requirements. At non-terminal stations, arriving and departing passengers will often be using the stairways at the same time which necessitates double width or multiple stairs to handle the up and down flows simultaneously.
- k. Particularly at high ridership intercity stations, it is desirable that baggage trucks and service vehicles not ordinarily have to traverse or occupy platform space being used for the accommodation of passengers. Determination of the type of platform (i.e. combined or separate trucking and passenger) best suited to a particular situation is dependent upon the character and volume of the various kinds of traffic handled, the type of station (i.e. stub-end, run-through) the location and type of approaches to the platforms for the various kinds of traffic, the relation of the various approaches to each other, the relative lengths of platforms and trains, space available for station track and platform development, and the method of operation. Because there are many variables, the best arrangement can only be reached with a thorough study.
- l.

4.2.3.2 Disabled Access Requirements

The information in this Part is based on current United States regulations specified in the Americans with Disabilities Act (ADA). In Canada, the Accessible Canada Act of 2019 establishes similar requirements. Local jurisdictions may impose additional requirements as long as they are not less restrictive than the federal requirements. The access design requirements and guidance documents issued by the US Federal Railroad

Administration require level boarding to the greatest extent possible. Level boarding is defined in the Code of Federal Regulations as a maximum 10 inches on tangent track and 13 inches on curves and the vertical height of the car floor is no more than 5.5 inches above the boarding platform. Where the horizontal gap is more than 3 inches and/or the vertical gap is more than 5/8 inch, measured when the vehicle is at rest, the horizontal and vertical gaps between the car floor and the boarding platform must be mitigated by a bridge plate, ramp, or other appropriate device. Where freight service clearances preclude a platform height matching the car floor height, use of portable lifts on the station platform or a car-mounted lift is allowed. In those situations, the designer must meet with the responsible operating railroads and the Federal Railroad Administration to determine how best to serve the needs of all the users. Where new stations are constructed on existing railway lines, the designer should carefully review Section 37.42 of Title 49 of the US Code of Federal Regulations for guidance and applicability. The use of single "mini-high" platforms is no longer considered acceptable as all new railcars are required to be accessible and if open to passengers, then they should be open to the disabled as well. The use of public funds to construct new station facilities or alter existing facilities may require the owner/operator to upgrade those facilities to comply with the current accessibility regulations. Once constructed, the dimensional relationships between platform edge/surface to the top of rail and track centerline must be maintained to remain in compliance with the regulations. Tactile strips must be located along the edge of platforms adjacent to the tracks and at changes in elevation. If the accessible path crosses tracks at grade, flangeways may not exceed two inches in width and filler strips may be required.

4.2.3.4 Platform Dimensions (2020)

Platform heights above top of rail will be determined by the types of railroad cars operated through the station. Table 6-8-5 summarizes car types used in North America. This table is not all inclusive. New rail systems or new car procurements, especially if not interoperating with another passenger rail network, may adopt different car floor heights. Before designing any platforms, the rail equipment diagrams and the operating railroad structure clearance diagrams should be consulted. Distance from the centerline of track to the edge of platform will be established on a case by case basis depending upon the width of the passenger cars at the boarding door threshold, the operating railroad's clearance diagram, other equipment that must be operated on the station track, and the height of the platform surface above the top of rail. Platform lengths are determined by the nominal number of cars in trains, the level of patronage at the station, and whether checked baggage service is offered. The designer should specify a platform length that allows all the required activities to be performed with only one positioning of the train during a station stop. Platform lengths are based upon car length (nominally 85 feet), times the number of cars with a margin of 40 feet for braking. Actual platform lengths will vary according to site constraints and train operational requirements.

Platform Dimensions for Rolling Stock

Car Type/Manufacturer(s)	Platform Edge from C/L	Platform Height ATR	Car Floor ATR	Door Locations	Notes
Bombardier (UTDC Design) Car has three levels	5'-1" Note 2	0'-8"	2'-1" lowest level	Lowest level @ third points	Doors have exterior step at 17" ATR. Note 2
Kawasaki (LIRR) Car has three levels	5'-7"	4'-0" to 4'-3"	4'-2"	Ends above truck	Note 1
Kawasaki (MARC/VRE) Car has three levels	5'-1" 5'-7"	0'-8" 4'-0" to 4'-3"	4'-2"	Car ends with traps	Note 1
Single Level (multiple builders) Also includes heritage era cars	5'-1" 5'-7"	0'-8" 4'-0" to 4'-3"	4'-2" to 4'-3"	Car ends with traps	Some Bombardier and Alstom Comet series also have center doors. Note 1
New York area Single Level EMU	5'-7"	4'-0" to 4'-3"	4'-2" to 4'-3"	Quarter points	Note 1
Single Level EMU	5'-7"	4'-0" to 4'-3"	4'-2"	Quarter points	Hyundai-Rotem cars Note 1
Single Level EMU (Montreal, Shore Shore)	5'-1" 5'-7"	0'-8" 4'-0" to 4'-3"	4'-2" to 4'-3"	Car ends with traps	Some car series also have center doors. Note 1
Superliner, Surfliner, & Cal Car derivatives – NGEN 305 Spec. Car has two levels	5'-1"	0'-8"	1'-5"	Lowest level @ center or quarter points	Note 2
Gallery EMU (Chicago METRA)	5'-7"	4'-0"	4'-2"	Center and ends	
Gallery Cars (multiple builders and operators)	5'-1"	0'-8"	3'-10"	Center	
Amtrak single level (Amfleet, Horizon, Viewliner)	5'-1" 5'-7"	0'-8" 4'-0" to 4'-3"	4'-2"	Car ends with traps	
ACELA High Speed Trainset	5'-7"	4'-0"	4'-2"	Ends above truck	Doors are plug design – adequate clearance for door to move out and slide is required.
Siemens single level cars: Brightline, California (multi-state)	5'-7"	4'-0" to 4'-3"	4'-2"	At each car end	Note 4
TALGO Trainset	5'-1"	0'-8"	2'-3" to 2'-7"	At one end; on-board folding step	Articulated with carbody units approx. 43' long.
Stadler DMUs	TBD	25"	25"	Varies	Articulated trainset Note 2

Note 1: On tangent track in passenger only terminals with maximum allowable speed 20 mph or less, the platform edge from track C/L may be reduced from 5'-7" to 5'-4". Platforms on curves require specific study to accommodate car overhang, dynamic clearances, track superelevation, and vision sightlines. Refer to AREMA Chapter 28 and APTA SS-C&S-003-98 for guidance.

Note 2: Some operators are installing 17" or 25" ATR platforms where there are no freight operations.

Note 3: In all locations, the clearance rules of the operating railroad shall govern—this chart is for planning purposes only.

Note 4: Brightline has a retractable gap filler steps. Multi-state cars have traps for low platform boarding.

4.2.3.5 Platform Lighting and Signage (2020)

Platform lighting improves safety and security at station facilities. When platforms are properly illuminated it will enhance station safety as well as security. Passengers will perceive greater security when platforms are properly illuminated and such illumination will provide for increased safety of the passengers as they board and alight from trains. Additional guidance can be found in Chapter 6, Part 8.

4.2.3.6 Examples of Station Platforms (2020)

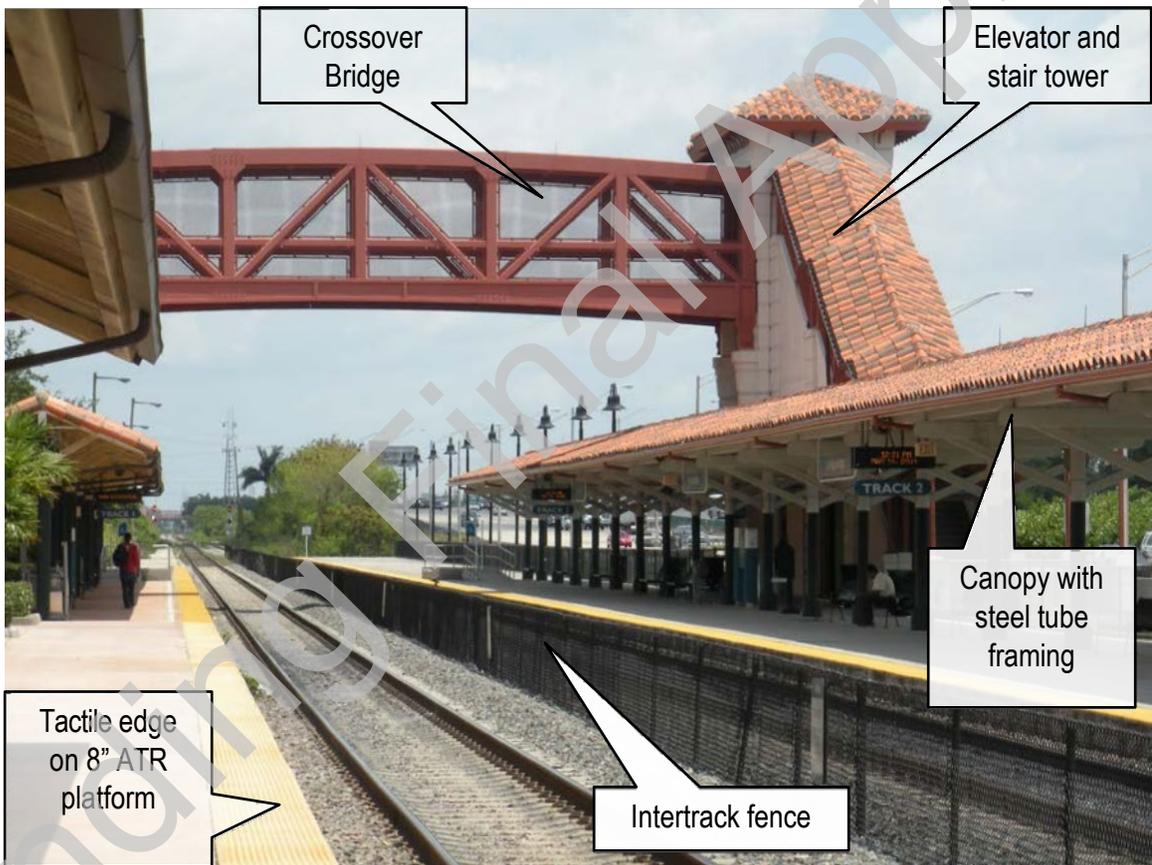


Figure 11-4-1. Low Level Platform 8" ATR height

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Figure 11-4-2. Commuter Passenger Station - Dual height platform for multiple styles of passenger cars



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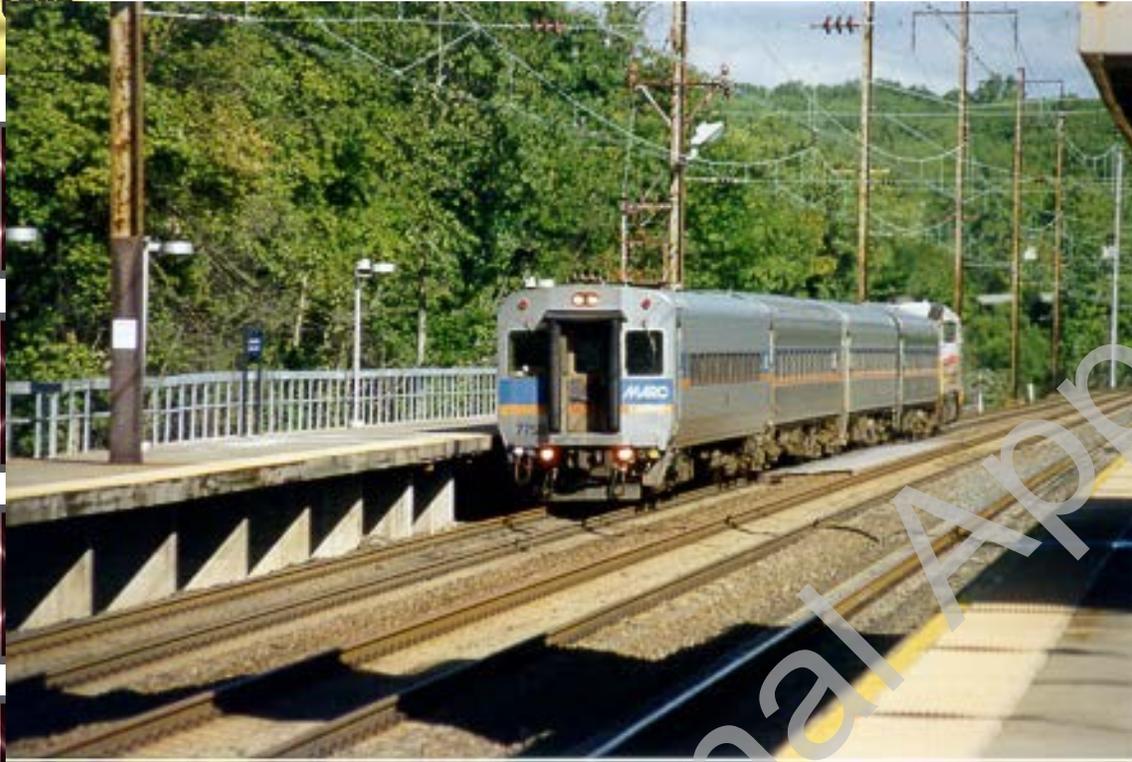
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11-4-3. Intercity and Commuter Passenger Station - Platform 50" ATR height

No changes to chapter
11 part 4 material
proposed beyond this
point.

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