NORTHSTAR CORRIDOR RAIL PROJECT

Design Criteria
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Minnesota Department of Transportation
in Cooperation with the
Northstar Corridor Development Authority
and the
Metropolitan Council

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Design Criteria

1.1 STATION DESIGN

1.1.1 Site Selection

Station sites have been identified in accordance with project goals. The stations have been spaced to maximize cost effectiveness for the Northstar system by ensuring train running times are competitive with driving times. Cities have been encouraged to consider taking advantage of the areas surrounding the stations to create community transportation centers with feeder bus, vans/van pools and taxi services. During PE, communities were encouraged to select sites based on a review of arterial access, feeder bus routes, employment centers and residential areas, master development plans and potential transit-related development.

Operational considerations, including train and automobile sight distance, ability of the location to accommodate additional tracks and site-specific train and passenger safety concerns are also important considerations in the site selection process.

1.1.2 Design Goals and Objectives

The following describes the design criteria for surface station site development including all circulation systems, hard surface elements, landscaping, and site amenities. The criteria are based upon standards related to vehicular and pedestrian circulation, visual aesthetics, urban development, civil and environmental engineering and systems maintenance. They are generally applicable to all stations. Unique site conditions and circumstances, however, may require design adjustments.

1.1.2.1 Site Development

Following are the primary goals and objectives for station development:

- Station sites and elements shall be readily identifiable, easy to understand and use, and accessible to everyone, including individuals with temporary or permanent disabilities.
- Station sites shall be designed to provide a safe, comfortable, and secure environment for all patrons, including protection from adverse weather conditions.
- Station site elements shall be interchangeable to the maximum extent possible.
- Station site development shall be designed for minimum environmental impact and most efficient use of resources with minimum disturbance of existing utilities.
- Station sites shall complement the character of their surroundings. Station sites shall be designed to take advantage of attractive, existing site features and be compatible with surrounding land uses and developmental patterns.
- Station sites shall accommodate the distinct spatial and operational requirements of various transit modes and intermodal exchanges.

- Station site elements shall be designed to accommodate the projected number of users for efficiency, safety, comfort and security.
- Station sites shall be designed to enhance surrounding land uses and foster joint development opportunities, where possible.

1.1.2.2 Circulation Systems

Typical station sites will include the facilities to accommodate the following intermodal transfers: pedestrian, bicycle, bus, automobile drop-off and pick-up and automobile park-and-ride. Each system will require different facilities and may serve a variety of roles depending upon the station location and program.

- A hierarchy established for the various circulation systems gives priority of access (including directness of route and proximity to the platforms) in the following order:
  (1) People who require accessible routes and/or facilities using any of the anticipated transportation modes.
  (2) Pedestrians and bicyclists.
  (3) Feeder buses (fixed route) and shuttles.
  (4) Taxi and automobile drop-off and pick-up facilities, including designated accessible parking spaces.. These spaces shall be located closest to the platform access points.
  (5) Automobile park-and-ride facilities (excluding designated accessible parking spaces).
- The Northstar system, including all structures and facilities, shall have a consistent, system-wide design character to provide visual and operational continuity. Site elements, including plantings and architectural components, shall be standardized and repeated whenever possible. Site layouts shall be similar as much as possible for clarity and efficiency.
- Each circulation stream in a station area shall be designed to accommodate the operation and accessibility requirements of other systems within and surrounding the station site.
- Station design shall feature amenities consistent with anticipated usage.
- Station areas shall be designed to discourage adverse impacts, such as noise, fumes, and traffic delays, on adjacent land uses. Additionally, station areas shall be designed to maximize rider safety and minimize the potential for criminal activity against people or property in the station area.
- To the maximum extent possible, each transportation mode operating in the station environment, shall have its own exclusive facilities and be separated from others as much as possible. Each shall provide safe, efficient and comfortable inter-modal transfer and passage. Track crossings shall be controlled and must be at existing public road ROW crossings or be grade separated. All at grade crossings must be equipped with automatic gates and signaling equipment.

1.1.2.3 Architectural Design

- Station facilities shall have a consistent, system-wide design maintaining functional similarity while varying as necessary to accommodate projected ridership for each station.
- Station facilities shall support patron circulation and ease of movement.
- Station facilities shall present an inviting physical and visual environment for patrons while ensuring the station materials, finishes and construction methods are durable and vandal resistant.
- Station facilities shall use similar architectural and functional elements in a consistent manner to provide consistent branding, legibility and functional clarity. Economic, safety and operational considerations also dictate the use of repetitive elements for the basic components of the stations and a degree of standardization.
- Station facilities shall be designed and constructed to minimize maintenance and repair requirements and be cost-effective to install.

1.1.2.4 Engineering Design

- Storm water, water, and sanitary sewer systems shall be designed to applicable state, local and other regulatory agency standards.
- Fire protection systems shall be installed consistent with state building codes and the requirements of the reviewing fire & life safety agency. As a minimum, each station area will have a minimum of one fire hydrant located in such a way as to ensure all platform areas are within 350 feet of a hydrant.
- Water hose bibbs shall provide for station platform wash-down.
- Storm water detention facilities shall be designed to provide water quality enhancements and control the rate of storm water runoff to predevelopment rates consistent to state and local watershed district requirements
- Storm water detention facilities design shall be coordinated with site layout and landscaping plans to create aesthetically pleasing sites which also provide habitat for wildlife. Such facilities must be set back a sufficient distance to not impact railroad grades or drainage. All storm drainage detention facilities must be accessible for maintenance.
- Utility systems shall be designed and constructed to minimize maintenance, met local requirements and be cost effective to install.

1.1.2.5 Landscape Architectural Design

- Landscaping shall be compatible with the intended commuter rail operations, station architecture, and graphics.
- No landscaping except turf grass and ground covers shall be permitted within 25 feet of the centerline of the nearest railroad track. Exemptions can be made for small-leaf trees separated from the tracks by intervening buildings.
- Landscaping must meet applicable Mn/DOT and county standards for site distance visibility at grade crossings.

- Landscaping in conjunction with hardscape elements such as curbs, seat walls and retaining walls shall help to control access to the station platforms and across the trackway by orienting and directing pedestrian and vehicular circulation.
- Landscaping shall be compatible with local climatic conditions and complement existing surroundings.
- Landscaping shall help to establish a cohesive visual identity for all the stations throughout the system and the trackway.
- Landscaping shall help to reduce the impact of unattractive surroundings and to provide privacy for adjacent land uses.
- Landscaping shall enhance attractive views.
- Landscaping shall be used in conjunction with storm water detention ponds to create wildlife habitat while aiding in controlling runoff and providing visual amenity while discouraging unauthorized access.
- Where possible, landscaping shall be designed to be consistent with Crime Prevention thru Environmental Design (CPED) principals.

1.1.2.6 Signage and Graphics

- Signage and graphics shall comply with the Site Development Goals and Objectives, ADA rules, AASHTO requirements, and the standards described in the Minnesota Manual on Uniform Traffic Control Devices.
- Signage and graphics shall offer transit patrons uniform (system-wide) and easily understood directions, warnings, and information.
- Signage and graphics elements shall visually complement one another.
- Signage and graphics elements shall employ or complement existing national and international standard designs.
- Signage and graphics elements shall assist persons with disabilities, non-English speakers, and non-readers in the use of the commuter rail facilities.

1.1.2.7 Lighting

The design shall provide lighting which is properly selected and located to achieve the required illumination levels in each area for safe, reliable and continuous operation of facilities, Lighting will also promote safety and comfort for all commuter rail patrons and employees.

- Design of lighting systems shall conform to the latest editions of all appropriate and applicable codes, local ordinances, regulations, standards, and recommendations, including the National Electrical Code, and the National Fire Protection Association (NFPA).
- Lighting shall be consistent with the site development goals and objectives.
- Lighting components shall complement station architecture and surrounding systems.
- Lighting shall help to define usage areas, entrances and exits, level changes, and passageways.

- Lighting shall not be at a height, direction or color that would produce glare or unsafe operating conditions for locomotive engineers.

1.1.2.8 Advertising

Provision shall be included in the station to allow advertising, including community information. It shall be designed to comply with the site development goals and objectives.

- Advertising shall occupy pre-determined locations, directed by the operator of the Northstar commuter rail system.
- The amount and extent of advertising shall be controlled exclusively by the operating entity.
- Advertising facilities shall not interfere with commuter rail operations or patron circulation or information systems.
- Advertising shall not be readily visible from the surrounding neighborhood.

1.1.2.9 Trackwork

Station design should attempt to minimize modification to the existing BNSF mainline track alignment. In the case where existing mainline track alignment must be modified, it will comply with BNSF track design standards. In particular, the BNSF standards for design of turnouts and typical track cross sections may be applicable to Northstar. The applicable portions of the BNSF standards are included as Section 3.0 of these design standards. Other elements of the BNSF standards, such as criteria for drainage along trackways, have been incorporated into the applicable sections of these standards.

In the event of a conflict between the various design standards, the following order of precedence shall prevail:

1. Legal requirements (Federal law or Minnesota Statutes)
2. BNSF standards
3. AREMA standards

Station design should follow all applicable AREMA and Burlington Northern Santa Fe (BNSF) standards, including but not limited to:

- Clearances on railroads and streets with regard to side and overhead structures, parallel tracks and crossings. The AREMA standards reference the Minnesota statutes governing rail clearances. This portion of the AREMA standards is included for reference within Section 3.0 of these standards.
- Warning devices at railroad grade crossings.
- Alterations of railroad grade crossings.
- Construction, reconstruction and maintenance of walkways, and control of vegetation adjacent to railroad tracks.

Where possible, revenue service track installed outside of BNSF ROW shall have the following minimum design standards.

- Curves shall be no tighter than 9.5 Degrees and designed for 20mph speeds.

- Turnouts shall be No. 9 or larger.
- Special trackwork shall be designed to be as compatible as possible with existing trackwork owned by Metro Transit to maximize the availability of repair parts, equipment and skilled labor.

Yard and storage tracks located off of BNSF ROW may follow AREMA standards for geometric layout.

2.1 STANDARDS AND CRITERIA

All facilities within the BNSF right of way (ROW) must be designed to meet BNSF standards. Facilities must also be designed to meet all applicable local, state, and federal laws, codes, and requirements including those of the Americans with Disabilities Act (ADA) and the National Fire Protection Association (NFPA). Facilities outside of BNSF ROW will generally follow applicable federal, state and local laws and be compatible with existing Metro Transit rail facilities and standards.

2.2.1 Station Platforms

2.2.1.1 Configuration

§ Side platforms: width 13 feet minimum, average 35 feet; length 425 feet minimum, with potential expansion to 600 feet.

§ Platforms are to be 8 inches above top of adjacent rail except as noted in 2.2.1.6 – Accessibility for Individuals with Disabilities.

2.2.1.2 Applicable Clearances

All station designs located in BNSF ROW must comply with BNSF clearance standards. In station areas located off the BNSF ROW, AREMA standards shall apply.

§ The track centerline shall be 5'- 4" from the edge of platform at the side of a station where train boarding is anticipated.

§ Fixed obstructions greater than 8" above top of rail shall be a minimum of 15 feet from track centerline except where an exemption is agreed to by BNSF.

§ Along the mainline, a minimum of 18 feet from track centerline to track centerline (double tracks) shall be maintained except where an exemption is granted by BNSF. In the station areas, a 15 foot center to center distance with inter-track fencing and concrete ties in the station areas extending 100 feet from the end of the platform shall be standard.

§ Maintain a minimum of 23 feet overhead clearance from top of rail to a fixed overhead obstruction.

The operating dynamic envelope of the locomotive and all coaches is to be clear of all posts, canopies, signs, handrails or other physical obstructions.

§ No landscaping except turf grass and ground covers is allowed within 25 feet of track centerline (exemptions can be made for small-leaf trees separated from the tracks by intervening buildings) and must not impede visibility at grade crossings. Provision must be made for removal of runoff from the track area.

- A walking surface is to be provided and maintained along both sides of every railroad track. It extends to a distance of 8 feet-6 inches from centerline of track. Maximum longitudinal slope is 5% (1:20).
- Any variance sought from state clearance regulations must be sought and secured by Northstar, with prior BNSF conditional approval if the clearance issue is on BNSF ROW.

2.2.1.3 Platform Surface and Edge

Platforms shall be designed for safety and operational efficiency.

- All platform surfaces are to include a 2-foot wide tactile warning strip located along the track-side edge, in accordance with ADA.
- A safety barrier must be provided along the platform edge opposite the track (backside of platform) when there is a grade difference. This barrier may consist of a fence or seating wall at least 30" high complying with the current ADA design requirements.
- Platforms should have level or ramped access points which meet all ADA criteria.
- Slopes should not exceed 5% (1:20). Stairs may be provided in addition to ramps, and shall conform to all applicable codes. New stairs shall be of concrete or concrete and steel construction.
- Platform surfaces should be impact- and slip-resistant.
- The platform should slope away from the track at a minimum 1% and no more than 2%. Water should drain away from the track area.

2.2.1.4 Shelters/Canopies/Windscreens

Shelters and canopies shall be provided to protect train and bus passengers and fare collection equipment from snow, wind, rain and sun.

- A portion of the area at each platform shall be fully enclosed to offer shelter in inclement weather. A minimum of one enclosed shelter shall be provided on each outbound platform, and a minimum of two such shelters shall be provided on each inbound platform.
- Canopy protection over the ticket vending machines (TVM) shall be placed in such a way that an 8-foot minimum distance in front of the machine is covered. Additionally both sides and the rear of the TVM shall be covered by a minimum of a 4 foot overhang. TVM canopies and machines shall be positioned so that the queuing direction is away from the tracks. In the case of a center platform, the queuing direction shall be parallel to the tracks.
- Rain gutters are required on each canopy. Roof canopies shall not drain onto the tracks or platform.
- Each enclosed shelter shall include at least one passenger-activated radiant electric heater.

2.2.1.5 Barriers/Fencing/Track Crossings

Fencing shall be provided between tracks to prohibit uncontrolled crossings.

Fencing shall continue at least 150 feet beyond the ends of the platforms except at controlled street crossings. The fence height shall be 6 feet and installed in accordance with BNSF standards when located in their ROW.

Track centers, where inter-track fencing is used, shall be a minimum of 15 feet unless a variance is approved by BNSF and the state.

At-grade pedestrian crossings of the tracks are allowed by BNSF only at controlled grade crossings on the mainline and are discouraged for all other tracks. At-grade pedestrian crossings shall be at the same elevation as the top of rail.

Pedestrian track crossings must be at least 10 feet wide. Appropriate safety controls (automatic gates, and signals) must be provided.

The number of pedestrian crossings between platforms shall be limited to one per station. In locations without an adjacent controlled intersection for pedestrian crossing, BNSF requires a grade-separated crossing. Grade separations, if required, may be either overpasses or underpasses at the discretion of the operator and BNSF.

Pedestrian grade separations of either configuration must be wheelchair accessible, by ramps with a maximum slope of 8.33% (1:12) if covered or 5 % if exposed, or by elevator.

Overpasses shall be built with a minimum clearance of 23 feet above top of rail. They are to have enclosed side walls (wire mesh, metal grill, or polycarbonate/glass composite panels) and shall not be lighted on the outside.

2.2.1.6 Accessibility for Individuals with Disabilities

All station platforms, building entrances and floor levels, shall be accessible to individuals with disabilities, according to ADA guidelines. FTA requirements for accessible boarding of commuter rail cars are rapidly evolving and the criteria are likely to change during the design of Northstar. The design team shall closely monitor the development of standards and shall coordinate with FTA to ensure that the final design is compliant with then-current regulations.

- Each side platform shall have at least one elevated accessible platform 1'-5" above the platform surface (i.e., 2'-1" above top of rail) to provide an accessible boarding route to trains. The center line of the accessible platform shall be located to line up with the second door of the cab car end of the train in all circumstances. Access to the platform shall be via at least one ramp with a maximum slope of 5% (1:20).
- At least one accessible path of travel shall be provided from the platform area nearest the railcar boarding ramp to the disabled parking spaces, the bus loading area and the passenger drop-off area. In addition, the path of travel connecting the inbound and outbound platforms (where applicable) shall be accessible.
- In all assembly places where seating is provided, spaces shall be included for wheelchair users in accordance with ADA requirements. In addition, seating suitable for individuals with ambulatory impairments shall be provided.

- All station site equipment and facilities including emergency and system information telephones, fire alarms and fare vending equipment are to be positioned and mounted according to ADA guidelines.

2.2.2 Station Facilities

Amenities for station sites include all the above-ground elements which are required for station operations and security such as site furnishings and communications devices. The following general design criteria apply to specialty items:

- Site amenities shall complement the overall design of the station site.
- Site amenities shall utilize durable, easy to maintain materials, finishes, and construction methods.
- Site amenities shall provide continuity and image consistency for the station sites.
- Site amenities shall not obstruct views or create areas of concealment.
- Site amenities shall conform to ADA and AASHTO guidelines where applicable.

2.2.2.1 Bicycle Storage

Facilities shall be provided to encourage the use of bicycles.

Bicycle storage facilities shall be designed and located to provide a secure, sturdy and convenient system for locking up bicycles. The number of bicycle storage facilities shall vary by station, according to anticipated ridership and spatial constraints, with a minimum 4 lockers and spaces for 10 bicycles in racks per station other than downtown Minneapolis. No bicycle parking is required at the Minneapolis station since it is expected to function as a destination rather than a starting point for most users.

2.2.2.2 Benches and Leaning Rails

Benches shall be provided on the platforms.

A bench capable of seating four or more people should be provided on each platform segment that is not occupied by a structure such as a shelter, TVM shelter, or accessible boarding ramp.

Benches shall be designed for easy maintenance and repair and be compatible with the station architecture.

2.2.2.3 Trash Receptacles

A minimum of two explosion-resistant receptacles per platform shall be provided.

All components of the trash receptacles shall be permanently attached or locked. They shall have removable metal liners.

2.2.2.4 Fare Collection

A proof-of-purchase fare collection system shall be employed with no turnstiles.

Each station will be equipped with a minimum of two ticket vending machines (TVM), and two ticket validators. Equipment shall be compatible with that currently being used by Metro Transit in their rail system.

TVM pads should generally match the slope of the surrounding platform except for the actual area where the machines are located which should be level to a minimum of 12 inches beyond the footprint of the machines. Queuing space must also be provided with at least 8 feet of cover in front of the machine for weather protection.

2.2.2.5 Electrical Service

Each station site shall have its own electrical service with metering located off the platform in an enclosure acceptable to the energy supplier.

2.2.2.6 Fire Protection

At least two fire hydrants are to be provided on site at each station, with one hydrant located near each end of the station on the vehicular-access side of the station. No hydrants are required on the remote side of any station (i.e., the side not accessible to vehicles) or on center platforms. Stations having significant structural components shall be equipped with standpipes in conformance with NFPA 130.

2.2.2.7 Water Service

- Two hose bibs, located at approximately 130 feet from each end of the platform, shall be provided at each platform. Together with provisions for a landscape irrigation system (see 2.2.10.8), an additional hose bib shall be supplied approximately one foot beyond the end of the platform furthest from the source for use as a blowoff for all landscape and wash down water lines.
- Water shall be provided in minimum 1" diameter pipe.
- Each station shall have an irrigation system for landscaping onsite.

2.2.2.8 Signage and Graphics

Signage and graphics are important functionally and aesthetically.

- One illuminated entry sign is to be provided at each vehicular entrance to the station site.
- At least one variable message sign is to be located on each station platform.
- Non-illuminated, post-and-blade signs are to be provided as required.
- Traffic control signs, pavement markings, and signals are to be provided as required.
- Signage and graphics shall be clear, consistent and attractive providing a consistent image and identity for the Northstar Line

2.2.2.9 Patron Information Center

A patron information center shall be provided in the vicinity of each fare vending area. These centers shall include the following:

- General information panel
- System map
- Vicinity map

2.2.2.10 Closed Circuit Television Cameras (CCTVs)

Closed-circuit televisions are to be used as a means of maintaining surveillance over station areas from monitors in central control facilities. These will be installed initially with coverage of the ticket vending areas and surrounding platform, however, provision for future expansion to cover the remainder of the platform and the parking lot areas will be provided.

In general, the station platform and location of ticket vending machines are to be within direct range of the initial CCTV camera installation.

Camera locations shall be coordinated with the location of other equipment such as lighting, Public Address System speakers and signage. The cameras should be visible to the public, but not readily accessible. The field view of cameras shall be adequately illuminated either by natural light or by luminaries.

2.2.2.11 Telephones

No public telephones will be provided at any station.

2.2.2.12 Monitor and Emergency Message Panels (EMP)

Monitor and Emergency Message Panels (EMP) as components of a Public Address/Variable Message Signs (PA/VMS) system shall be provided at each station.

2.2.2.13 Public Address/Variable Message Signs (PA/VMS)

The public address system (speakers and signs) shall be located a minimum of nine feet above the platform. The system shall convey information to persons with disabilities, in compliance with ADA guidelines.

The station design shall encompass Variable Message signs (VMS). Additional components may include strobe lights and audible alarms for emergency messages only.

2.2.2.14 Concessions

Concessions on the station platforms are prohibited.

2.2.2.15 Newspaper Vending Boxes

Each station site shall have one designated area for installing and securing newspaper vending boxes. Boxes shall not be allowed elsewhere on site, and particularly not allowed on platforms.

2.2.3 Structural Design

2.2.3.1 General

The structural design shall meet all applicable State of Minnesota general laws and regulations and the current editions of the codes, manuals, or specifications identified in this section. Where the requirements stipulated in any such document or by these criteria are in conflict the stricter shall govern.

For buildings and stations, the design shall meet all Occupational Safety and Health Act (OSHA) standards.

2.2.3.2 Building Codes

In all areas, the design for the construction of station facilities shall be in accordance with The International Building Code (IBC).

2.2.3.3 Grade Separation Requirements

Where access to the platform from parking is across a track, the crossing must be concrete and all aspects of its design will be subject to state and BNSF approval. Where signalized at-grade crossings are not feasible, a pedestrian grade separation below or above the track(s) is to be provided.

For a pedestrian overpass, a minimum vertical clearance of 23 feet, measured from the top of the rail to the underside of the elevated crossing, shall be maintained.

For pedestrian underpasses, the minimum vertical clearance shall be 10 feet measured from the tunnel floor to the underside of the ceiling, and the minimum width shall be 12 feet. BNSF requirements for clearance under tracks vary according to the underpass design, but shall be met for all sections within BNSF ROW.

2.2.4 Traffic Elements

2.2.4.1 Codes, Regulations and Standards

Stations shall conform to the requirements and standards listed herein. All traffic signals, signs, and striping shall be in accordance with the practices and requirements of the local jurisdiction. In the case where the local jurisdictions have no standards, the Manual on Uniform Traffic Control Devices shall be followed. Where the requirement stipulated in this document or any referenced sources are in conflict, the more strict requirement shall govern.

Applicable Codes and Standards include, but are not limited to:

- NEC — National Electrical Code

- NFPA 70 — (National Fire Protection Association), National Electrical Code
- NFPA 101 — Safety from Fire in Buildings and Structures
- NFPA 130 — Standard for Fixed Guideway Transit and Passenger Rail Systems
- Americans with Disabilities Act (ADA)
- Codes of Applicable Jurisdictions

2.2.4.2 Bus Parking Area

Bus parking areas include bus access drives and off-street parking areas or on-street bus stops and pull-outs, as well as adjacent sidewalks and waiting areas for passengers.

Bus parking areas and access should be clearly identified by signs visible from the station platform.

Concrete bus pads must be provided at bus parking areas. These pads shall be of a minimum thickness suitable for the type of bus projected to enter the facility.

Bus parking areas shall be illuminated according to the guidelines outlined in section 2.2.8.

Bus circulation should permit buses to receive and discharge passengers without blocking or interfering with auto circulation. Bus circulation routes should minimize interference with traffic entering or leaving parking areas. Curb radii within the station parking lot should be designed to accommodate buses.

Bus parking areas should receive maximum visibility.

2.2.4.3 Rider Drop-Off /Pickup Areas

Where feasible, private auto rider drop-off and pickup areas for shall be designed to accommodate at least 5 cars. A minimum 8-foot wide sidewalk shall be located adjacent to these areas.

Traffic in the drop-off / pickup areas shall be allowed to re-circulate (return to the drop-off and pick-up area) without leaving the station site.

The location and orientation of the drop-off / pickup areas should allow waiting drivers to clearly see the station platforms.

Drop-off / pickup areas shall be illuminated according to the requirements outlined in section 2.2.8.

2.2.4.4 Park-and-Ride Area

§ Where possible, new parking areas should be adjacent to stations. A preferred maximum of 1,200 feet from the most remote parking stall to the platform is highly desirable. Minimum distance from paved parking area to the center line of the nearest existing or future track shall be 25 feet. This setback may be increased by the railroad in areas with grade differentials. Multi-level parking structures may be constructed to meet commuter needs. Such a facility may accommodate both commuter and general use parking.

- The vehicular circulation systems within park-and-ride lots shall be designed to provide the clearest and most direct travel paths from the lot entrances to the parking spaces. In most cases this will mean that the parking facilities need to be organized into entrance drives, distribution aisles, and parking aisles.
- The entrance drives shall sort out traffic at the access points to the station sites and shall be free of any parking spaces or connections to parking aisles.
- The distribution aisles shall channel traffic to the parking aisles.
- Park-and-ride lots shall include accessible parking spaces in accordance with ADA requirements. These spaces shall be located so that they are close as possible to the station platforms and if possible the accessible boarding platform located at the cab-car end of the train.
- Park-and-ride lots shall be designed to provide the most direct walking paths from the parking spaces to the station platforms. In most cases this will mean that the aisles are laid out perpendicularly to the station platforms so that individuals walking to the platforms can walk down the drive aisles which should lead directly to the station platform.
- All interior parking rows shall be defined at their ends with raised islands.
- Park-and-ride areas shall be illuminated according to the requirements outlined in section 2.2.8.
- Fire lanes within the parking lot should be provided as required by code or ordinance to maintain unobstructed access for fire apparatus and emergency vehicles. Fire lanes shall be clearly identified "Fire Lane - No Parking" using pavement striping and/or appropriate signage. Locations of fire hydrants, standpipes, and other emergency equipment shall be in accordance with Section 2.2.2.6.
- All station parking areas should be paved with asphalt or concrete. Unpaved and gravel parking areas are not allowed.
- Curbs shall be provided at station parking areas.
- The station platform area shall be protected with landscaping, bollards, walls or other structure such that non-maintenance vehicles can not access the platform from the parking areas.

2.2.4.5 Wheel Stops

Parking areas shall not include wheel stops, except when necessary to protect other elements such as trees, fences, and light standards where standard curbs cannot serve the purpose.

Wheel stops may be used in conjunction with parking for individuals with disabilities.

2.2.4.6 Parking for Individuals with Disabilities

Accessible parking spaces shall be located as near as practical to a primary entrance to the platform. The spaces shall be located so that a person with disability does not have to wheel or walk behind parked cars other than his own. Pedestrian ways shall be provided so as to ensure an accessible pathway from each such parking space to the facility.

ADA guidelines shall be met for other factors such as signage, minimum dimensions of accessible spaces, slope of parking surfaces, and vertical clearances for parking structures.

2.2.4.7 Emergency Access

Emergency access for fire department and paramedic equipment and personnel shall conform with local fire and police department requirements.

2.2.4.8 Bicycles

Bicycles may use the circulation paths provided for vehicles and pedestrians at station facilities. Dedicated bike parking areas will be provided at each station with the exception of downtown Minneapolis. (See 2.2.2.1)

2.2.4.9 Pedestrian Access

Paved sidewalks and plazas with attendant site amenities shall be provided at each station site.

Pedestrian paths shall connect the on-site pedestrian origination points to the platform. Origination points may include bicycle parking areas, bus stops, automobile drop-off areas, and automobile park-and-ride areas. Location and size of paths shall encourage balanced platform access and egress.

Pedestrian paths shall be as short and direct as possible; they shall be free of obstructions, dead-ends, unnecessary turns, steps, and abrupt grade changes; and they shall allow for clear lines of sight to the platforms.

Pedestrian paths shall avoid crossing or passing through any rail tracks, vehicular access drives, and parking areas whenever possible. Where such crossings occur, they shall be identified with standard pavement markings and signs in conformance to ADA requirements. Potential unsafe crossing points, particularly adjacent to bus parking areas, shall be blocked with railings or shrubs. Track crossings shall be located as specified in 2.2.1.5, and railings shall be located along the track alignment adjacent to the platform and access walks to discourage pedestrians from crossing elsewhere.

Pedestrian paths shall be visible from on-site access drives and parking areas, as well as from adjacent streets.

Pedestrian paths shall be illuminated according to requirements outlined in sections 2.2.8.

The recommended width of pedestrian walkways shall be as shown in following table.

Type of Walkway	Preferred	Minimum
Track Crossings (pedestrian)	12 feet	10 feet
Walkways adjacent to bus parking	12-15 feet	8 feet
Walkways adjacent to park-and-ride facilities	8 feet	6 feet
Walkways in front of accessible parking spaces	12 feet	11 feet
Walkways adjacent to drop-off and ride facilities	8 feet	6 feet
Crosswalks	12 feet	10 feet
Pedestrian paths	8 feet	6 feet

Pedestrian paths, plazas, ramps and queuing areas shall be sized in accordance with the level-of-service capacity standards contained in Pedestrian Planning and Design by J. Fruin as they relate to the projected number of patrons during peak intervals of fifteen minutes (level of service C or better). Specifically, site elements, such as fare vending facilities, and adjacent paths and plazas shall be located and sized so that queues or areas of configuration do not block pedestrian flow.

- Pedestrian paths shall be uncolored concrete. The surface treatment shall be a brushed broom finish.
- Plaza pavement may be pre-cast, concrete pavers, or uncolored concrete.
- Crosswalks shall be marked and clearly visible to motorists.
- Warning signs or signals shall be provided at crossings of railroad tracks and adjacent roadways as specified in 2.2.1.5 for track crossings.

The following shall be incorporated into the design of all stairs and ramps:

- Maximum riser height — 7 inches
- Minimum tread width — 11 inches
- A cleaning trough 3 inches wide, flanking the stair treads and risers

2.2.4.11 Recommended Systems Dimensions

Bus Parking Area	Recommended Dimension
Single lane (one-way)	20’
Entrance drive (two-way)	27’ width
Entrance drive (left & right exits)	39’ width
Entrance radii @ intersection	30’ minimum radius
One-way travel lane with adjacent bus bay	28’ width
Two-way travel lanes with adjacent bus bay	38’ width
Turn-around	100’ diameter
Park-and-Ride Area	**Recommended Dimension**
Single lane (one-way)	16”
Entrance drive (two-way)	27’ width (single-lane, two-way) 39’ width (single-lane, w/ right turn lane)
Distribution aisles (two-way)	24’ width
Parking aisle (two-way)	24’ width
Parking space (90 degree)	9’ x 18’ where curb overhang occurs, or 9’ x 20’ where two spaces meet head-to-head
Accessible spaces	As per ADA guidelines
Drop-Off /Pickup Areas	**Recommended Dimension**
Entrance drive	27’ width (single-lane, two-way) 39’ width (single-lane, w/ right turn lane)
Distribution aisle	24’ width
Parking aisle	24’ width
Curbside parking space	8’ x 22’

Note: Roadway dimensions are measured from curb face to curb face

Recommended Grades

	Longitudinal Slope			Cross Slope		
	Min.	Preferred Max.	Absolute Max.	Min.	Preferred Max.	Absolute Max.
Access road-Automobiles only	1% (0.5%)*	4%	8%	0.5%	2-3%	5%
Buses and automobiles	1% (0.5%)*	3%	5%	0.5%	2-3%	5%
Approaches to access road intersection	1% (0.5%)*	2%	5%	0.5%	2%	5%

	Longitudinal Slope			Cross Slope		
	Min.	Preferred Max.	Absolute Max.	Min.	Preferred Max.	Absolute Max.
Parking/Stalls-automobile travel lane parallel to parked vehicle	1% (0.5)*	2%	5%	0.5%	2-3%	5%
ADA-accessible parking space			2% in any direction	—	—	—
Automobile travel lane perpendicular to parked vehicle	1% (0.5)*	3%	5%	—	—	—
Bus loading area	1% (0.5)*	1.5%	2%	0.5%	1.5%	2%
Pedestrian walkways	—	—	5%	0.5%	1.5%	2%
Pedestrian ramps	—	5%	8.33%	0.5%	2%	2%
Mowed slopes	2%		33%	—	—	—
Slopes with groundcover	2%		40%	—	—	—

*Allowable minimum slopes with cross slope 2% or greater.

2.2.4.12 Traffic Signals

Traffic signal designs and details shall conform to local agency standards and be approved by Mn/DOT.

Traffic signal indications shall be provided for each approach to an intersection at a minimum of two locations (on two poles).

Where left turns or right turns across the tracks are to be controlled by a traffic signal, a protected turn phase shall be provided.

Pedestrian capacity and control at station access and egress points shall be considered. Pedestrian traffic signals shall be provided at all signalized intersections and shall have Mn/DOT approval. All pedestrian signals shall display international symbols.

2.2.4.13 Striping

Striping details, including standard pavement marking, striping with markers, striping transitions and crosswalk details shall conform to the Minnesota MUTCD standard and ADA guidelines.

2.2.5 Trackwork

This section establishes the basic design criteria for commuter rail trackwork. BNSF engineering standards shall apply on mainline track and AREMA standards for all track located outside the BNSF ROW. In addition, all trackwork shall comply with the clearance standards contained in the Minnesota Statutes, Chapter 219.47. See Section 3.0.

2.2.5.1 Alignment

Changes to existing track alignment in BNSF ROW must be approved by BNSF.

2.2.5.2 Special Trackwork

Special trackwork includes fixed crossings, turnouts, and crossovers and must be coordinated with BNSF.

2.2.6 Right-of-Way

Right-of-way reflects the composite total requirement of all interests and uses of real property needed to construct, maintain, protect, and operate the system.

2.2.6.1 Ownership

BNSF owns the right of way for the majority of the track alignment and the station platforms. The BNSF will lease the necessary platform areas to NCDA as part of an overall agreement which includes track improvements and BNSF responsibilities for operation of the Northstar trains. A Minnesota public agency such as the NCDA, Mn/DOT, or Metro Transit will own the station areas, parking facilities, downtown trackwork and platform and the maintenance facility.

2.2.6.2 Right-of-Way Limits

Drawings shall indicate the limits of the railroad's right-of-way relative to the station's land requirements.

Any BNSF functions required in the station area, including maintenance roads and drainage ditches, shall be provided for in station design. Property required for stations shall include space needed for platforms, fare collection, waiting areas, stations' ancillary facilities, and structures, parking and circulation areas. In addition to the structural, mechanical, and electrical requirements for space, the requirements for pedestrian and vehicular circulation space shall be included.

2.2.7 Roads and Paving

2.2.7.1 General

Roadway design in public rights-of-way and for at-grade railroad crossings shall be in conformance with the specifications and design guidelines of the local jurisdiction, BNSF and/or Mn/DOT. Pavement structural cross sections shall be designed for a minimum 20-year life.

2.2.7.2 Roadway Dimensions

The number and type of traffic lanes (i.e., through, right or left) shall be determined in consultation with the applicable jurisdictions and Mn/DOT; based on a traffic analysis which considers projected traffic volumes, vehicle intersection crossings, critical traffic movements and geometric configurations. Lane configuration and signal timings shall, whenever possible, be designed to provide no worse than level of service D at signalized intersections in the P.M. peak hour during the year following completion of this project.

- All vehicular driving surfaces shall include a concrete curb and gutter unless otherwise requested by the local agency owning the ROW.
- The bus driveways and bus bays shall be concrete pavement, designed for bus axle loading standards and bus turning criteria.
- All at grade automobile driveways and parking areas shall be bituminous pavement.

2.2.7.3 Curb Cuts

The design and location of curb cuts and ramps shall be in accordance with the applicable provisions of the ADA and the local jurisdiction.

2.2.7.4 Pedestrian At-Grade Crossings

Pedestrian crossing shall be provided at all stations with at-grade track crossings and must be approved by Mn/DOT.

Typical warning devices include pedestrian gates across the sidewalk and crosswalk; bell and flashers for pedestrians; and a pedestrian traffic signal head. Installation of these devices shall comply with BNSF requirements, local standards, and have Mn/DOT approval. Additionally, a second train warning system may be provided on the main grade crossing near the platform to ensure pedestrians are aware of the

presence of a second train arriving when a stopped commuter train has the potential to screen the sound and visual indication to people who may try to cross.

2.2.7.5 Highway Safety Grade Crossing Devices

Highway grade-crossing warning devices shall be provided at all at-grade crossings around the station site. The equipment shall include flashing lights, gates and bells. Installation of these devices shall comply with BNSF requirements, local standards, and have Mn/DOT approval.

Additional gates (dual gates) and cantilevers may be required for multi-lane highways. Locations for the signal equipment should comply with BNSF requirements. Installation of these devices shall comply with BNSF requirements, local standards, and have Mn/DOT approval.

Advance warnings for pedestrians and preemption signals may be provided at selected locations. . Installation of these devices shall comply with BNSF requirements, local standards, and have Mn/DOT approval.

2.2.8 Drainage

2.2.8.1 General

Drainage systems shall be designed to meet applicable state and local codes except for urban sites.

Each site other than downtown Minneapolis shall utilize storm water detention ponds to manage storm water runoff as required by the local stormwater permitting authority. Such ponds and runoff may not be located on BNSF property.

2.2.8.2 Surface Drainage and Detention

Ground cover shall be provided to prevent soil erosion.

Surface water detention shall be provided to limit runoff to pre-development rates for the 10-year storm event frequency.

Water quality enhancement ponds shall be designed to Best Management Practices guidelines including MPCA requirements for a permanent erosion and sediment control plan.

Any new storm water flow generated by the project which flows towards BNSF tracks must be diverted to a storm water facility designed to a 25 year storm event frequency except where local topographic conditions make it infeasible. Existing flows outside of station areas may remain as is.

Ponds shall include a min. 1-foot freeboard at the 100-year storm event elevation and an emergency overflow at the 100-year elevation.

Storm water ponds shall include trash grates or skimmers at their normal outlet

2.2.8.3 Two-Cell Storm Water Ponds

Shallow water wetlands should be incorporated where feasible, in conjunction with storm water treatment ponds. Typically, the two-cell system includes a fore bay and permanent pool pond. General guidelines for the fore bay include:

- Depth 4 to 6 feet
- Separate the two cells using a berm, gabions or riprap
- Sized to hold at least 15% of the pond's required volume
- Outlets to the permanent pool pond
- Easy access for cleaning and maintenance

The permanent pool treatment pond should be designed with the following general guidelines:

- Depth 4 to 8 feet
- Basin shape should be approximately 3 times as long as it is wide
- Safety shelf should be provided and consist of a "bench" 10 feet wide with a 10% slope. The high side of the bench should be at normal water level for the pond.
- Emergent vegetation should be planted or allowed to become established on the safety shelf
- The shoreline should be planted with native grasses and forbs
- The surrounding upland should be landscaped with native shrubs, grasses and forbs for approximately 10 feet from the start of the pond slope.

2.2.8.4 Subsurface Drainage Systems

All storm water pipe shall be reinforced concrete pipe (RCP), a minimum of 12 inches diameter and 0.5% min. slope.

- Storm water pipe shall conform to Mn/DOT specifications and plates for construction
- Storm sewers within BNSF right-of-way shall be designed to a 25-year storm event frequency
- Storm sewer grates shall be bicycle safe when installed in any paved area or other locations where bikes may be reasonably expected to be in operation.
- Storm sewer catch basins shall be located away from pedestrian traffic where possible

2.2.9 Electrical & Lighting

2.2.9.1 General

Illumination levels shall define and differentiate between task areas, decision and transition points, and areas of potential hazard. In addition to quantity of light, it is essential that illumination be designed to minimize glare, including glare to train engineers, and provide uniform distribution.

- All site lighting shall be waterproof and vandal-resistant.
- Luminaries shall be standardized to maintain a uniform color and quality of illumination. Spot and flood lighting may be used to draw attention to specific site features.
- Lighting fixtures and poles shall be designed to provide ease of maintenance. Maximum combined height of pole and fixture shall be no more than 40 feet to permit servicing by a bucket truck; however, tower lighting may be considered for use in large parking areas.
- Luminaries shall be metal halide (MH) or high pressure sodium (HPS).

2.2.9.2 Vehicular Circulation Lighting

- Lighting poles shall be located generally along the parking barriers, within parking islands and/or the parking lot perimeter. The placement of poles shall present a minimum obstruction to movement and parking of cars.
- Security lighting shall be provided for parking lots, and entrance and exit roadways. Security lighting may utilize the same fixtures as for normal lighting.
- Special care shall be taken to accommodate local exterior lighting requirements and avoid "spill" light and objectionable glare which might affect adjacent properties and roadways.
- Illumination shall be provided for vehicular traffic areas within the station boundary lines. A hierarchy of lighting levels shall provide a natural lead-in to the bus loading/unloading, auto drop-off, and parking areas. The illumination on all access and egress roads shall be graduated up or down to the illumination of the "feeder" street or highway.

2.2.9.3 Pedestrian Circulation Lighting

- Pedestrian lighting shall be located along walkways and at crosswalks, stairs, ramps, and bicycle storage areas.
- Lighting of outdoor plazas, pedestrian walkways, and similar areas shall be accomplished by utilizing luminaries on low poles.

2.2.9.4 Emergency Lighting

- Emergency lighting shall be provided in accordance with NFPA 130. All public areas, including platforms, shall have emergency lighting.
- Emergency lighting for stairs shall be designed to emphasize illumination on the top and bottom steps and landings. Emergency lighting shall be in accordance with applicable portions of the Uniform Building Code (International Conference of Building Officials [ICBO]) and with all local requirements. Emergency lighting systems shall be installed and maintained in accordance with NFPA 70, Article 700 "Emergency Systems," and shall provide a minimum illuminance level of 1 foot candle measured at the walking surface.

Drop-off areas and parking lots do not need provision for emergency lighting.

2.2.9.5 Exit Sign Lights

- Station signs which indicate exits or routes to exits shall be provided as required by building codes. Such signs shall be internally illuminated. These signs shall be accordance with the Life Safety Code (NFPA 101) and OSHA regulations.

2.2.9.6 Lighting Control Systems

- All parking lot, illuminated signs, plaza, platform and walkway lighting will be controlled automatically by photocell and time-clock switches. A combination of photocell-ON/photocell-OFF and timer-ON/photocell-OFF/photocell-ON/timer-OFF will be used to control the lighting to coincide with commuter rail times of operation.
- Photocell-ON/Photocell-OFF control will be used for security lighting circuits. These circuits will be designed so that approximately 25 percent of normal platform, plaza, parking and roadway entrance lighting remains energized from dusk to dawn. Security lighting will provide the illumination required for proper security camera image capturing.
- Although not discussed in the PE documents, it may also be necessary to maintain this level of security lighting if not more (recommend 50%) for security lighting at underground passageways. Lighting would be controlled with a timer only for the tunnel and a night circuit wired for security lighting.
- Timer-ON/photocell-OFF/photocell-ON/timer-OFF control will be used for the remainder of exterior lighting to control lighting in conjunction with commuter rail operations.
- Time clocks will be provided with manual overrides.

Emergency Lighting

- All public areas, including platforms, tunnels, over passageways, elevator lobbies and stairs will have emergency lighting. Emergency battery units will be located in accordance with NFPA 70, Article 700 "Emergency Systems", and will be vandal proof and of NEMA 4 construction.
- Parking lots and roadways will not be provided with emergency lighting.

2.2.9.7 Illumination Levels

Minimum Illumination Levels Required During Hours of Station Operation [(2)]

Location	Minimum Average or Minimum Maintained	Foot-candles (fc)
Platform includes fare vending area	Average	4.0
Edge of platform	Minimum	2.0
Enclosed shelter	Average	7.0
Stairs, ramps and elevators	Average	15.0
Toilet, washrooms. depot buildings (not used)	Average	30.0
Parking area and pedestrian walkways	Average	2.0
Underground passage	Average	20.0 [(1)]
Elevator machine room	Average	20.0
Entrance and exit roads	Average	3.0
Passenger bus loading zones	Average	7.0
Outdoor plazas, bicycle stands	Average	5.0

(1) Original value of 30 fc was excessive. According to the IEC guidelines, the recommended average maintained illuminance for pedestrian tunnels is 4.3 fc. By reducing the value to 20 fc, the public is provided with safe levels of lighting.

(2) ASHRAE 2004 has a new exterior lighting section which includes specific lighting power limits for a variety of exterior applications. Illumination levels may require adjustment upon review of the new standard. The State of Minnesota has not adopted said standard as of present.

2.2.9.8 Electrical Materials

Conduit and Fittings

- Rigid metal conduit will be used in all exposed installations, and utility underground feeds.
- Flexible metal conduit will be used for final connection to motors.
- PVC conduit will be used in and below concrete slabs and below grade for installation which are concealed throughout.
- EMT will be used in all concealed dry above grade interior locations. EMT will not be installed in platform shelters.
- Expansion fittings shall be installed at all expansion joints.

Wires and Cables

- Wires and cables will be insulated copper, minimum #12 AWG.

Boxes and Enclosures

- Boxes and enclosures in exterior and/or wet areas will be NEMA 3R gasketed cast metal (stainless steel or aluminum). Enclosures for electrical and communication cabinets shall be painted green.
- Boxes and enclosures in damp locations will be NEMA 12.
- Boxes and fittings in dry finished areas will be NEMA 1.

2.2.9.9 Heaters

Infrared radiant heaters will be provided at each fully enclosed platform shelter. The heaters will be controlled with on-demand pushbutton stations. Additional control will be wired through an adjustable thermostat and off-delay relay to avoid energizing the heaters above a pre-set temperature. A time of day timer can also be installed to prevent the use of heaters during non-commuter rail operating times.

As an alternative, access to heaters could be managed by adding control to the motor operated doors to include an automatic locking mechanism through a time-of-day timer that would allow access into the shelters only during normal commuter rail operating times. Bypass key for the timer would be installed for Operations to access shelters during off-hours.

Location of the control box should be in the electrical cabinet to minimize the potential for vandalism.

2.2.10 Landscaping

Landscaping shall include plant materials (trees, shrubs, groundcover, turf grass and vines), mulch and irrigation systems.

2.2.10.1 General

- All plant materials shall conform to local codes and to the American Society of Nurserymen's standards for nursery stock and shall be nursery grown. In additional the following guidelines and standards shall be referenced: Bailey's Standard Encyclopedia of Horticulture and the Mn/DOT Standard Specifications for Construction, 1995 edition.
- Plantings within the areas encompassed by the commuter rail project shall include material suitable for the climate and United States Department of Agriculture Hardiness Zone 3.
- Landscape components shall be integrated with existing landscaping, where appropriate.
- Plant materials within the station areas shall be automatically irrigated, where appropriate.
- Plant materials may be used in conjunction with structures (fences and walls for example) and mounds for screening,
- Healthy, established trees, large shrubs and shrub masses, stands of native grasses and wildflowers of appropriate species shall be preserved whenever possible.
- Landscape components shall not impinge upon proposed commuter rail operations and vehicular or pedestrian ways, nor impede circulation and obstruct visibility. Plant materials except turf grass and ground covers are to maintain a minimum distance of 25 feet from the centerline of nearest track.

Trees are to be planted no closer than 25 feet. Exemptions can be made for small-leaf trees separated from the tracks by intervening buildings. Grade crossing visibility must also be provided.

- Landscape components shall not impede maintenance of or access to proposed transit facilities, track, utilities or existing structures.
- Landscape components shall not be of a character that may cause injury to users or damage to facilities.
- Selection, location, and maintenance of landscape material must be sensitive to security of patrons and be designed to maintain open and visually accessible station and platform paths.
- Landscape components shall require minimal maintenance and be drought resistant.
- Landscape components shall be accessible for maintenance and removal.
- Landscape components shall not interfere with existing or proposed lighting.

2.2.10.2 Plant Material Selection Criteria

Considerations for the selection of plant materials shall include:

- Initial cost
- Availability
- Attractiveness
- Growth rate, eventual size, and longevity
- Drought resistance
- Tolerance to wind, pollutants, and salt
- Hardiness
- Soil and drainage conditions
- Sun/shade preferences
- Maintenance characteristics
- Production of litter (due to wet tree leaves causing train wheels to slip and flatten, non-deciduous trees are recommended within 50' of rails.)
- Potential damage to adjacent paved areas by roots
- Attraction of rodents or insects

Plant materials shall not be selected which are unusually expensive, locally unavailable, or so exceptionally slow-growing to unduly delay the achievement of a mature effect.

Ground covers shall be spaced to provide complete coverage with two years of installation. Once established, no plant material should need excessive maintenance in order to contain it within its designated planting areas.

Native plant materials shall be given consideration wherever practicable in the selection of a planting palette especially in the creation of wildlife habitat in and around storm water detention basins.

Soil testing shall be done as necessary to ensure proper plant selection and soil amendment specification

2.2.10.3 Trees

- Trees shall be part of an existing street tree pattern, if any, or part of a street tree pattern established by the local governmental authority for adjoining areas. Where no pattern exists, an orderly pattern shall be established.
- Minimum caliper of deciduous shade trees located in paved pedestrian areas shall be 3 inches. Minimum caliper of deciduous trees in unpaved areas shall be 2 inches. Under story deciduous trees shall be 2 caliper inches or larger; and coniferous trees shall be 10 feet or taller.
- In paved areas, trees shall be planted in beds or with grates, as long as 300 cubic feet of planting soil at a depth of three feet per tree is maintained.

2.2.10.4 Shrubs

- Minimum shrub size shall be a 5 gallon container.

2.2.10.5 Ground Cover and Vines

- Minimum ground cover and vine size shall be a 1 gallon container.
- Ground cover may be used on slopes greater than 3:1.
- Vines may be used selectively to landscape vertical surfaces.

2.2.10.6 Turf grass

- Turf grass seed mixes shall be installed along the trackway to complement existing conditions and selectively within station areas.
- Grass shall be installed as sod and maintained as a lawn within the station areas.

2.2.10.7 Screening and Plant Massing

Station perimeter plantings may be located for screening, glare prevention and general landscape planting.

Parking areas shall be screened from adjacent buildings by walls, planting strips or changes in grade. Trees are to be planted with a clear trunk of at least 6 feet.

At stations with park-and-ride or major bus transfer facilities, trees shall be located (where practicable) around the perimeter and along the major pedestrian walks leading to the station platform.

Trees shall be planted in the parking row end islands or in areas specifically designed for planting. Entrances to stations may be emphasized by grouping trees in large masses. Trees shall be located, when possible, to provide useful shade in waiting, circulation, or parking areas.

Planting around storm water detention ponds shall be design to discourage unauthorized access to them and shall be in concentric rings with the species which are most resistant to inundation in the inner rings

2.2.10.8 Irrigation System

Plant materials within the station areas shall be watered by an automatically controlled irrigation system. The irrigation plans shall be developed in coordination with the station area landscape and architectural plans, as well as existing surrounding conditions.

- The irrigation system shall be capable of automatic or manual operation, with the piping, valves, wires, fittings, and sprinkler head installed below ground.
- Above-ground components, such as the control box, shall be located and installed to provide ready access for operation and maintenance, yet discourage vandalism and minimize visibility.
- The water source shall be the existing public water system.
- The system shall be designed to provide double coverage and to properly water various types of plants materials in zones or individually.
- Quick coupler valves shall be provided when appropriate at station sites and in park-and-ride lots for general maintenance and irrigation. The locations shall be coordinated to permit coverage with a 200 foot hose.

2.2.11 Materials

The following requirements have been established for finishes in public areas within the station site. While convenience, comfort, and attractiveness are to be considered in the selection and application of these finishes; safety, durability and economy are essential attributes that must be given priority.

2.2.11.1 General Requirements

Materials selected as finishes shall comply with the following:

Hazards from fire shall be reduced by using finish materials with minimum burning characteristics, smoke generation and toxic emissions consistent with Code requirements as noted in the Uniform Building Code (UBC).

Hazards from dislodgment due to temperature change, vibration, wind, seismic forces, aging, or other causes shall be reduced by using proper attachments and adequate bond strength.

The following static coefficient of friction as defined in ASTM C 1028 shall be provided as a minimum:

Area	Coefficient Of Friction
Public horizontal surfaces	0.6 per ADA
Non-public horizontal surfaces, exterior	0.6
Non-public horizontal surfaces, interior	0.5
Platform edge strips	Textured visually contrasting material conforming to ADA/ADAAG Section 4.29
Stairs, ramps, sloping sidewalks	0.8 per ADA
Area around equipment	0.6

The platform edge strip shall be electrically insulated. No grounded metallic surface shall be installed within five feet of the edge of the platform edge.

Materials shall exhibit excellent wear, strength, and weathering qualities with due regard for both initial and replacement costs. The materials must be colorfast and maintain their good appearance throughout their useful life.

Cleaning shall be facilitated and cleaning costs reduced by selecting materials that do not soil or stain easily, and by having surfaces that can be easily cleaned in a single operation with the use of standard equipment and cleaning agents.

Maintenance costs shall be minimized by using standardized materials that, if damaged, can be easily repaired or replaced without undue interference with the operation of the system.

Materials and details shall be provided that are difficult to deface, damage, and remove. Materials chosen should be able to resist impact caused by normal forces.

All surfaces exposed to the public shall be finished in such a manner that the results of casual vandalism can be readily removed or repaired with common maintenance techniques. Anti-graffiti coating shall be applied as necessary.

Units shall be large enough to reduce the number of joints, yet small enough to facilitate replacement if damaged. Monolithic materials may be used if they can be easily repaired without the repair being noticeable.

Selected materials shall be detailed and specified to be installed in accordance with industry standards and manufacturers printed directions for long life, low maintenance, and compliance with warranty requirements.

2.2.11.2 Palette of Acceptable and Non-acceptable Materials

Floor Materials

All floors shall be finished to provide a slip resistant surface.

Acceptable:

- Monolithic materials
  - Concrete, integrally-colored or uncolored
- Unit materials
  - Precast concrete pavers
  - Vinyl tile (in non-public areas only)
  - Granite
  - Manufactured stone

Non-acceptable:

- Monolithic materials
  - Synthetic resin toppings
  - Bituminous toppings
- Unit materials
  - Carpet
  - Wood products
  - Ceramic Tile

Platform Edge Strip

Pre-cast, integrally-colored concrete tiles with raised truncated domes, in contrasting color to adjoining platform surface color(s) and texture. Platform edge strips shall be the same throughout the entire commuter rail line.

Wall Materials

Acceptable:

- Monolithic materials
  - Form-finished concrete
  - Unfinished concrete (in non-public areas only and at heights of 8 feet of more above grade)
- Unit materials
  - Pre-glazed concrete masonry units
  - Glazed ceramic tile
  - Unglazed ceramic mosaic tile
  - Pre-cast concrete
  - Glazed and unglazed brick
  - Stainless Steel (Natural or Porcelain Finish)
  - Porcelain enamel
  - Stone
  - Glass
  - Anodized Aluminum Panels

Non-acceptable:

Monolithic materials
- Gypsum board (except in maintenance facility office areas.
- Paint (except in maintenance facility office areas.
- Vinyl wall coverings (except in non-public restroom)
- Synthetic plaster systems
- Unfinished concrete (as noted above)
- Unfinished metal

Unit materials
- Plastics
- Wood

Canopy Materials

Acceptable:

Monolithic materials
- Form finished concrete
- Exterior plaster

Unit materials
- Standing seam metal decking
- Translucent fiberglass panels

Non-acceptable:

Monolithic materials
- Sprayed acoustic materials
- Gypsum board

Unit materials
- Acoustic tile
- Wood

Canopy Structural Elements

Pre-finished metal or concrete

Stairs

Treads and risers: Solid granite, Cast-in-place or pre-cast concrete for all public stairs. Provide a textured warning strip at the top and bottom tread of all stairs.
Handrails: stainless steel, painted steel, or aluminum.

Guardrails

Steel with factory-applied, powder-coat finish, stainless steel, painted or wrought iron.

Windscreens

Stainless steel, painted steel, or pre-finished aluminum window wall systems with laminated glass, or solid glass blocks.

Benches and Leaning Rails

Bench base: Concrete, steel with factory-applied, powder-coat finish, or stone.
Bench seat: Exterior grade solid wood or steel with factory-applied, powder-coat finish.
Leaning rail: metal with factory applied, powder-coat finish.

Trash Receptacles

Metal with factory-applied, powder-coat finish, concrete or stone

Bicycle Storage Loops

Stainless steel or steel with factory-applied, powder-coat finish, integrally-colored HDPE (plastic) or reinforced fiberglass.