

**CRITERIA
ARCHITECTURE**

PASSENGER STATIONS

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**CRITERIA
ARCHITECTURE**

PASSENGER STATIONS

1. GENERAL

This Section includes architectural design requirements for passenger stations and associated support facilities.

1.1 APPLICATION

This document applies to all stations, existing and planned, and facilities that are physically connected or adjacent.

1.2 ACCEPTANCE OF EXISTING CONDITIONS

For stations in good repair and sound operation, acceptance of station elements in their existing condition without mandating conformance the Facility Standards is are subject to review by the District.

1.3 REFERENCE STANDARDS

Design of station shall comply with the principal standards listed below, except when superseded or amended by the District's Facility Design/ Criteria. The latest edition of any design standards, codes, and regulations shall be used:

- California Building Code, as applicable;
- NFPA101, 130, 220, as applicable;
- California Code of Regulations CCR Title 8, as applicable;
- California Code of Regulations CCR Title 24, as applicable;
- American with Disabilities Act Accessibility Guidelines, as applicable;
- American Society of Mechanical Engineers Safety Code for Elevators and Escalators, ASME A17.1
- Appendices, District Programs and Guidelines, BART Station Access Guidelines.

2. DESIGN PRINCIPLES

The stations should be designed to make access to the transit system as safe, rapid, and convenient as possible for all potential passengers. There are five main considerations for station design:

- **Safety and Security.** Providing adequate station evacuation capacity as well as preventing unsafe conditions such as overcrowded platforms and escalators feeding congested areas. Stations should be planned to have the best possible unobstructed lines of sight and well-lit spaces throughout. Long passageways, dark spots, hiding places and dead ends shall be avoided.
- **Passenger Experience.** Ensuring the quality of passenger experience by minimizing congestion. Provide adequate physical clearances and space for smooth flow of passengers, and reasonable comfort level for waiting and circulating in the station. The level of space provision

recommended in this guideline is considered to be economically optimal. Stations should be planned to optimize access to stations by all modes of transportation, in accordance with the access hierarchy -- see Appendix, BART Station Access Guidelines, Chapter 2, page 2-4.

- **Capacity.** Accommodating demand while optimizing the efficiency of a facility.
- **Resiliency.** Providing resiliency to demand surges and maintaining a reasonable quality of service during unusual events such as system delays, partial network closures, and station maintenance.
- **Safe and Efficient Operations.** Station planning and design should contribute to the efficient use of energy, facilitate maintenance, and promote smooth and efficient operation of the railway. Pedestrian routes should be free from abrupt obstructions and capacity bottlenecks shall be avoided. Provide effective wayfinding means, such as signs, markings, and textured surfaces, and minimize conflicting flows and travel distance.

2.1 PATRONAGE

- Ridership Forecast.** Patronage forecast for station design will be provided or as accepted by the District. Design years to be assessed include 5, 10, 15, and 20 years after station completion, subject to project requirements.
- Peak Demand.** Patronage forecast will be supplied in terms of AM and PM peak hour demand. Peak 15-minute flow data shall be used for sizing new station infrastructure. (Average flow per minute shall be determined by dividing the peak 15-minute demand by 15.)

2.2 SERVICE STANDARDS

2.2.1 Level of Service

Space planning in stations shall be performance based as defined in the pedestrian planning concept of level of service (LOS). The LOS provides a measure of the pedestrian environment based on the freedom to select walking speed, ability to bypass slow-moving pedestrians and relative ease of cross- and reverse- flow at different levels of pedestrian concentration.

2.2.2 Level of Service Description

LOS A - Free Circulation

LOS B - Minor pedestrian conflict

LOS C - Some restrictions in walking speed and ability to pass others

LOS D - Restricted and reduced walking speed for most pedestrians

LOS E - Restricted and reduced walking speed for all pedestrians

LOS F - Shuffling pedestrian movement

Station should be designed to provide an overall LOS C for the design year patronage forecast.

2.3 DESIGN CAPACITY

The element design capacities below in Table 2.3 are deemed appropriate for the District's operations. They provide adequate levels of service without making stations uneconomically large.

Table 2.3 Design Capacity Requirements (Square Footage for Level of Service)	
Area	Quantitative Measure
Open Concourse	11.5 sq ft per person (LOS B)
Queuing/Platform	5 sq ft to 7 sq ft per person (LOS C)
Passageways	
One-way	15 passenger per min per ft (LOS D)
Two-way	12 passenger per min per ft (LOS C)
Stairways	
One-way	11 passenger per min per ft (LOS D)
Two-way	8.5 passenger per min per ft (LOS C)
Escalators	67.5 passenger per min
Platforms	7 sq ft per person (LOS C)

2.4 TRAIN LOAD

For calculating maximum alighting loads, the number of passengers off boarding shall not exceed the maximum train capacity; 200 passengers per car x 10 cars per train = 2000 passengers per train.

2.5 HEADWAY

Train headways shall be in accordance with the service plan to be provided by the District. The minimum peak hour service headway is assumed to be 2 minutes.

2.6 PEDESTRIAN HAZARDS

- *Pedestrians shall not be exposed to bumping or tripping hazards on the platforms, plazas, concourses, or other public occupancy areas.*
- *Sufficient clear space shall be provided around overhead and side projections and corners to reduce the potential for bumping and walking into protuberances.*
- *Wherever practical, items requiring wall mounting that are within an area from floor level to 7'0" above the floor, shall be recessed. If this is not possible, the wall-mounted object shall not protrude more than 4 inches from the wall surface. The corners and edges of such objects shall be sufficiently rounded to prevent patron injury. Coordinate with related ADA requirements.*
- *Platform shall remain as clear as possible so that emergency evacuation is not impeded.*
- *Station design shall attempt to avoid inclusion of bump hazards for the visually impaired, such as free-standing signs and telephone pedestals. Where such hazards cannot be avoided, a device shall be installed that will assure detection of such obstacles by the visually impaired. The design of the detection devices shall require the approval of the BART System Safety Department.*

2.7 INFORMATION DISPLAY

Incorporate an information display system to effectively communicate basic information about using the BART system, specifically about BART fares, schedules, policies, maps, and connecting transit information; tips related to courtesy and security; marketing to encourage more frequent use of BART; and other important BART messages. The system shall also include paid advertisements.

The architectural design should delineate locations for each of the following media:

- Free standing kiosks in the free area of the station
- Wall-mounted display cases in the free area of the station and on the platform
- Advertising frames on the walls across the BART tracks from platform waiting areas.
- Advertising frames on the walls of the concourse level and free standing kiosks in the free and paid areas of the concourse and patios.
- Visual message boards on the concourse and platform levels shall be considered to display real time train arrival information.

3. BASIC CODE AND BUILDING REQUIREMENTS

3.1 USE OR OCCUPANCY

- A. *The primary purpose of a station is its use by transit patrons who normally remain in a station for a period of time no longer than necessary to await and enter a departing transit vehicle, or who exit the station after arriving on an incoming transit vehicle. In short, it essentially functions as a means of accessing and egressing transit vehicles.*
- B. *Station public occupancy shall consist of all areas in which patrons may be allowed to enter, and shall include concession areas and the full length of corridors, stairways, ramps, and passageways required for emergency egress.*
- C. *Station ancillary occupancy shall consist of all spaces other than station public occupancies defined in 2.1B. above.*

3.2 GENERAL BUILDING LIMITATIONS

Reference is made to CBC.

3.3 BUILDING CONSTRUCTION

3.3.1 Types of Construction

Reference is made to CBC.

3.3.2 Fire Separation

Area separation, exterior wall fire rating and opening protection. *Materials and systems used for fire resistive purposes shall be in accordance with the following references unless specifically directed by the District.*

- *Reference is made to CBC.*
- *Fire rating of doors shall be in accordance with NFPA 80.*

Occupancy Separation.

- *Station public occupancy shall be separated from station ancillary occupancy by minimum 2-hour fire-rated construction, as defined in NFPA 220. Exceptions: Station Agents' Booths and free-standing concessionaire kiosks (when within the station and in a sprinklered area) shall be constructed of non-combustible materials approved by the District.*
- *Station public occupancy shall be separated from power substations and transformer vault areas in station ancillary occupancies by 3-hour fire-rated construction, as defined in NFPA 220.*
- *Station public and ancillary occupancies shall be separated from non-transit occupancies by 2-hour fire-rated construction, as defined in NFPA 220.*
- *Construction underneath aerial structure shall be Type I or Type II One Hour, in accordance with NFPA 220.*

3.4 MATERIALS AND FINISHES

This Article specifies basic requirements and criteria which have been established for the finish of facilities within the System. While convenience, comfort, and attractiveness will be considered in the selection and application of these finishes, the District shall be also assured that the goals of safety, durability, and economy are achieved. The facilities shall employ standardized materials that are fabricated in such a manner to resist vandalism and provide for ease of maintenance, cleaning, and repair or replacement.

3.4.1 Basic Goals

A. Safety

- *Fire Resistance and Smoke Generation: Reduce hazard from fire by using non-combustible materials. A small quantity of combustible materials may be allowed for station map and other information media. Interior finishes shall meet NFPA 101 requirements. Adhesives and sealants shall meet the requirements stated herein.*
- *Attachment: Eliminate hazard from dislodgement due to temperature change, vibration, wind, seismic forces, aging, or other causes by using proper attachments and adequate bond strength.*
- *Slip-Resistant: All walking surfaces including the public areas and the ancillary spaces shall be constructed of materials selected for their slip-resistant qualities in both wet and dry states. These materials shall not require maintenance (other than normal housekeeping) to retain their slip-resistant qualities. The following static coefficients of friction are in accordance with Architectural and Transportation Barriers Compliance Board recommendations when tested in accordance with ASTM C1028, Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method, 15.02. The static coefficient of friction shall be not less than 0.6 for walking surfaces of public areas and ancillary spaces include entrances, stairways, platforms, concourse, and areas around equipment. The static coefficient of friction shall not be less than 0.8 at ramps.*
- *Glazing: Station glazing used in areas such as windbreaks, Station Agent Booths, partition walls, and barriers shall comply with the requirements of CBC.*

- B. **Durability.** Provide for long and economical service by using materials with wear, strength, and weathering qualities consistent with their initial and replacement costs, and their location. The materials shall maintain their good appearance throughout their useful life. Materials shall be colorfast.
- C. *Resistance to Vandalism. Anti-graffiti coating shall be provided as required.*
- Provide materials and details that do not encourage vandalism, that are difficult to deface, damage, or remove.
 - All surfaces exposed to the public shall be finished in such a manner that the results of graffiti can be readily removed with normal maintenance techniques.
- D. **Ease of Maintenance.**
- **Cleaning:** Reduce cleaning costs by using materials which do not soil or stain easily, which have surfaces that are easy to clean in a single operation, and on which minor soiling is not apparent. Materials shall be cleanable with standard equipment and cleaning agents. Maintenance procedures shall not require use of JLG lifts.
 - **Repair or Replacement:** Reduce maintenance costs by using materials which, if damaged, are easily repaired or replaced without undue interference with the operation of the System. Spare materials shall be provided for tile and other unit materials in a quantity of approximately two percent of the total used.
- E. **Aesthetics:** Create a feeling of welcoming and timeless quality.

3.4.2 List of Finish Materials

- A. This list provides general guidance as to acceptable and not acceptable materials. Those not specifically mentioned shall be reviewed with the District for acceptability.
- B. This list shall apply to all areas of public use and contact such as entrances, passageways, concourse and platform levels, except as noted for non-public areas. For the use of items listed as "Acceptable", installation is subject to location and environment considerations.

3.4.3 Floor Materials

Acceptable common materials include:

- Concrete - all foot traffic areas; hardened finish only in equipment rooms.
- Terrazzo (interior only).
- Natural granite (public areas only).
- Quarry tile.
- Brick (dense, hard, full thickness).
- Vinyl composition sheet and tile (nonpublic areas only).
- Ceramic and porcelain tile, non-slip (interior only).
- Unglazed mosaic tile (interior only).
- Tactile (detectable) warning material along platform edges*.

* Refer to Article 4.4 herein, for platform edge detection strip.

3.4.4 Wall and Column Cladding Materials

Acceptable common materials include:

- Concrete with sealers (smooth finish with sufficient surface texture to conceal minor soiling and damage without complicating maintenance procedures, or constituting a hazard to clothing or skin of patrons).
- Cement plaster (smooth finish).
- Glazed ceramic mosaic tile (for accent only).
- Glazed ceramic facing veneers (4 1/4 inch by 4 1/4 inch minimum size).
- Glazed brick.
- Precast concrete, smooth finish.
- Concrete masonry units (non-public areas or above 8-feet in public areas).
- Gypsum board (non-public areas).
- Stainless steel.
- Natural granite.
- Quarry tile.
- Laminated tempered glass (for elevator car and hoistway doors, barriers, wind screens, and Station Agent Booth).
- Epoxy coatings.

3.4.5 Ceiling Materials

Acceptable common materials include:

- Concrete.
- Cementitious sprayed acoustic materials.
- Acoustical metal panels.
- Acoustical tiles (mineral, glass, and wood fiber, vinyl wrapped): Offices and staff break rooms only.

3.4.6 Door Materials and Schedule

Acceptable common materials include:

- Flush hollow metal doors and frames (with enamel paint finish).
- Laminated tempered glass.
- Stainless steel overhead coiling grilles.
- Stainless steel doors and frames.

3.4.7 Railings

Acceptable common materials include:

- Stainless steel.
- Galvanized steel (nonpublic areas only).

4. CONCOURSE

4.1 GENERAL

This Article describes specific architectural criteria for the concourse area and elements within.

- A. In all public areas, minimum overhead clearance to ceilings shall be 10 feet above finish floor; however, at localized critical points such as beams or signs, clearance may be reduced to not less than 8 feet 6 inches.
- B. Location of Station Agent Booth or Booths, Ticket Vending Machines, Fare Gates, and other Concourse items shall take into account multiple entries, where they occur. Where necessary, items shall be duplicated to accommodate multiple entries.
- C. The concourse shall divide naturally into two distinct areas, the free and paid areas. The free or unpaid area is where passengers digest travel information and purchase tickets before proceeding into a paid area from which access is made to platform level. The layout of the concourse area will be primarily determined by the location of station entrances, location of station agent's booth, and the number and location of the passenger audits or escalators, stairs, and elevators to the platform or platforms.
- D. The paid and free areas will be separated by barriers, an array of ticket gates for normal passenger circulation and service gates for station staff and equipment access. Barriers shall be five (5) feet in height, see-through type, non-climbable. If the barrier is elevated from the finished floor, the gap between the bottom of the barrier and floor shall be three (3) inches.
- E. The size of the concourse in any given station shall satisfy the required operational functions, expected patronage levels, and available site area. The basic dimensions are determined by the gateline width, run-off requirements, queuing space for automatic fare collection (AFC) facilities, circulation space and headroom.
- F. The unpaid areas shall allow space for passengers' decision-making and the provision of public facilities, passenger information, and AFC equipment.
- G. The paid area shall give direct and clearly defined access to the platforms via escalators, elevators, and stairs. Any public facilities in the paid area shall be located away from the direct route to the escalators and stairs.
- H. A single paid area shall be provided, except where the District agrees there are specific station layout constraints that dictate that the paid area should split.
- I. *If gates are required for emergency egress purposes, the gate height shall match the barrier adjacent to where it is located. Such gates shall be equipped with a panic open device on the paid area side, and be self-closing.*



Example of barrier between paid area and non-paid area – Brussels Metro South Station

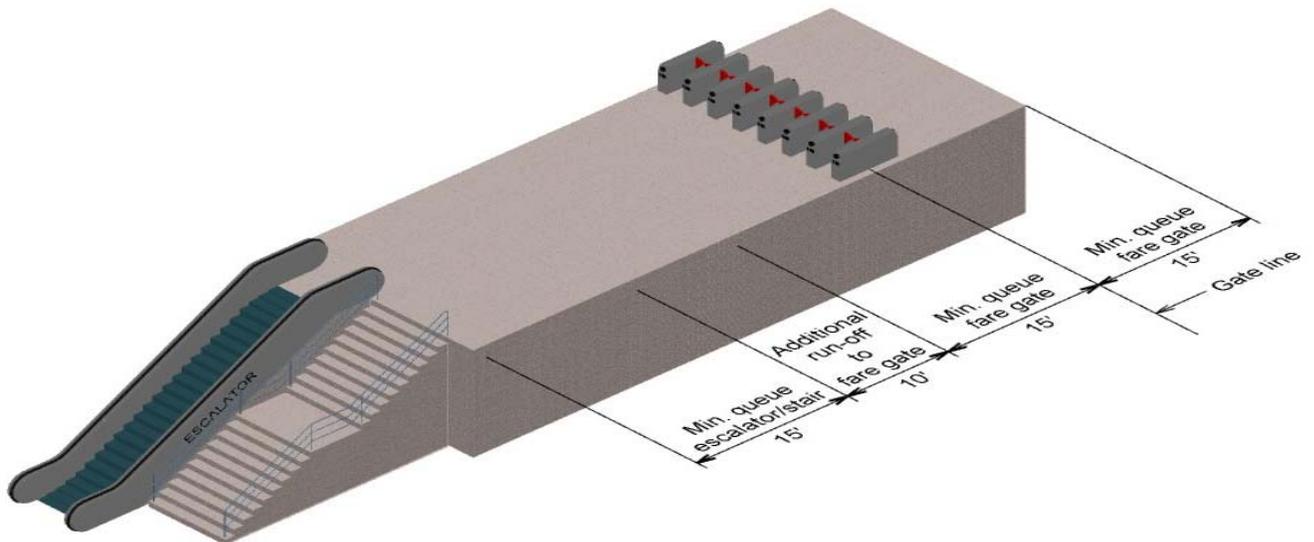
4.2 *QUEUING*

Space shall be provided for queuing at all circulation and passenger service elements. The queuing area provides space for passengers to queue without disrupting flow-routes. *Queuing spaces should be placed end to end and should not overlap. Minimum queuing distance requirements are given in Table 4.2.* Extra queuing space shall be considered for high-volume, high-transaction and mixed-occupancy (such as intermodal, joint development) stations.

Element	Minimum Queuing Distance
Escalator (from escalator newel)	15'-0" (pending study result)
Stair	15'-0" (pending study result)
Fare Gate	15'-0" (pending study result)
Elevator	8'-0"
Transfer Machine	8'-0"
Ticket Vendor	6'-0"
Add Fare Machine	6'-0"
Parking Control Machine	6'-0"
Change Machine	6'-0"

4.3 *RUN-OFFS*

- A. Run-off distances allow passengers to be drawn away from escalator, stair and fare gate exit points. This allows time and space for passengers to become oriented, make decisions and initiate actions without blocking following passengers.
- B. *In addition to the required queue space, a 10-foot additional surge space shall be provided to stair and escalator landings that feed fare gates.*



4.4

STATION AGENT BOOTH

- A. The station agent is the most important person in the day-to-day operations of the stations. The agent gives information and assistance to passengers, supervises fare collection and vertical circulation equipment, and copes with special conditions as they arise.
- B. The station agent booth shall be located in line with the gates and either centrally located with respect to the gates or to the side of the entry gates as patron circulation dictates.
- C. Where a paid area has two sets of gates, the station agent booth shall be placed adjacent to those gates serving the majority of off-peak users (bus and taxi drop off, off-peak and non-commuter parking). It is expected that these passengers will require more assistance than the regular commuter.
- D. *The booth shall be visible from entire concourse area.* The booth shall be located adjacent to fare gate array separating the free and the paid areas and shall be accessible to patrons in both the free and paid areas. It provides the station agent direct and unobstructed views of the fare gates, ticket vendors, change machines, public toilets, and the vertical circulation elements to the greatest extent possible.
- E. *The Station Agent Booth shall be equipped with consolidated on-site control and communication facilities needed for emergency situations.*
- F. *Construction:*
 - 1. *Station Agent Booths shall provide security to Station Agents. The booths shall be constructed to bar public entry.*
 - 2. *Station Agent booth shall have an access floor flush with the station floor thus requiring a recess. .*
 - 3. *Booth shall be a standard size and configuration as required by the District.*
- G. *Equipment:*
 - 1. For communications and other systems provided in the Station Agents Booth, refer to the appropriate section in the Facility Design/ Criteria/ ELECTRONICS. *Systems provided are as follows:*
 - Emergency Telephone*
 - a. *PABX telephone with PA access and with “white” courtesy telephone answering capabilities*
 - b. *Annunciator for Fire Alarm Control Panel*
 - c. *Station Agent Terminal*
 - 1) *Fare Gate Control*
 - 2) *BART ticket reader*
 - d. *Control and Annunciator Panel*
 - 1) *Elevators*
 - 2) *Escalator*
 - 3) *PA Access*
 - 4) *Train Information Monitor (TIM)*
 - e. *CCTV monitor*
 - f. *Network monitor, keyboard, and mouse..*
 - 2. *Miscellaneous items including:*

- a. *Keys necessary for access to all areas of station*
- b. *Maps showing locations of shutoff controls for fire suppression and domestic water systems, gas, electricity (these maps shall also be placed in the room where the fire alarm control panel is located)*
- c. *Maps showing locations of fire alarm zones, emergency exits, hose cabinets and fire alarm control panel*
- d. *First Aid Kit*
- e. *Flashlight*
- f. *Fire Extinguisher: Refer to Facility Design/ Criteria/ MECHANICAL/ Stations and Station Sites, for specific criteria for fire extinguisher.*
- g. 120 V ac convenience outlets
- h. Area for temporary storage of lost and founds articles, 14"W x 12"H x 24" D.

4.5 SERVICE GATE

Access via service gates for maintenance personnel and emergency crews (police, fire, etc.) shall be provided in the fare gate array for movement between the free and paid areas in accordance with the California Building Code. Service gates shall be accessible to the elderly and disabled in accordance with CBC and ADA.

- A. *Service gates shall be provided along the barrier separating the paid and free area for staff and equipment access, overflow, luggage and bicycles.*
- B. *The gate shall have a minimum clear opening of 3 feet 6 inches.*
- C. *At least one full size service gate shall be located adjacent the station agent booth for staff and public use. Service gates not adjacent to the station agent booth shall be protected from unauthorized use by means of audible visual alarms fitted in close proximity to the gate.*
- D. *The gate shall be self-closing and double acting to provide movement in both directions.*
- E. *The gate shall not be lockable.*
- F. *The gate surface on both sides shall be smooth and solid.*

4.6 AUTOMATIC FARE COLLECTION

Refer to Facility Design/ Criteria. ELECTRONICS, Automatic Fare Collection Equipment for AFC equipment count requirement. Provision shall be made for adopting the AFC system arrangement to accommodate smart card (TRANSLINK) equipment. Consult District for further guidance.

4.6.1 Description of System

- A. Barriers shall be provided to prevent anyone from reaching the paid area without passing through an entry fare gate, or from leaving the paid area without passing through an exit fare gate.
- B. Barriers between paid and free areas shall be designed to provide appropriate physical separation without excessive visual emphasis on security.

- C. Wherever possible, all ticket vendors, moneychangers, addfare machines, and fare gates shall be in direct view and proximity to the Station Agent's Booth. Where this is impossible, they shall be indirectly supervised by means of mirrors or CCTV.
- D. Fare collection equipment shall be arranged in groups and installed in secure vaulted areas.
- E. Refer to Facility Design, Criteria, ELECTRONICS, Automatic Fare Collection for operations criteria. If not applicable, District will provide Designer with detailed systems requirements for Automatic Fare Collection system.

4.6.2 Fare Collection Sequence

- A. Ticket purchasers may initially go to a ticket vendor; high value and discount tickets may also be purchased by mail or at certain preselected locations.
- B. The ticketing sequence is:
 - 1. Upon entering:
 - Bill changer (if needed by individual commuter) and ticket vendor
 - Entry fare gates
 - 2. At exit station:
 - Addfare machines (if needed by individual commuter)
 - Exit fare gates
- C. Entering commuters carrying adequate "stored fare" tickets will not need to stop at bill changers or ticket vendors, but will go directly through the entry fare gates.
- D. Exiting commuters carrying adequate "stored fare" tickets will not need to stop at addfare machines, but will go directly through the exit fare gates.

4.6.3 Ticket Vending Machines

- A. Located in the free area and placed to serve incoming passengers only.
- B. Clearly visible on entering the station but placed so as not to impede the direct flow between entrance and fare gates.
- C. Space and necessary under floor raceway or conduits for an additional 33 percent ticket vending machines shall be provided for future expansion. At minimum provide for one additional ticket vending machine at each Ticket Vending Machine area.
- D. Equipment shall be built-in flush with wall surfaces with front access for maintenance and servicing.
- E. Refer to Facility Design/ Criteria/ ELECTRONICS/ Automatic Fare Collection Equipment, for detailed specifications.
- F. For minimum queue space in front of machines, refer to Table 4.2 herein.
- G. Include Train Information Monitor at each Ticket Vending Machine area.
- H. Dimensions: 3 feet 4 inches wide by 2 feet 10-5/8 inches deep by 6 feet 6 inches high, spaced 4 feet on center.

4.6.4 Addfare Machines

- A. When passengers arrive at their destination station with insufficient value on their tickets to exit, addfare machines will be needed within the paid area to add value to their tickets. If addfare machines also validate parking (act as parking control machines), addfare machines shall be

located to perform this additional function for passengers upon entering station from parking areas. Addfare machines shall be located out of the traveled way.

- B. These machines shall be free standing.
- C. Dimensions: Same as ticket vending machines.
- D. Refer to Facility Design/ Criteria/ ELECTRONICS/ Automatic Fare Collection Equipment for detailed specifications.
- E. For minimum queue space in front of machines, refer to Table 4.2 herein.

4.6.5 Transfer Machines

- A. For passengers using both rapid transit and feeder services (SamTrans, Muni, AC, VTA, and County Connection), transfer tickets will be issued at the stations and at preselected locations.
- B. Provide space for at least two dispensers within every paid area of the station, located in the vicinity of exiting gates but out of the direct flow of exiting passengers.
- C. The position of the transfer machines shall be in relation to the exit fare gate nearest to the feeder service but out of reach from the free area.
- D. These units may be freestanding, but built-in is preferred. Confirm through the District which kind of machine is available.
- E. For minimum queue space in front of machines, refer to Table 4.2.

4.6.6 Bill Changer

A minimum of two bill changers shall be located in the free area.

4.6.7 Fare Gates

- A. All patron entry and exit to the BART system shall be controlled through fare gates.
- B. Satisfy the District's minimum clearance and size requirements as stated herein and in Facility Design, Criteria, ELECTRONICS, Automatic Fare Collection.
- C. For minimum space on both sides of the fare gates, refer to Table 4.2.
- D. In an array of gates, the right hand gate to the entering flow shall be "entry" gate; the right hand gate to the exiting flow shall be the "exit" gate. This gate will also accommodate patrons with oversized items such as luggage, strollers, and bicycles. The remaining center gates shall be set to suit the major directional flows. There shall be a minimum of six gate aisles per station.
- E. *During emergency evacuation all fare gates shall permit free exiting.*
- F. *One ADA accessible fare gate shall be provided in each fare gate array to accommodate the passage of wheelchairs and persons with special needs.*
- G. Refer to Facility Design/ Criteria/ ELECTRONICS, Automatic Fare Collection Equipment for detailed specifications.

4.7 PATRON AMENITIES AND CONCESSIONS

Patron amenities and concession spaces shall be located where they will not impede the station's normal and emergency passenger circulation, and will not restrict the visual supervision of the station from any Station Agent Booth. Refer to Facilities Design/Criteria/ MECHANICAL/ Station and Station Sites for comprehensive mechanical requirements.

4.7.1 Toilet Rooms

- A. Men's room and women's room shall each have a toilet and lavatory with cold water. With District approval, two unisex toilets may be provided in lieu of men and women's toilet rooms.
- B. The men's room shall also have a urinal.
- C. The following toilet accessories shall be provided in each. Note several plumbing items and toilet accessories are Designated Matching Products. Obtain District list:
 - Recessed paper toilet seat cover dispenser
 - Warm air hand dryer
 - Toilet grab bars
 - Recessed liquid soap dispenser, located above the lavatory
 - Two recessed toilet tissue holders for sheet type tissue (District furnished, Contractor installed).
 - Recessed sanitary napkin disposal unit.
 - Recessed trash receptacle.
 - Polished stainless steel frameless mirror (not located over lavatory)
 - Stainless steel shelf
 - Two stainless steel coat hooks (One hook shall be wheelchair accessible height. "Robe hook" style is preferable.)
 - Women's toilet shall also have a recessed napkin disposal unit.
- D. Doors shall be lockable from outside by key and from inside by thumb-turn knob. Inside lock shall be a privacy lock with exterior "OCCUPIED/VACANT" indication. Toilet room locksets are Designated Matching products. Doors shall also have kick-down holder.

4.7.2 Maps

In each concourse free area at the station entrance and in the platform area, provide space for, as a minimum, the following mounted maps. At minimum, provide four map cases per station entry and four map cases per platform face. District will furnish maps.

- One local city street map showing public transit routes and points of interest
- One vicinity map showing public transit routes and points of interest
- One map showing the BART route and selected points of interest served by public transit
- One map showing the BART route and fares.

Refer to Facility Design/ Criteria/ ARCHITECTURE/ Signage, for additional requirements.

4.7.3 Information Boards

- A. In each concourse free area at the station entrance adjacent to the maps, provide space for, as a minimum, the following mounted boards:
 - Instructions on how to use the BART System and display racks for handout printed schedules.
 - The respective BART station and time schedule.In lieu of mounted boards at station entrance, provide free standing triangle information kiosks per District standard design.
- B. On the platform provide space for, as a minimum, one permanently mounted display board 50 inches wide by 30 inches high of the respective BART Station time schedule.
- C. In the paid area of the concourse adjacent to each transfer machine, provide one rack for handout printed schedules of the respective feeder transit system.

Refer to Facility Design/ Criteria/ ARCHITECTURE/ Signage, for additional requirements.

4.7.4 Trash And Newspaper Receptacles

- A. Floor mounted trash receptacles shall be provided at approximately 70 feet on center along platform and shall be large enough to receive discarded newspapers. Trash receptacles are Designated Matching Products. Floor mounted trash receptacles shall be mounted in such a way that they may be removed without marring platform surface.
- B. Trash receptacles shall be provided adjacent to the entry fare gates because eating and drinking, are not permitted within the paid area.
- C. Provide recycling receptacles at concession areas and station entrances. Coordinate types of recycling with local recycling authority. Design of recycling receptacle areas shall be flexible to accommodate changing recycling demands.
- D. Trash receptacles shall be located at each entrance, bus drop-off areas, and kiss-ride areas.
- E. Newspaper-only trash receptacles shall be provided in concourse paid area between the vertical circulation elements and the fare gates. Designer shall propose for District approval a minimum of two newspaper only receptacle locations within paid area and two at free areas.

4.7.5 Drinking Fountains

- A. Provide one set of drinking fountains in the free area and one set in the paid area of the concourse. Both sets of drinking fountains shall include one high fountain and one at wheelchair accessible height, shall be within view of the Station Agent Booth, and shall not be chilled.
- B. Drinking fountain in free areas shall be located within the area secured after operating hours.

4.7.6 Benches

- A. Benches shall be provided on the platform level for patrons waiting for the train. As a minimum they shall be at the platform center and two-thirds the distance from the center to the platform ends.
- B. Benches that are accessible to the elderly and disabled shall be provided. Space for wheelchair shall be included adjacent to benches protected by windscreens.
- C. Benches shall not interfere with passenger circulation.
- D. Refer to Standard Drawings, ARCHITECTURE for standard bench designs.

4.7.7 Windscreens

When the platform is at or above grade and exposed to the wind, transparent screens shall be provided around the benches to protect the waiting area. The design of windscreen will incorporate features that will shield patrons from weather. Refer to Standard Drawings for windscreen design.

4.7.8 Parking Control Machines

If parking control is not accommodated by addfare machines, Designer shall indicate a location (subject to District approval) for a minimum of two future possible Parking Control Machines within paid area of the concourse and provide electrical outlet for machines.

4.7.9 Bicycle Parking

- A. Provide areas for secure bicycle parking commensurate with station location, design, and potential demand.
- B. Bicycle parking shall be provided in either the paid or free area of the concourse as space permits, without interfering with passenger circulation. To the extent possible, bicycle parking shall be located in the concourse paid area. Refer to Bicycle Access and Parking Plan for bicycle parking supply and demand analysis.
- C. Secure bicycle lockers shall be provided so that security is maximized, pedestrian circulation is not adversely impacted, and lockers can be used to their maximum capacity. Refer to Bicycle Access and Parking Plan for bicycle locker placement criteria.
- D. Attended bicycle parking “Bike Stations” shall be considered at stations where the demand for bicycle parking exceeds 100 bicycles/day; and are most appropriate for stations that have demand during the whole day.
- E. Dimensions required for 7 bicycle parking spaces at racks: 9’x10’9”. Refer to the BART Bicycle Access and Parking Plan, Appendix B, for bicycle parking installation guidelines.

4.7.10 Concessions and Other Commercial Uses

- A. Provide areas for future concessions equaling between 500 and 1000 square feet depending on station location, design, and potential demand. To the extent possible, concession area shall be located in one or two areas permitting partitioning for different size spaces with maximum flexibility for future tenant improvements.
- B. Concessions shall be located in the concourse free area or in kiosks just outside the station entrance. No concession operations shall be permitted on the platforms.
- C. *No combustible construction materials shall be allowed per NFPA 130.*
- D. *Concession areas shall be accessible to disabled operators and patrons in accordance with CBC and ADA requirements.*
- E. *The following utilities shall be provided in each booth for the use of the concessionaire:*
 - Electric power panel, 480v 3 phase, 100 amp, 12 circuit panel located in each booth or concession area. Each concession shall be supplied from a dedicated PG&E metered circuit.
 - Domestic water: 3/4-inch cold water supply with shut-off valve.
 - Drainage: Floor drain in center.
 - Telephone: 2-inch diameter conduit for a private telephone.
 - Fire protection: Automatic sprinkler system in accordance with NFPA 13.
 - Fire detection and alarm system.

4.8 EMPLOYEE FACILITIES

4.8.1 General

This Article describes specific architectural criteria for areas in the stations that serve the BART employees and serve as storage areas. Architectural design criteria are mentioned where

applicable. These areas shall be accessible to the disabled except where noted otherwise or specifically exempt by the District. Refer to Facilities Design/Criteria/ MECHANICAL/ Station and Station Sites for comprehensive mechanical requirements.

4.8.2 Staff Break Room

A staff break room shall be provided for all station employees. Staff break room equipment and accessories (such as kitchen faucet) include Designated Matching Products. Obtain list from District. Room shall be equipped with the following.

- A small kitchen with sink, garbage disposal, microwave, refrigerator, counter top, and storage cabinets, all accessible to the disabled. Towel dispenser.
- An eating area for a table and six chairs.
- Door to public area with one-way viewport, as applicable.
- *Emergency Supply Storage: Separate room or closet off of or adjacent to the Station Agent Break Room for the storage of emergency supplies such as stretcher or stair chair.*
- PA speaker, HVAC and convenience outlets.

4.8.3 Staff Toilet Room

Staff toilet room shall be accessible for the disabled and equipped with the following (one unisex toilet room shall be provided unless otherwise indicated on the preliminary engineering documents). Plumbing and toilet accessories include Designated Matching Products. Obtain District list:

- Wall mounted toilet.
- Urinal (at men's and unisex toilets).
- Lavatory with hot and cold water.
- Wall mounted recessed liquid soap dispenser mounted above lavatory. Where recessing unit is not possible, surface mounted dispenser permitted.
- Warm air hand dryer.
- Surface mounted two roll toilet paper dispenser.
- Recessed seat cover dispenser. Where recessing unit is not possible, surface mounted dispenser permitted.
- Toilet grab bar(s).
- Surface mounted towel dispenser except where space restrictions require recessed paper towel dispenser and waste receptacle. (Confirm type of towels with District).
- Mirror, 16 inches wide by 30 inches high with stainless steel frame and shelf (not mounted above lavatory).
- Two robe hooks (one at wheelchair accessible height).
- Lockable door from inside by thumb-turn knob with exterior "OCCUPIED/VACANT" indication.
- Sanitary napkin disposal (for women's and unisex toilet rooms).

4.8.4 Police Department Facilities

The following Police Department Facilities shall be incorporated into passenger station design:

- A. Police Station Office at every passenger station
- B. Remote Reporting Location at end-of-line stations and where required by the District

- C. Police Zone Facility every 5 to 7 stations. Police Zone Facility shall typically include Lobby, Record/Dispatch Room, Sally Port, Detention Area, Offices and Open Area Workstations, Training/Squad Room, Exercise Room, Lockers and Restrooms.

For Communications Criteria, refer to Facility Design/ Criteria/ ELECTRONICS. For Electrical Criteria, refer to Facility Design/ Criteria/ ELECTRICAL.

4.8.5 Maintenance and Engineering Station Office

Each station shall include a Station Office area for Maintenance and Engineering, located to facilitate operational activities. The area shall be designed to accommodate the three major divisions of BART Maintenance and Engineering:

- A. Way and Facility
- B. Power and Mechanical
- C. Systems Maintenance

Refer to Facility Design/ Criteria/ ARCHITECTURE/ Maintenance and Engineering Facilities for space and equipment requirements.

4.8.6 Janitor's Rooms

- A. In the Concourse Janitor's Room, provide the following. Janitor room plumbing fixtures and accessories include Designated Matching Products. Refer to Facility Design/ Criteria/ MECHANICAL/ Stations and Station Sites for plumbing requirements. Obtain District list:
- Minimum of two 110 V ac GFI duplex outlet, waterproof
 - Two shelves 12-inches deep mounted to wall at 4 feet and at 5-feet-6-inches above floor and over mop sink.
 - Two shelves 18-inches deep mounted to wall at 4 feet and at 5 feet 6 inches above floor
 - Ten anti-slip, spring-loaded, rubber cam stainless steel mop/broom holders
 - Floor space for double-bucket and wringer
 - Floor space for storage of floor scrubber machine
 - Four double-tier lockers
 - For mop sink, fittings, and accessories, refer to Standard Specifications
- B. In the Platform Janitor's Room, provide the following:
- Minimum of one 110 V ac GFI duplex outlet
 - Two shelves 12-inches deep mounted at 4 feet and at 5-feet-6-inches above floor
 - Ten anti-slip, spring-loaded rubber cam stainless steel mop/broom holders

4.8.7 Storage Room

A separate secured storage room shall be provided with shelving for supplies, brochures, transfer ticket stock, temporary signs, escalator barriers, survey collection equipment, emergency equipment, and lost and found articles. Minimum size room shall be 200 square feet.

4.8.8 End-Of-Line Operations Area

- A. Supervisor's Booth.** A space shall be provided at the end-of-line station for the train crew supervisor to observe the train operations at the platform and at the end of the track. Supervisor's Booth shall include securable storage lockers. Booth shall be equipped with public pay, PABX, and emergency telephones; train radio monitors; station public address; ATZ logger; Field Services computer network terminal; and CCTV monitors. Refer to Facility Design/ Criteria/ ELECTRONIC, for specific communications systems requirements.
- B. Office.** A separate room shall be provided with a conference table and six chairs for a private environment. It shall have a PABX telephone and a Field Service computer terminal.
- C. Staff Break Room.** Criteria are the same as for staff break room at stations except that the room shall also include space and utilities for three vending machines (one for hot drinks, one for cold drinks, one for snacks).
- D. Shower and Toilet Rooms.** Separate men's and women's rooms shall be provided for showering, changing clothes, and toilet facilities. The following shall be provided at each room:
- One handicapped accessible shower stall with toweling area and bench immediately outside shower. Shower stall provided with shower curtain and toweling area provided with privacy curtain.
 - Two stainless steel towel hooks for each shower (one at wheelchair accessible height).
 - One stainless steel soap dish for each shower.
 - Grab bars for shower and accessible toilet.
 - Clothes lockers, double tier, 12-inches wide, closed base (may be located in space other than shower/toilet rooms). Quantity of lockers as required by the District.
 - Bench.
 - Mirror, full-length with stainless steel frame.
 - Two lavatories, wall-mounted.
 - Recessed liquid soap dispensers mounted above lavatories.
 - Two mirrors, 16 inches wide by 30 inches high, stainless steel frame and shelf (not mounted over lavatory).
 - One recessed paper towel dispenser and waste receptacle (Confirm type of towels with District).
 - Two robe hooks at lavatory area (one at wheelchair accessible height).

- One water closet for Men's and two water closets for Women's.
- Toilet partitions, ceiling-mounted.
- One combination partition-mounted (or recessed) dispenser unit for toilet seat covers and two toilet paper rolls for each toilet (include napkin disposal unit at Women's).
- Two urinals, wall-mounted, for Men's
- Modesty screen between urinals and between lavatory and urinal, if required, for Men's.

End-of-line staff toilet rooms and break room shall be in addition to staff facilities for station staff unless approved otherwise by the District.

4.8.9 Trash Area

Area for trash bins (dumpsters) including recyclable collection bins shall be provided, accessible to janitorial staff and waste management trucks and recycling service trucks. Location shall take into account control of odors and provide for wash down of bins and area.

5. PLATFORM

5.1 GENERAL

This Article describes specific architectural criteria for the platform area and elements within.

Platforms shall be designed to promote easy access, egress and circulation and offer good sightlines by avoiding recesses and indentations that could offer hiding places and litter traps.

Platform length shall be fixed as stated herein under "Sizing". Platform width shall be determined by a combination of patronage demand, passenger movement, physical clearances, and safety criteria.

Platform vertical circulation elements shall be arranged along the length of the platform to avoid concentrating passengers in one area. The placement shall be designed on a site specific basis and coordinated system wide so that passengers are evenly distributed within trains.

5.2 CONFIGURATION

Platforms are either side platform or center platform. They can be elevated, at grade, or underground in a cut-and-cover station box or in a station tunnel. Center platforms are generally preferred to side platforms. Platform design shall comply with the following:

- A. Wherever possible, no major equipment of support areas shall be located on the platform public areas.
- B. Markings shall be provided on the platform to control the flow of passengers boarding and alighting the trains.
- C. The platform edge shall conform to CBC and ADA.
- D. Space for miscellaneous equipment, including emergency phones, telecommunication equipment, and advertising panels, shall be provided as required by safety and operations

concerns. The location and sizes of these spaces shall be integrated with the design of the platforms and station finishes.

- E. As a minimum, platforms shall be covered over 40 percent of their length. Consideration should be given to providing cover for their entire length and width.
- F. Where columns run the whole length of the platform, adequate spacing shall be provided to assure that columns do not form a continuous, or nearly continuous, wall effect. The spacing of columns shall also take into account and coordinate with the train door openings.
- G. Grouping vertical circulation elements in pairs should be considered for more efficient use of space.
- H. No commercial establishments shall be located on platform.

5.3 SIZE

Minimum platform width is a function of the area required for peak passenger loads distributed over the length of the platform and taking into account delay and emergency operation. In many cases actual platform width will also result from the configuration of vertical circulation elements.

Platforms shall be designed to meet the following requirements:

- A. The platform length shall be sufficient to accommodate a full length BART train (700 ft).
- B. Platform widths shall be determined to provide minimum of 5 sf/person under the worst scenario established by the District.
- C. Satisfy the District's minimum clearance and size requirements as stated herein and in Introduction/ COMMON REQUIREMENTS/ Trackway Clearances.

5.4 CLEARANCES

Trainway and platform clearance requirements are as stipulated in Introduction/ COMMON REQUIREMENTS/ Trackway Clearances and shall conform to "Deviations from Section 9, General Order No. 26D", State of California Public Utilities Commission (See Appendices, GOVERNMENT CODES & REGULATIONS, California Public Utilities Commission).

The platform design shall be coordinated with the track clearance requirements to provide an acceptable interface between the platform and vehicle. This interface shall minimize horizontal and vertical gaps at the vehicle door threshold. Unless otherwise waived by special instructions from the District, the following criteria shall be used for determination of station clearances with respect to the trainway.

- A. *Platform Walkway Clearance: The minimum allowable distance between an obstruction (e.g.: columns, pilasters, stairways, walls, windscreens, escalators, etc.) and platform edges shall be as indicated on the station platform clearance diagram in Introduction/ COMMON REQUIREMENTS/ Trackway Clearances. Obstructions such as benches and advertising devices shall not be permitted within this clearance. BART signage is excepted.*
- B. *Platforms. For platform height refer Introduction/ COMMON REQUIREMENTS/ Trackway Clearance.*
- C. *Platform Edge. The platform edge shall provide a gap between the platform edge and vehicle threshold per Introduction/ COMMON REQUIREMENTS/ Trackway Clearance.*
- D. *Platform End Transition Zone. An 8-foot long transition zone, at both ends of each platform, shall be provided to prevent transit vehicle impact with the blunt end of the platform. At the*

ends of the platform the platform edge-to-vehicle gap shall be tapered per Introduction/ COMMON REQUIREMENTS/ Trackway Clearance.

- E. Walls Along Platform. Within the length of the station platform, finished surfaces on walls, advertisement boards, artwork, etc., on the opposite side of the track from the platform shall not be closer than the clearance to the centerline of the track indicated for Station Platform Clearances in Introduction/ COMMON REQUIREMENTS/ Trackway Clearance.*
- F. Walls beyond the ends of the station on the platform side of the track, enclosing stairs or walkways from the platform, shall not be closer than 6' – 8" to the centerline of the track.*
- G. Under Platform Refuge Area: An emergency refuge space shall be provided adjacent to the track, underneath the edge of the platform. The platform over the refuge shall be cantilevered.*
- H. Undercar Clearance in Trackway: Along entire length of the station platforms, trackway shall contain a continuous depressed trench-like space between rails and under cars. For configuration requirements of the space, see Introduction/ COMMON REQUIREMENTS/ Trackway Clearance.*
- I. Overhead Obstructions. In all public areas, overhead clearances as indicated on the station platform clearance diagram in Introduction/ COMMON REQUIREMENTS/ Trackway Clearances.*
- J. To prevent vehicle-to-platform shock hazards, provide isolation of electrically conductive materials used within 6'-0" of platform edge.*

5.5 PLATFORM EDGE DETECTION

Tactile (detectable) warning material along platform edges: A platform edge detection strip, approved by the District, shall be installed along the length of every platform. Its primary function is to provide tactile and visual warning to visually impaired patrons, alerting them that they are approaching the platform edge.

5.6 STATION PLATFORM EMERGENCY THIRD RAIL TRIP STATION

Refer to Facility Design/ Criteria/ ELECTRICAL/ Traction Power.

5.7 SLOPE

Finished surfaces of platforms shall be sloped at one percent from the center towards the platform edge to allow for drainage and a maximum of one percent from one end to the other.

5.8 CIRCULATION

For center platforms, 50% of escalators should be paired with exit stairs. Stairs may be emergency exit only stairs.

6. STATION INGRESS AND EGRESS AND CIRCULATION

6.1 GENERAL

Station layouts should allow passengers to transfer simply and efficiently between trains, the surrounding environs, and other means of transportation. The circulation movement of passengers

governs the placement of station elements. Station access and circulation design for a specific application may be impacted by the additional criteria identified in the Facility Design, Criteria.

Some of the basic principles to consider in planning station circulation are as follows:

- A. Patron circulation shall be arranged to minimize walking distances and offer clearly marked routes and decision points.
- B. People tend to keep to the right, and for that reason, right-hand flows are recommended. Patron flow patterns in the stations shall maintain a right-hand circulation where possible and shall be as simple as practicable.
- C. Any cross-flow of passengers is highly undesirable; separate passenger flows moving in opposite directions wherever possible.
- D. Dead-end conditions shall be avoided wherever possible.
- E. Any design features or vistas which may distract patrons at the head or foot of stairs and escalators should be avoided.
- F. Pedestrians shall not be exposed to bumping or tripping hazards on the platforms, plazas, concourses, or other public occupancy areas.
- G. Sufficient clear space shall be provided around overhead and side projections and corners to reduce the potential for bumping and walking into protuberances.
- H. Station design shall attempt to avoid inclusion of bump hazards for the visually impaired, such as free-standing signs and telephone pedestals. Where such hazards cannot be avoided, a device shall be installed that will assure detection of such obstacles by the visually impaired. The design of the detection devices shall require the approval of the District and coordinated with related ADA requirements.

6.2 STATION ENTRANCES

- A. Station entrances provide the link between the station concourse and the surrounding area. The form and configuration of station entrances shall be provided as required by projected patronage demand, capacity calculations, and site context.
- B. Entrances lead into the concourse area containing the Ticket Vending Machine (TVM) and entry and exit gates. Position TVMs and gates to minimize conflicting movements between arriving and departing passengers.
- C. In general, provide easily identified and located entrances leading directly from street level to the concourse area to provide convenient access for passengers. The siting of the street level portion of each entrance depends upon factors such as the physical constraints of the surrounding streets.
- D. Other entrances may connect directly to the basements of buildings, to pedestrian subways, etc. In some instances it may be necessary to consider these as auxiliary entrances and to take no account of them in capacity calculations if there is provision for the entrance to be closed by an authority outside the control of the District.
- E. Additional factors that shall affect the siting of entrances are access consideration for the disabled, the predicted passenger movements, interchange with other forms of transport, and the presence of nearby developments that may require a longer direct connection to the station.
- F. Provision shall be made for the entrance to be closed by means of roll-down grilles. Refer to Facility Design/ Criteria/ ARCHITECTURE/ Facilities Security.

6.3 PASSAGEWAY/PORTAL

Entrances and passageways should be designed to promote easy access, egress and circulation and offer good sightlines by avoiding recesses and indentations that could offer hiding places and litter traps.

The minimum width of a passageway is 8 ft. The width of a passageway between junctions shall be uniform along its entire length.

Provide passageways with emergency lighting and ventilation.

6.4 CONCOURSE AREA

Refer to concourse area requirements.

6.5 CODE REQUIREMENT

6.5.1 Station Ingress and Egress Facilities

- A. *The minimum criteria for design of station egress facilities shall comply with the provisions of the CBC and NFPA 130.*
- B. *Occupancy Load Data*
 - *The load on any single train is limited to the maximum train capacity which is assumed to be 2000.*
 - *For future stations, the exiting capacity computations shall use projected patronage data provided by the BART Planning Department. The data shall be based on predicted BART patronage ten years, minimum, after commencement of service at the new station.*
- C. **Patronage Analysis:** Patronage Analysis will be prepared by the District and provided to the Designer, as applicable
- D. *Egress Requirement*
 - 1. *There shall be sufficient means of exit to evacuate the station occupant load from the station platforms in four minutes or less.*
 - 2. *The station shall be designed to permit evacuation from the most remote point on the platform to a point of safety in six minutes or less.*
 - 3. *Stations shall have at least two exits placed a distance apart equal to not less than one half the length of the maximum overall diagonal dimension of the station.*
 - 4. *No point of station platforms shall be more than 300 feet from a point of safety.*
 - 5. Enclosed (and underground) station platforms shall have a minimum of one exit within 20 feet from each end. Routes from platform ends into the underground guideway shall not be considered as exits for calculating exiting requirements.
 - 6. Egress path shall be continuous from platform to outside of station.
 - 7. Exit hatches shall not be used as a means of egress from underground stations.
- E. *End of Platform Ingress Requirements: Access/egress shall be provided between trainway and platform per CBC. Means of egress shall be provided from each trainway to the platform, meeting the following requirements:*

1. *A 2'-10" minimum clear width stairway, or other arrangement having equivalent capacity, shall be provided at each end of the platform, arranged so as not to restrict exiting capacity from either trainway.*
 2. *Gates at the top of each stairway shall swing in the direction of access to the platform and shall not restrict patron flow rate from the walkway to the platform. Gates shall be locally alarmed.*
 3. *Gates, stairs, and landings shall conform to requirements of NFPA 101.*
 4. *The platform gates are intended to deter patrons from entering onto the trackway. The gates shall have a sign or signs installed, facing the platform, bearing the words. Refer to Standard Drawings for "end of platform warning sign" for sign detail.*
- F. *Egress from Utility and Equipment Rooms: All utility and equipment rooms shall have a sufficient number of exits which lead to a point of safety, as defined in CBC. The exit capacity shall be based upon normal occupancy and use of such rooms and conform to the CBC.*
- G. Refer to Facility Design/ Criteria/ ELECTRICAL, for station emergency lighting.

6.6 ADDITIONAL CODE, ACCESSIBILITY, AND SAFETY CRITERIA

- A. **Protection From Flammable And Combustible Liquid Intrusion:** Refer to Facility Design/ Criteria/ CIVIL/ Basic Design Policies, for requirements for protection of underground trainways from intrusion of flammable or combustible liquids. These requirements shall be applied to underground stations.
- B. **Protection From Water Infiltration And Flooding:** Structures shall be designed to minimize water infiltration and the probability of flooding. Stations shall be protected from flooding as specified for underground trainways.
- C. **Materials:** Combustible adhesives and sealants may be used when the requirements of Article 2.4.1A. under Fire Resistance and Smoke Generation are met.
- D. *Railings and guardrail shall comply with the requirements of CBC.*
- E. *Provide a tactile guide strip on the walking surface from bus unloading area through the accessible fare gate to the stairs leading to the platform for cane using visual impaired passengers. This strip shall be architecturally integrated using a textured surface of contrasting color.*

6.7 PLATFORM EXITING

Refer to Article 6.5 above.

6.8 CONCOURSE EXITING

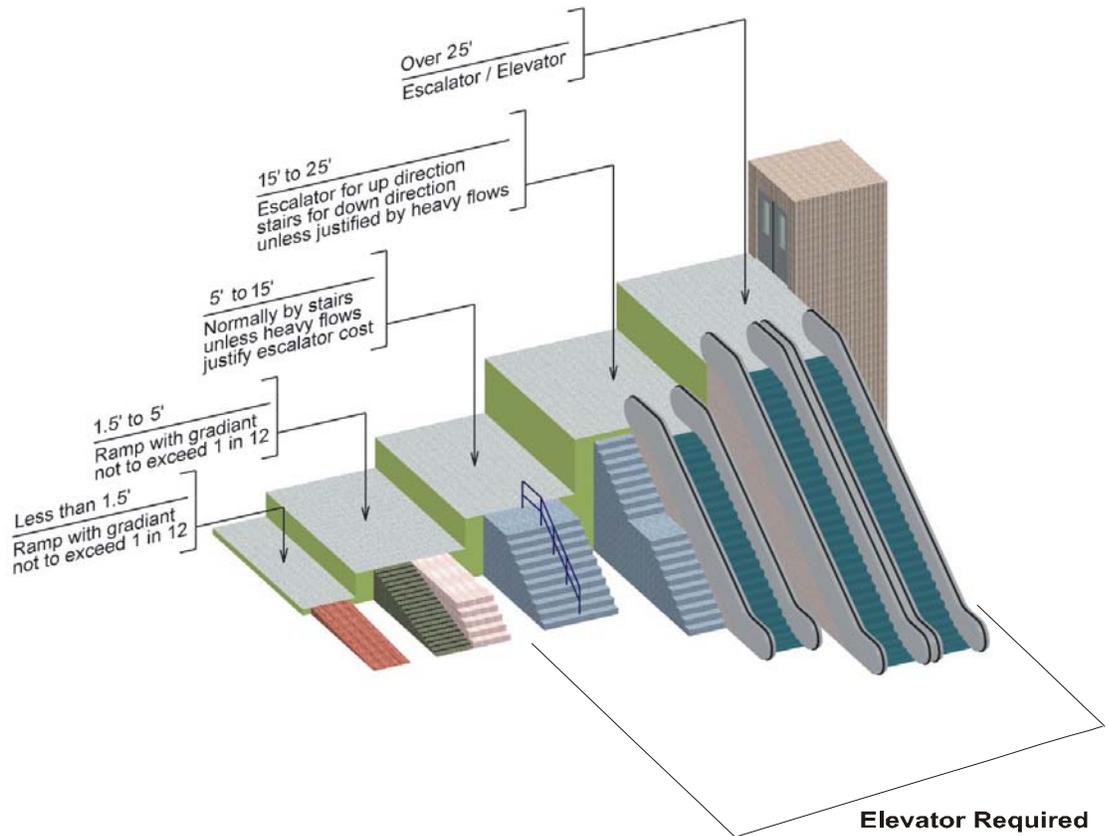
- A. **Integrated Entrances.** These entrances are those that directly connect to another property development without allowing access to a public way. These generally will be part of an adjacent retail or commercial property development. Since the operation of the property can affect the station entrance, they shall receive special consideration as follows:
- **Exiting.** An integrated entrance shall not be designated as a station or development emergency exit and therefore not be included in calculating exit capacity.
 - **Fire Separation.** Fire separation will be maintained between the Station and adjacent development via fire rated entrance enclosures, walls, floor, roof, etc. The station area shall be separated from the development entrance via fire doors or fire shutters. The fire doors or shutters shall be operated manually by station staff.

- Fire and smoke control. Provisions shall be made to assure that fire, contaminated air, or other emergency conditions in adjacent development shall not endanger the Station.
- B. Refer NFPA 130 and NFPA 101
- Mixed Occupancy egress requirement
 - Materials

7. VERTICAL CIRCULATION

Some of the basic principles to consider in planning station vertical circulation including stairs, escalators, and elevators are as follows:

- A. Escalators, elevators, and stairs shall be so situated that they carry passengers directly to the platform at locations convenient for boarding their particular train.
- B. Changes of direction should be avoided whenever possible.
- C. Vertical circulation elements shall be located at all levels to make direct routing possible.
- D. Elevators shall be provided to make the system accessible to the handicapped as well as to other passengers and staff personnel.
- E. Where escalators are provided, layout of vertical circulation elements shall facilitate the use of escalators in preference to stairs wherever possible.
- F. At center platform stations, provide at least two escalators between the platform and the concourse to permit simultaneous escalator operation up and down. In addition, include at least one stairway to provide an alternative route from platform to concourse.
- G. At side platform stations, provide a minimum of one escalator and one stair per platform in the station core.
- H. Consideration should be given to provide additional escalators at high traffic stations.
- I. Provide 8 feet 6 inches minimum headroom above these vertical circulation elements; 10 feet is preferred.
- J. Locations of vertical circulation elements shall be strategically designed to minimize local concentrations of patrons at either platform or concourse, and maximize even distribution of patrons along the entire length of a train.
- K. In addition to complying with minimum requirements indicated in item F and item G, use the following diagram as a guideline to select additional vertical transportation devices.



8. STAIRS

8.1 GENERAL

This article includes facility criteria of stairs located in passenger stations and parking structures. The criteria provide specific requirements for District facilities and identifies facility interfaces.

Stairs are the preferred means of vertical circulation for low rises (i.e., up to 15 ft); they are most cost effective and require low maintenance.

- A. Public use stairs intended to handle principal pedestrian flows shall have a minimum width of 5 feet 6 inches (3 lanes at 22 inch each). Other stairs for emergency service and secondary circulation shall have a minimum width of 3 feet 8 inches (2 lanes at 22 inch each).
- B. The quantity and location requirements for stairs are identified in Facility Design/ Criteria/ ARCHITECTURE/ Passenger Stations/ Stairs.
- C. For the purpose of determining the number of stairs required, the nominal egress capacity for stairs shall be based on the following rates:
 - 1. Two-way – 8.5 passengers per minute per foot width (LOS C)
 - 2. One-way - 11 passengers per minute per foot width (LOS D)
- D. See Table 4.2 regarding run-off/queue space at top and bottom of stair landings.
- E. All public use stairs shall be designed and constructed so that they offer maximum flexibility for possible future replacement with escalators with minimal disruption to station operations.

- F. Stairs fed by escalators shall be sufficiently wide to provide capacity at least equal to that of the escalator. Stairs adjacent to single escalators shall be considered as having a downward flow.
- G. Changes in direction at landings shall be avoided. Winding, curved, and spiral stairs shall not be allowed.
- H. At each station public use stairs shall be identified for bicycle access ways to the concourse, platform, and plaza levels. One or more routes shall be identified for convenience of bicyclists and safety of passengers. At each station, one or more selected stairways serving all levels of the station shall be designed and constructed to include bicycle stair channels. Refer to Bicycle Access and Parking Plan for bicycle stair channel guidelines including Stair Channel Priority Rankings.

8.2 CODE REQUIREMENTS

- A. *Stairs and handrails shall meet the requirements of the California Building Code. Refer to CBC.*
- B. *Noncombustible materials shall be used for stair construction.*
- C. *The stairs shall be of a slip-resistant material with a nosing that is distinct and meets the requirements of ANSI A117.1 and CBC. The slip-resistant materials used shall not require maintenance (other than normal housekeeping) to retain their slip-resistant qualities. The static coefficient of friction shall not be less than 0.6 when tested in accordance with ASTM (C 1028) 15.02.*
- D. *Except at intermediate landings, change in floor texture shall be provided for a minimum of 4 feet in front of the first riser at both top landing and bottom ends of stair runs.*
- E. *Minimum unobstructed space in front of stairs, at top and bottom, shall be 15 feet beyond the last riser. For stairs wider than 6 feet, the minimum distance shall be increased proportionally to the nearest whole foot.*
- F. *In any one flight, the minimum number of risers shall be two.*
- G. *For stairs used by the public (other than emergency exit only stairs), straight run stairs are preferable. Winders, curved stairs, and spiral stairs are prohibited.*
- H. *Where a stair is adjacent to an escalator, align the lower working points of both stair and escalator.*
- I. *Gutters and/or runnels along sides of stairs are not acceptable.*
- J. *At each station one or more selected stairwells serving all levels of the station shall be designed and constructed to include bicycle stair channels. Refer to Bicycle Access and Parking Plan for bicycle stair channel guidelines including Stair Channel Priority Rankings..*

8.2.1 Stair Widths

- A. *Public use: 5 feet 6 inches minimum (3 exit lanes at 22 inches each).*
- B. *Service stairs (staff use only): 3 feet 8 inches minimum (2 exit lanes at 22 inches each).*
- C. *Access/egress stairs from track bed to ends of platform: 2 feet 10 inches minimum; however, previous BART criteria, 2'-6" minimum may be acceptable if specifically approved by the District.*
- D. *Emergency stairs: 3 feet 8 inches minimum (2 exit lanes at 22 inches each). Provide areas of refuge for disabled where required by code.*

8.2.2 Stair Landings.

Straight run stair: Length of landing shall be 4 feet 6 inches minimum.

8.2.3 Tread-Riser Relationship.

For public use stairs (other than emergency exit only stairs), the slope shall be 30 degrees. Tread and riser relationship shall have a component slope of 30 degrees to the horizontal with a minimum riser of 6-1/2 inches and a maximum riser of 7 inches. A 6-3/4 inch riser and 12 inch tread is preferred.

8.2.4 Headroom

- A. *For protruding objects, measured perpendicular to the tread at nosing: 8 feet 6 inches minimum..*
- B. *For continuous soffits or ceilings, without obstructions: 10 feet minimum.*

8.2.5 Handrails

- A. *All stairs in excess of 7 feet 4 inches wide shall have center handrails spaced not more than 5 feet 6 inches apart.*
- B. *Height of handrail at stairs, stair landings, and top and bottom of stairs: 2 feet 10 inches measured vertically from the top of the tread, at the nosing, to the top of the handrail.*
- C. *Handrails shall be continuous and meet the requirements of ANSI A117.1 and CCR, Title 24. Handrails shall be continuous through landings for the full length of the stair.*
- D. *Where a stair is adjacent to an escalator, the stair handrail shall not be higher than the escalator handrail decking.*

8.2.6 Stairway Marking

- A. *Nosings of each step and landing shall be slip-resistant and of contrasting color and texture to alert the visually impaired. Nosing shall be a minimum of 3 inches wide and include the nose of the step or landing.*
- B. *When stairs are poured-in-place concrete finish, a manufactured integral nose guard meeting the above requirements shall be used.*

9. ESCALATORS

9.1 GENERAL

This article includes facility criteria of escalators located in passenger stations and parking structures. The criteria provide specific requirements for District facilities and identify facility interfaces. Specific criteria for the manufacturing are identified in Standard Specifications Section 14 31 00, Escalators.

Escalators are most suitable for high traffic volume or medium rises (i.e., 10 ft to 30 ft).

- A. All escalators shall be 48 inches in nominal width and have 3 flat steps at top and bottom landings and shall be bi-directional.
- B. All escalators shall be of weatherproof construction, regardless of location, so that water, wind or temperature will not interfere with normal operation.
- C. Escalators shall be in a secured area when the stations are closed and shall be located under cover. Escalators to street level from downtown underground stations shall be provided with weather-shielding enclosures. Enclosure shall be securable.
- D. For the purpose of determining the number of escalators required, the nominal egress capacity for escalators shall be based on the following rates:

1. Escalators at 90 fpm - 4050 passengers/hour (67.5 passengers per minute (ppm))
2. Escalators at 100 fpm - 4500 passengers/hour (75 ppm)
3. Escalators at 120 fpm - 5400 passengers/hour (90 ppm)

A consistent speed for all escalators in a station is recommended. The speed of 100 fpm is preferred.

- E. For the purpose of determining other requirements, such as number of fare gates and surrounding space requirements, these items shall be designed based on the maximum capacity of escalators which is the double rate listed in above paragraph E.
- F. See Table 4.2 regarding run-off/queue space at top and bottom of escalator landings.
- G. At the top and bottom, the distance between the escalator working point and the pit opening shall be at least 12 feet to provide adequate maintenance space in the escalator pits.
- H. At the top and bottom of each escalator, there shall be a barrier along both sides to assist in queuing/run-off at the escalator. The barrier shall be between 36 to 42 inches high and between 36 to 48 inches in length measured from the escalator newel as described in paragraph G.
- I. Escalator well ways shall not be used as easements for any other systems that are not related to the escalator.
- J. Architectural cladding surrounding the escalator well way shall not be supported by the escalator truss.

9.2 ***ELECTRICAL***

- A. All escalators shall be operated by 480 volt, 3-phase power.
- B. A dedicated 120 volt circuit shall be provided to each escalator wellway for pit lighting and receptacles. If 120 volt power is required for the operation of the escalator, then a step down transformer shall be powered from the main 480 volt escalator power.
- C. Illuminated signage near the entrances of the escalator shall be interfaced with the escalator if there is no adjacent stair. The signage shall be 277 volt power and be controlled based on the direction of the escalator. A separate conduit shall be provided from the signage to the escalator controller.
- D. *The lighting levels along the entire escalator shall comply with the requirements of the Facility Design/ Criteria/ ELECTRICAL.*
- E. *Electrical Interlocking with Rolling Grille: When an escalator may discharge patrons into an area bounded by a rolling grille, the following code requirements shall be applied, as applicable. An electrical interlock shall stop the escalator from running when the coiling grill is not fully opened. Electrical interlock with rolling grille shall meet the requirements CCR Title 8.*

9.3 ***COMMUNICATIONS AND SEISMIC SENSOR***

- A. Refer to Facility Design/ Criteria/ ELECTRONICS/ Public Address and ELECTRICAL for detailed requirements of public address announcement and escalator shut-down in the event of fire alarm within the station.

- B. *All escalators shall be stopped in the event of seismic event near the Station. The station seismic sensor shall be installed in the Train Control Room or Communications Room in the Station. The switch shall activate and shutdown the escalators upon excitation in a vertical direction of not more than 0.15 times gravity acceleration. The frequency response of the switch shall be 1HZ to 10HZ. Upon shutdown, the escalator shall activate the emergency alarm bell for at least 15 seconds but not more than 20 seconds, at which time the main power shall be interrupted from the escalator drive machine and the escalator brake shall be applied.*
- C. For escalator remote monitoring and indication at the Station Agents Booth, refer to Facility Design/ Criteria/ ELECTRONICS/ Supervisory Control and Data Acquisition (SCADA).
- D. Refer to Station Agent Booth requirements herein. Escalator running up/running down/stop signal for each escalator shall be provided at the Station Agent's booth.

9.4 MECHANICAL

- A. The escalator well way shall be equipped with a floor drain at the lower end. Refer to Facility Design/ Criteria/ MECHANICAL/ Stations and Station Sites for requirements for drainage from escalator. The escalator well way shall be of continuous concrete construction or continuous heavy gauge galvanized steel oil/water drip pan with side walls at least 3 feet high installed within a minimum 2-hr fire rated well way structure.

10. ELEVATORS

10.1 GENERAL

This article includes facility criteria of elevators located in passenger stations and parking structures. The criteria provide specific requirements for District facilities and identifies facility interfaces. Specific criteria for the manufacturing are identified in Standard Specifications Section 14 21 00, Electric Traction Elevators, and Section 14 24 00, Hydraulic Elevators.

Elevators are most suitable for high rises and constrained sites and meet the needs of nearly all passengers.

- A. In all stations, at least one elevator shall serve the platform, concourse, and street levels. Where the configuration of the station is such that one elevator cannot serve all levels and areas, additional elevators shall be installed to provide full access for the elderly and disabled. If additional elevators are necessary to reach all levels of the station, then the elevators shall be located as close as possible to each other. Free and paid areas shall not be accessible from the same elevator (i.e. the elevator to the train platform shall be located within the paid area of the station).
- B. Refer to California Code of Regulations to determine the number of elevators required for access by patrons with disabilities. Where a second elevator is required for access by disabled patrons, the second elevator may, with District approval, serve both free and paid areas with provision to block access to paid areas except when first elevator is out of service. In addition, where the capacity of a station and the configuration of vertical transportation indicate the need for more than one elevator, consider additional elevators.
- C. A duplicate elevator that serves all levels shall be considered for stations that have patronage in excess of 15,000 patrons per day.

- D. A dedicated room shall be provided as the elevator machine room. An elevator machine room may service multiple elevators.
- E. Elevator machine rooms shall be located as close as possible to the elevator hoistway, but shall not exceed 100 feet.
- F. Refer to Facility Design/ Criteria/ ELECTRONICS/ Telephone Systems for communication requirements in regard to elevators.
- G. Wayfinding signage to assist patrons in locating elevators shall be provided. Signage shall be accessible to patrons with disabilities. Signage indicating elevator locations shall be carefully designed so as not to misdirect passengers toward the sign but away from the elevator. Elevators shall be signed as part of bicycle access routes.
- H. Elevator hoistways shall be constructed to meet the code requirements of the building but shall be a minimum of 2-hr fire rated construction.

10.2 ELECTRICAL

- A. All elevators shall be operated by 480 volt, 3-phase power from the emergency power source of the 480-volt switchboard or emergency generator.
- B. There shall be a minimum of four dedicated 120 volt circuits provided for each elevator, unless the elevators are group by one controller; elevator cab lighting and ventilation, CCTV, elevator machine room lighting and receptacles, and hoistway pit lighting and receptacles.
- C. The lighting levels in the elevator cab, at hoistway entrances, and in machine rooms shall comply with the requirements of the Facility Design/ Criteria/ ELECTRICAL.
- D. Elevator machine rooms shall be equipped with smoke detectors that interface with the elevator controller via the main fire alarm panel.

10.3 COMMUNICATIONS AND SEISMIC SENSOR

- A. *All station and parking structure elevators shall be shutdown upon occurrence of a seismic event near the Station. The elevators shall be connected to the seismic sensor described in paragraph 7.3 above. If a separate seismic sensor is provided in the parking structure, it shall be installed in one of the auxiliary communications room in the structure.*
- B. For communications systems related to elevators including white courtesy telephone inside and at entrances to elevators, fire alarm, seismic, CCTV cameras, remote monitoring and control indication of elevators in the Station Agent's Booth, refer to the appropriate section in the Facility Design/ Criteria/ ELECTRONICS.

10.4 MECHANICAL

- A. Refer to Facility Design/ Criteria/ MECHANICAL/ Stations and Station Sites for requirements for drainage from elevator pits.

10.5 OTHER REQUIREMENTS

- A. The hoistway doors shall be a minimum of 42 inches in width and 84 inches in height. Elevator doors and hoist way doors shall have glass vision panels. Elevator doors shall be center opening. Side opening doors may be considered with an approved Variance.

- B. *The elevators shall be equipped for Fire Service according to ASME A17.1.*
- C. *All elevators shall be sized for emergency evacuation of a horizontally positioned stretcher.*
- D. Interior of elevator hoistway and outside of elevator car shall be painted.
- E. Station elevators shall typically be hydraulic type; parking structure elevators shall be traction type.
- F. Finish floor at entrances to elevators shall slope away from hoistways to prevent direct flow of water towards cabs and pits.
- G. Elevator machine rooms and auxiliary machine spaces shall be sized to accommodate the elevator and related equipment with ample space for maintenance and replacement of all equipment located in the machine room. The main machine room floor area shall be at least 150% of the square footage required by NEII.
- H. Machine room shall have clear headroom of 84 inches minimum. Auxiliary machine spaces located at the top of hoistway shall have clear headroom of 60 inches minimum.
- I. For platform signs directing passengers to the elevators, the font and size displaying an elevator's location within the station shall be consistent with the Wayfinding Hierarchy as defined by the District Architect.

11. MECHANICAL AND PLUMBING SYSTEMS

11.1 GENERAL

This Article establishes the architectural facilities criteria of the mechanical systems for the stations, parking structures, station sites, and miscellaneous facilities. The mechanical systems are heating, ventilation, and air conditioning (HVAC); fire protection; and plumbing and drainage. For specific mechanical criteria refer to Facility Design/ Criteria/ MECHANICAL/ Stations and Station Sites.

Common utilities chase/routes shall be provided throughout the station to accommodate immediate and anticipated future requirements. Utility chases shall be concealed from public view and accessible for maintenance and future modifications.

11.2 HVAC CRITERIA

The following general architectural design guidelines shall apply wherever mechanical ventilation systems are required.

- A. The wall-mounted thermostat shall be located 5'-6" high.
- B. Sound attenuators shall be provided in heating, ventilating, and air-conditioning systems to meet the requirements of the Noise and Vibration criteria.
- C. Air outlets shall be located to minimize the impact of noise on the neighbors and no lower than 8 feet at station public areas.
- D. Door openings to mechanical rooms shall be a minimum 6 feet wide.

11.3 FIRE PROTECTION CRITERIA

- A. *Fire Hose Cabinets. Cabinets shall be recess mounted in station public areas where possible and surface mounted elsewhere. In public areas, they shall be satin finished stainless steel*

construction with hinged door unless otherwise shown on the Standard Drawings. Except as otherwise shown on Standard Drawings, fire hose cabinets shall be as required by code, in unlocked stainless steel cabinets with solid doors labeled "FIRE HOSE CABINET" in red color at parking structures and black for stations. Fire hose cabinets at parking structures which only contain fire hose may be commercially available stainless steel cabinet, in lieu of cabinet shown in Standard Drawings.

- B. Fire Suppression System. Fire suppression system shall be provided in the train control and communication rooms. Refer to Standard Specifications Section 21 22 00, Clean Agent Fire Extinguishing System.*
- C. Automatic Fire Sprinklers. Automatic fire sprinkler head locations shall be in straight alignment and coordinated with light fixtures, air outlets and other items attached to ceiling and surroundings. In public areas and other areas with finished ceilings, piping shall be concealed. Where exterior exposed piping is permitted, piping shall be mounted flush to bird roosts.*
- D. Fire Water. Fire water pipe shall enter into the building through the outside wall rather than underground through the perimeter foundation or floor slab. Where the fire water pipe enters building through an outside wall, it shall be concealed from public view.*
- E. Fire Extinguishers. Fire extinguishers shall be provided as required by code and these criteria in unlocked recessed stainless steel cabinets in public areas. Fire extinguisher cabinets in non-public areas may be surface mounted. Cabinets shall have solid doors labeled "FIRE EXTINGUISHER" in red in parking structures and in black in stations.*
- F. If District requires, provide cabinets (for extinguishers and hoses) with glazed panels in doors so that District personnel can check for hidden objects within opening cabinet.*

11.4 PLUMBING AND DRAINAGE CRITERIA

Domestic Water Supply. Where the domestic water supply pipe enters building through an outside wall, it shall be concealed from public view. Isolation valves shall be located within a non-public room or an enclosed area. If it must be located outside, it shall be in a valve box concealed from view. When the valves are located in a room, the pipes shall enter through the outside wall rather than underground through the perimeter foundation or floor slab. These exposed pipes shall be concealed from public view. All valves shall be accessible without use of ladders or lifts.

11.4.1 Domestic Water System.

- A. Pressure reducing manifold shall be located within a non-public room or an enclosed area. When the valves are located in a room, the pipes shall enter through the outside wall rather than underground through the perimeter foundation or floor slab. The exposed pipe shall be concealed from public view.*
- B. When hose bibs or wall hydrants are required in the same room or area as electrical receptacles, they shall be aligned, arranged symmetrically, or otherwise organized so that such devices so not appear haphazard.*

11.4.2 Sanitary and Industrial Waste Drainage Systems.

- A. Floor clean-out locations in public and staff spaces shall be coordinated with the architectural floor finish pattern and as approved by the District.*

- B. Wall clean-out access panel locations in public and staff spaces shall be coordinated with the architectural wall finish pattern and as approved by the District.

11.4.3 Storm Water Drainage Systems

- A. All floors in spaces requiring floor drains shall be sloped to the drain a minimum of 1/8-inch vertical in 12 inches horizontal.
- B. Roofs shall be sloped to the drains a minimum of 1/4-inch vertical per 12 inches horizontal. Downspouts for roof drains shall be accessible for maintenance and replacement and shall be concealed from public view wherever possible unless a daylighted drainage program calls for visible drainage. Drains and downspouts shall meet all maintenance and safety requirements.
- C. Under platform utility chase shall be provided with floor drains, unless chase is protected from water intrusion.

12. ELECTRONICS

12.1 GENERAL

The station shall be equipped with Communications systems for use by BART operations staff and the convenience of patrons. This Article provides a brief description of these systems and detailed requirements including equipment and device locations within the station are covered in the Facility Design/ Criteria/ ELECTRONICS. Refer to Facility Design/ Criteria/ ELECTRONICS/Telephone Systems for the following telephone systems:

- PABX Telephones
- Courtesy Telephones
- Emergency Call Boxes
- Fire Phone
- Emergency Telephone

12.2 PUBLIC TELEPHONES

- A. *Public pay phones shall be provided in both free and paid areas of each station. Public phones shall be located so that they will not interfere with pedestrian flow. A minimum of two public pay telephones shall be located in both the free and paid areas on the concourse level and a minimum of two on the platform level of the station. Unless otherwise indicated, the District will make arrangements for public telephone installation.*
- B. *Wall-mounted telephones are preferred to freestanding booths.*
- C. *At a minimum, one telecommunication display device for the hearing impaired (TDD) shall be available in the free area at the concourse and one at each platform.*
- D. *Public telephones shall comply with CBC and ADA accessibility requirements including mounting heights and signage.*
- E. *At least one telephone in each bank of public telephone shall be mounted to be accessible to the disabled. A bank consists of two or more adjacent phones.*
- F. *Emergency "911" service shall be provided at each pay phone. Money will not be needed to access the "911" service. Signage shall be provided by each telephone station indicating the availability of the "911" service and procedure for its use.*

12.3 PRIVATE TELEPHONES

Conduit and terminal space shall be provided for each concession booth or kiosk for future service from the telephone service company.

12.4 PUBLIC ADDRESS SYSTEM

- A. *All stations shall have a public address system for communicating with patrons and employees. This system provides one-way voice communication from the Station Agent Booth, from PABX telephone sets with PA access, from the Emergency Management Panel, and from Central Control to the patrons by means of speakers located throughout the station public and ancillary areas. Refer to Facility Design/ Criteria/ ELECTRONICS/ Public Address System.*
- B. *The station audible fire alarm signaling shall be via the PA System as described in Facility Design/ Criteria/ ELECTRONICS/ Public Address System and ELECTRICAL. The design of the PA System shall be subject to the review and approval of the local jurisdictional authority.*

12.5 TRUNK RADIO SYSTEM

An antenna system shall be located on the concourse and platform levels as well as in long corridors and pedestrian underpasses to provide radio coverage in all areas of the station. The system shall be concealed or otherwise made unobtrusive within the station architecture. Refer to Facility Design/ Criteria/ ELECTRONICS/ Trunk Radio System.

12.6 CLOSED-CIRCUIT TELEVISION (CCTV) SYSTEM

A CCTV system is provided for surveillance of public areas in the station and station site from the Station Agents Booth, Central Control, Police Rooms, and Emergency Management Panel Room. Refer to Facility Design/ Criteria/ ELECTRONICS/ Closed-Circuit Television System.

13. SANITATION AND MAINTENANCE

13.1 BASIC DESIGN OBJECTIVES

- A. To provide facilities for an efficient maintenance program.
- B. To integrate maintenance elements in the basis of station design, without detracting from the appearance of the stations.
- C. To provide standardized facilities within each station and, where possible, between stations to minimize the inventory of replacement items.

13.2 GENERAL CRITERIA

- A. A program of routine maintenance requires access to many parts of stations and their sites. Elevated areas of stations shall be accessible for maintenance by portable equipment such as ladders. Stations requiring special maintenance equipment are unacceptable, unless specifically approved by the District.
- B. A truck-mounted "cherry-picker" can be used for maintenance of pole-mounted lighting on station sites and for other relatively inaccessible portions of station exteriors.

- C. In the maintenance of station interiors, access shall be provided to lighting fixtures and other equipment located directly above stairs, escalators, or light wells. Access shall also be provided for maintenance of wall surfaces adjacent to and above escalators and stairs. Access to roof-mounted equipment shall be by fixed ladders.
- D. Normal station maintenance shall not be conducted from the trainway (except for maintenance of the trainway area itself), nor shall maintenance equipment normally be brought into stations through the trainway. Maintenance and operation programs requiring the use of trainway areas and equipment will not be acceptable.
- E. Horizontal ledges shall be avoided to minimize the collection of dust and debris and to prevent bird roosting. The exposed top surfaces of outriggers, beams, parapets, and window ledges shall have a minimum slope of 35 degrees to horizontal. Elements such as signs and lighting fixtures shall be selected and designed to prevent bird roosting.
 - 1. Where architectural treatment of stairs, escalators, and visual openings include use of parapets or otherwise create horizontal ledges, slope the top of parapet or ledge away from the vertical circulation elements and visual openings to prevent objects being placed upon them.
- F. *Handrails, door pulls, and other protruding elements shall have a 1-1/2-inch minimum clear space behind them. Refer to CBC for maximum clearance for certain elements, i.e. handrails.*
- G. Signs and advertising panels shall be designed and located to require minimum maintenance.
- H. Cleanouts and access panels shall be located inconspicuously and to the extent practicable in non-public areas. In public areas, access panels shall be provided with key lock.
- I. *Wall-mounted equipment, including portable equipment, shall be flush, unless required otherwise by the District.*
- J. Notches in walls for flush-mounted equipment shall not extend down to the floor unless necessary to provide access for the disabled. Bottoms of such notches shall be not less than 6 inches above the adjacent floor at any point. Objects which project from walls more than 3 inches shall be mitigated at floor level for the sight impaired in accordance with ADA requirements.
- K. Where equipment is freestanding, it shall have its own integral base fitted tight to the floor. Where equipment is grouped, flush closure strips shall be used to cover spaces between units.
- L. Structural and architectural elements which project from walls shall be avoided. Where an element projects more than 3 inches from a wall, verify that floor and wall surfaces below or adjacent to the projecting element are easily accessible for cleaning.
- M. Signs, handrails, and benches shall be securely anchored with phillips head or allen head screws or bolts. If heads are exposed, use flush spanner head screws. Use socket head screws if heads are concealed from view.
- N. *Areas under stairs and escalators with headroom of less than 8-foot-6-inches shall be enclosed to prevent collection of debris and to eliminate headroom hazard.*
- O. Refer to Article entitled Trash and Newspaper Receptacles herein.
- P. Bases shall be covered for floor cleaning machines.

14. NOISE AND REVERBERATION CONTROL

14.1 GENERAL

These provisions apply to the design of stations.

14.2 PURPOSE

The inclusion of acoustical treatment in the design of stations is required to accomplish four major purposes:

- A. Control and reduction of noise from transit vehicle operations.
- B. Provisions for good intelligibility of announcements from the public address system.
- C. Control of noise in enclosed areas generated by patrons and/or exterior sources.
- D. Assistance in the control of noise from station air handling equipment, vertical circulation equipment, and any other station mechanical equipment.

The design goal maximum noise levels in stations are presented in Table 14.2-1. The noise levels inside stations are dependent on the design of the transit vehicles and station mechanical equipment, noise from traffic outside station, and on the acoustic treatment in stations. The criteria for the acoustic treatment take into account the general architectural characteristics of the BART stations and the noise to be radiated by the transit cars and other noise sources.

On platform, trains entering and leaving: Ballast and tie trackbed Concrete trackbed	75-80 dBA 80-85 dBA
On platform or in concourse areas, noise from traffic on nearby streets, highways or expressways (peak hour)	70 dBA L_{eq}
On platform or other public areas, noise from any ancillary mechanical or vertical circulation equipment	55 dBA
Noise in station agent booths or offices due to ventilation system and booth equipment	50 dBA

Table 14.2-2 summarizes the criteria for reverberation time and acoustic treatment of the various enclosed or partially enclosed areas of stations.

Table 14.2-2 Summary of Station Acoustic Design Criteria			
(Applicable to enclosed or partially enclosed areas)			
	Areas Exposed to Street Traffic and Railroad Noise	Concourse Areas	Enclosed Platform Areas (Train Rooms)
Maximum Reverberation Time (500 Hz)	1.2 to 1.4 sec.	1.2 sec.	1.5 sec.
Maximum Mechanical Equipment Noise		55 dBA	55 dBA**
Treatment:			
Minimum wall/ceiling area	20-25%*	35%***	35%***
Minimum ceiling only	70-100%*		
Treatment Properties:			
Minimum 500 Hz absorption coefficient	0.6	0.6	0.6****
Minimum Noise Reduction Coefficient	0.6	0.6	0.6****

- * Large openings in enclosed spaces may be considered as acoustical treatment for the purpose of calculation.
- ** 50 dBA maximum in station agent booths.
- *** Including at least 50% of ceiling area.
- **** Underplatform treatment also required--minimum absorption coefficient of all acoustical treatment at 250 Hz: 0.4; at 500 Hz: 0.65.

14.3 STATION INTERIOR ACOUSTICAL DESIGN

The design of absorption treatment for enclosed areas consists of three basic steps:

- A. Determine required reverberation times and quantities of absorption.
- B. Determine locations that will provide maximum control of noise.
- C. Select acoustical materials and design material installations.

14.3.1 Reverberation Time and Absorption Quantity

As summarized in Table 14.2-2, the acoustical criteria for stations include maximum reverberation time at 500 Hz, minimum areas for treatment, and minimum absorption properties.

- A. Enclosed Platform Areas (Train Rooms):

Analysis of enclosed platform areas indicates that optimum treatment is obtained with a reverberation time of about 1.3 seconds. Reverberation time in the platform areas shall be 1.2 to 1.5 seconds.

The acoustical treatment shall be continuous and uniform for the entire length of the enclosed space. When the enclosed platform areas have a relatively constant cross-section, it is most appropriate to define the quantity of treatment in terms of treatment per foot of station platform length. From this, the width of treatment required as a function of the absorption coefficient of the material can be determined.

- B. Concourse and Corridor Areas:
The reverberation time shall not exceed 1.2 seconds for enclosed concourse areas such as fare collection areas and corridors.
- C. Station Areas At- or Above-Grade:
Areas exposed to street noise can be increased to the range of 1.2 to 1.4 seconds at 500 Hz.
- D. Ancillary Areas:
For the purposes of acoustical design, ancillary areas include service rooms, toilets, mechanical/electrical equipment rooms, and train control and communications equipment rooms. Access to these noisy areas shall be through double-entrance doors or sound treated doors. Any of these areas used by the public or next to public spaces shall receive appropriate acoustical treatment.

14.3.2 Location of Absorption Material

The preferred locations for acoustical treatment in stations are described below.

- A. Enclosed Platform Areas (Train Rooms):
Continuous treatment of the under platform overhang surface in enclosed platform areas shall be provided for the effective control of train noise since most train noise originates in this area. Although it is also very effective to treat the side walls opposite the platform, spray acoustical material shall not be used in this area because it becomes dirty and unsightly. Refer to Standard Specifications, Section 09 83 14, Acoustic Coating, for spray-applied acoustical finish for under platform surfaces.
The criteria call for coverage of 35 percent of the total projected wall and ceiling area with acoustical treatment in addition to the under platform treatment.
- B. Concourse and Corridor Areas:
All enclosed public areas of the station shall receive acoustical treatment equal to a minimum of 35% of the total projected wall and ceiling area, or the equivalent, including coverage of at least 50% of the ceiling area where possible. In narrow spaces, treatment may be concentrated on the ceiling, covering 70% to 100% of the ceiling area. Acoustical material in public areas shall be placed a minimum of 9 ft from floor surfaces. Large openings in enclosed spaces may be considered as acoustical treatment for the purpose of calculation.
Ceiling treatment shall be placed between structural members or directly on the ceiling surface for flat ceilings. Wall treatment shall use appropriate panel assemblies or direct wall-mounted materials.
- C. Ancillary Areas:
As required, toilet, locker and service rooms shall have acoustical treatment applied to the ceilings for control of reverberation and noise. The acoustical absorption material shall have an NRC of at least 0.55.
As required, electrical equipment rooms with noise generating equipment shall have acoustical treatment covering the ceiling. The acoustical material shall be an equipment room type of ceiling/wall treatment, for example, 1" thick glass fiber boards, and shall have an NCR of at least 0.65. Mechanical equipment rooms housing fans, pumps, and other equipment which generate high sound levels shall have a sound absorption treatment equivalent to 2" thick glass fiber board or blanket (minimum NRC of 0.75) applied to cover the ceiling and wall areas as required. In other spaces with equipment which generates only low or moderate noise, the acoustical treatment shall be as indicated above for electrical equipment rooms.

14.3.3 Acoustical Materials and Installations

This Article covers the selection and application of appropriate acoustical materials for stations. Acoustical treatment for transit system stations consists of three elements: The sound absorption media or material, a protective covering, and an architectural or trim facing.

- A. Materials: All acoustical materials, covers and trim shall be in accordance with NFPA-130. Typically, spray-applied material is used in non-public spaces only (and under platform areas). Glass fiber blankets shall be used in dry areas only. Absorption materials for wall and ceiling treatment shall be:
- Cellular glass blocks behind corrosion-resistant perforated sheet metal facings or slit-and-slat system facing. The material shall be of 2" or 4" thickness in platform areas, 2" thickness in concourse areas and 1.0" to 1.5" thickness at other locations. This material is to be used because of its non-flammability and lack of need for protective covering or mechanical protection in most applications.
 - Spray-applied cement base acoustic finish material that is free of asbestos and mineral fibers. The material should be 1.5" to 2" thickness in platform areas, 1.5" thickness in concourse areas and 1" to 1.5" thickness at other locations. This material is to be used because of its non-flammability, applicability to irregular surfaces, and lack of need for protective covering or mechanical protection in most applications. For design purposes, the expected sound absorption coefficients for cementitious spray-on material are given in Table 14.3-1.

Table 14.3-1 Cementitious Spray-On Sound-Absorption Coefficient							
*							
Material Thickness	Frequencies in Hz						NRC**
	125	250	500	1000	2000	4000	
1"	0.18	0.30	0.64	0.73	0.73	0.77	0.60
1.5"	0.36	0.51	0.64	0.74	0.84	0.91	0.70

* Sound absorption coefficients for cementitious spray-on, sound absorption material with proper application on solid backing with no air gap--as measured by ASTM C423 (may vary from manufacturer to manufacturer)

** Noise Reduction Coefficient

- Glass fiber blankets wrapped in close-weave glass cloth or other non-flammable sheeting not to exceed 0.004" thickness. This material shall be of 2 to 16 lb/cu ft density and of 2" to 4" thickness in platform areas, 2" thickness in concourse areas and 1" thickness at other locations. Mechanical protection facings of hardware cloth, expanded metal or architectural facings, or perforated metal or slit-and-slat panels shall be used with this material, as indicated on the Contract Drawings. For design purposes, the expected sound absorption coefficients for glass fiber treatment are given in Table 14.3-2.

Table 14.3-2 Glass Fiber Sound-Absorption Coefficients

Material Thickness	Frequencies in Hz					NRC**
	125	250	500	1000	2000	
1"	.08	.30	.65	.80	.85	.65
2"	.20	.55	.80	.95	.90	.80
3"	.45	.80	.90	.95	.90	.90

* Typical sound absorption coefficient to be expected from glass fiber sound control materials mounted directly against a concrete surface.

** Noise Reduction Coefficient.

B. Installation:

Wherever perforated metal or slit-and-slat facings are used, the open area shall be at least 30% of the total area. Air space should be provided around the edges to allow free circulation of air to prevent loading of the acoustical material panels due to air pressure transients created by the train movements. Panels with perforated metal or slit-and-slat facings for ceiling and wall installations shall have a dimpled screen placed between the metal facing and the face of the acoustic blanket to establish an air space of approximately 0.5" thickness between the perforated facing and the blanket or glass-cloth bag.

If a continuous panel acoustical system or a suspended acoustical tile ceiling is used, openings shall be provided to permit free air flow between the panels and the concrete surface behind. This shall be done in order to prevent loading of the acoustical panel by the air pressure transients created by train piston action on the air. All acoustical systems shall have positive mechanical anchorage designed to resist the shock of transient air pressure produced by the movement of a train moving through a station at maximum speed.

14.4 STATION AREAS RELATED TO NOISE FROM TRAFFIC AND RAILROAD OPERATIONS

A. Criteria:

The following areas of the stations shall be shielded from highway and railroad noise to the extent possible:

- Entrance areas
- Stairs
- Escalators
- Elevators
- Platforms
- Corridor and concourse areas
- Staffed facilities

The reverberation time of enclosed areas shall be in the range of 1.2 to 1.4 seconds at 500 Hz when the area is unoccupied.

- B. Acoustical Treatment: A width of treatment equivalent to 20% to 25% of the cross-sectional perimeter, or 70% to 100% of the ceiling, is required. The treatment can consist of an absorptive wall panel system, an acoustical panel, an acoustical absorption assembly applied to the ceiling, or a combination of these. The acoustical treatment shall have a Noise Reduction Coefficient (NRC) of at least 0.60, and a minimum sound absorption coefficient of 0.60 at 500 Hz.

15. **ANCILLARY FACILITIES**

15.1 **GENERAL**

This Article describes specific architectural criteria for non-public areas in the stations other than those areas, which serve the BART employees and serve as storage areas. Architectural design criteria are mentioned where applicable. These areas shall be accessible to the disabled except where noted otherwise or specifically except by the District. For additional architectural criteria and specific electrical and mechanical design criteria, refer to other articles in this Section and Facility Design/ Criteria/ MECHANICAL and ELECTRICAL.

15.2 **TRAIN CONTROL ROOM**

- A. The train control room shall contain all apparatus and systems required for the control of trains on the main line and in the yards. Train control room shall be sized at least 30 percent over the necessary designed capacity.
- B. The floor shall be finished with resilient tile and cove base.
- C. Provide a space of 10' x 10' for a drawing storage rack cabinet, a drawing reference table, and an office chair to be provided by the District.
- D. The roof/ceiling structure shall be designed to support cable trays as well as conduit, ducts, and lights.
- E. Lighting shall be located over the aisles between cabinets.
- F. *Provide a ramp for equipment removal if the floor elevation of the train control room is different than the floor elevation of the adjoining area. Size door openings to permit equipment removal and replacement.*
- G. Room shall contain terminal cabinets for communications, automatic fare collection, radio, computer systems, and other communication systems.
- H. No equipment other than train control and communications shall be located within this room. No utility shall be routed through this room unless it serves the train control and communications equipment or the space itself. Power transformers and other large heat emitting components shall not be located in the Train Control Room.
- I. *Provide 3/4 thick fire-retardant treated plywood (5 ply, CDX grade) panels at all walls used for mounting equipment. Panel shall be 4 by 8 feet mounted horizontally with the bottom of panels at the height of 3 or 4 feet above the foot.*

15.3 **BATTERY ROOM (UPS)**

- A. *Battery systems shall be in a separate enclosed room next to the Train Control Room.*
- B. *Battery rooms shall not be located beneath any means of egress. Locate Battery Room adjacent to outside wall when possible to facilitate provisions for natural ventilation.*
- C. *Battery rooms, containing liquid-filled batteries, shall have spill control containment around battery racks.*

- *Spill control containment shall be designed for containment and neutralization of electrolyte.*
 - *The storage capacity of the containment shall be sufficient to hold a spill from the largest battery container.*
 - *An emergency eyewash shall be provided for personnel decontamination, and shall be located in the immediate area of the battery and battery charging room(s). The emergency eyewash shall be permanently connected to the potable water supply. Unit shall be located near the exit door. This unit will have integral signage that meets OSHA standards..*
 - *Flame arrestors shall be installed in all new stationary battery installations to comply with NEMA and NFPA.*
 - *The entire floor shall be coated with acid-resistant epoxy and sloped to an acid-resistant coated floor drain.*
- D. The interior walls and ceiling shall be painted or sealed for a nondusting finish.*
- E. Battery racks shall be provided for maximum protection against battery damage and earthquakes, and for ease of accessibility. The battery racks shall be braced for seismic restraint and shall be coated with acid-resistant paint..*
- F. The floor and base shall be finished with a novolac epoxy or vinyl ester coating.*
- G. The battery racks shall be arranged so that the racks are held away from the wall at 2 feet minimum, not stacked on top of each other preventing removal of the lower battery, and shall have at least 3 feet clear space in front.*
- H. The battery room light switch shall be installed outside the battery room.*
- I. The battery charger shall be installed outside the battery room*
- J. For ventilation and plumbing requirements, refer to Facility Design/ Criteria/ MECHANICAL, Stations and Stations Sites.*
- K. Signage shall be posted on the doorways to battery rooms prohibiting smoking and use of equipment which creates, sparks or open flames because of the possible presence of hydrogen gas. Signage prohibiting access by unauthorized personnel shall also be posted on the battery room doors. Refer to Facility Design/ Criteria/ ARCHITECTURE/ Signage.*

15.4 TRAIN CONTROL AND COMMUNICATIONS HVAC ROOM

Separate room for HVAC equipment for Train Control and Communications Room shall be provided. If required by the local fire department, fans shall reverse direction in case of fire for smoke removal.

15.5 TRACTION POWER SUBSTATION

If the Station includes a traction power substation, provide a separate secured area to enclose its equipment. Access shall be provided to allow the removal and replacement of the largest single piece of equipment. For maximum security fencing, see Facility Design/ Criteria/ CIVIL/ Miscellaneous Standards.

15.6 EMERGENCY MANAGEMENT PANEL ROOM

The Emergency Management Panel (EMP) is provided to serve as a Fire Command Station during fire or other emergency conditions. The EMP shall be provided with Electronic Systems controls and monitoring in accordance with CBC. The EMP Room shall be a minimum of 7 by 7 foot clear and shall have a continuous counter along the wall opposite the door. Counter shall be

built-in, 30 inches deep, and designed to accommodate EMP equipment. EMP Room shall be located within or adjacent to station envelope at concourse level. Room shall have at minimum two 20 amp 120 Vac circuits from the essential power panel. Location shall be subject to local fire marshal approval. Also, refer to Facility Design/ Criteria/ ELECTRONICS, for details.

15.7 STANDBY GENERATOR ROOM

A separate secured room shall be provided for the standby generator that provides emergency power for the station in the event of PG&E failure. The generator shall be oriented so that the exhaust air vent and exhaust piping are not in public view. Provisions shall be included for access for servicing and for fueling. Doors or hatches shall be sized to permit removal and replacement of equipment.

END