Southern California Rapid Transit District

METRO RAIL PROJECT

System Design

Criteria & Standards

VOL. 3

STATIONS

RTD

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: FOREWORD

REVISION RECORD

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FOREWORD

The Metro Rail Project, undertaken by the Southern California Rapid Transit District (SCRTD), will have a significant role in the future development of the Los Angeles region. As part of the 1976 Regional Transportation Development Program, Metro Rail is designed to help solve the increasing transportation problems of Los Angeles' high-density urban center - the regional core.

SYSTEM DESCRIPTION

The Metro Rail line will be a conventional two-track, steel wheel, steel rail system. The initial segment will be approximately 18 miles long and will serve the central business district, Wilshire Boulevard, Fairfax, Hollywood, and North Hollywood areas. On December 20, 1982, SCRTD adopted the route and station locations shown on the following figure.

The initial line is being designed with future line extensions in mind. Seven Metro Rail corridor extensions have been analyzed to estimate the effect of additional travel demand on the initial line. The ultimate regional system under consideration is a 150-mile rapid transit system, to be developed on an incremental basis. Different types of transit - light rail, bus-on-freeway, rail rapid transit - will be evaluated as each extension is planned. The most appropriate type will be selected, but in some cases, the system design will allow upgrading to other types of high-capacity transit as demand increases.

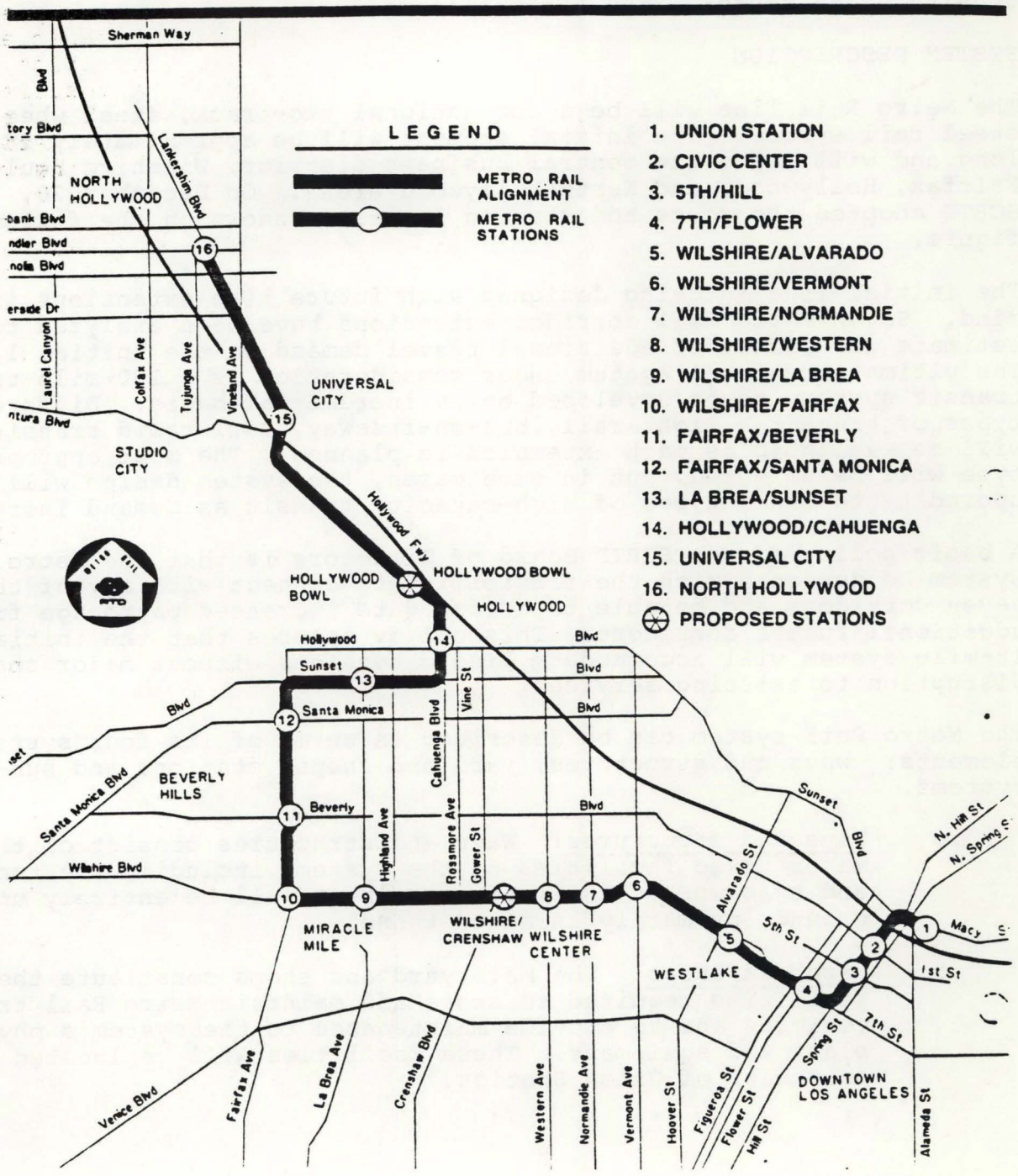
A basic policy of the SCRTD Board of Directors is that the Metro Rail System be designed with the flexibility to connect with any of the seven corridors and be able to accommodate increased patronage from additional future corridors. This policy ensures that the initial 18-mile system will accommodate line extensions without major cost or disruption to existing services.

The Metro Rail system can be described in terms of its four system elements: ways and structures, yard and shops, station, and sub-systems.

- Ways and structures: Ways and structures consist of the major fixed facilities of the system, including the tunnels and trackwork. The initial segment will be entirely underground, primarily in mined tunnel.

- Yard and shops: The main yard and shops constitute the facilities required to store and maintain Metro Rail transit vehicles and to provide maintenance to the system's physical plant and equipment. These facilities will be located southeast of Union Station.

Southern California Rapid Transit District
Metro Rail Project



- o Stations: Stations provide riders access to the trains from the street level. Stations include stairs, escalators, elevators, a platform area for boarding and leaving trains, and a mezzanine area for fare collection. The stations also provide space for such elements as train control equipment and ventilating equipment. The stations will be constructed by the cut-and-cover method.

- o Subsystems: The subsystems are the operating equipment portions of the system, such as the passenger vehicles, train control and communications equipment, traction power, and fare collection equipment. The passenger vehicles will be similar to those currently in use in modern U.S. rail rapid transit systems. It will comfortably carry approximately 76 seated or 94 standing passengers. Trains will consist of up to six passenger vehicles, and will be run by one operator. Automatic devices will be provided for routine operating functions and to ensure safe operations.

PROGRAM DEVELOPMENT

When Metro Rail goes into operation, it will have passed through the five conventional stage of rapid transit development: (1) planning and alternatives analysis; (2) preliminary engineering/environmental impact analysis; (3) final design; (4) construction, manufacturing, and installation; and (5) operational testing.

The first phase ran from 1977 to 1980. Since June 1980, SCRTD has been engaged in the preliminary engineering (PE) phase. This phase has three major objectives: (1) to define and resolve major design and engineering issues; (2) to provide precise location and design data for detailed environmental analysis; and (3) to produce reliable cost estimates. Upon completion of the preliminary engineering phase and the commitment of necessary capital funding, the final design phase will commence. This will be followed by a four-to-six year construction period culminating with system inspection and testing.

One of the major project documents developed during the PE phase is the design criteria. The criteria define detailed functional requirements for all aspects of the Metro Rail System, and will determine the direction taken by the final designers of the various facilities and subsystems elements. The Metro Rail Project System design criteria and standards are presented in five volumes, as follows:

- Volume 1, Systemwide--Contains criteria that affect the whole system, including contract drawing standards, fire/life safety, system safety, security, and system assurance.

- Volume 2, Civil/Structural--Contains civil and structural criteria for all facilities (tunnel, stations, yard and shops), and functional criteria for certain specific elements (trackwork, yard and shops).

- Volume 3, Station--Contains criteria, primarily architectural, for stations.

- Volume 4, Mechanical/Electrical--Contains criteria for mechanical and electrical elements of the facilities' heating, ventilating, and air conditioning; plumbing; facilities electrical; elevators and escalators; and miscellaneous criteria for several other subjects, such as corrosion control, and noise and vibration control.

- Volume 5, Subsystems--Contains functional criteria for the passenger and auxiliary vehicles, train control and communications, traction power and distribution, and fare collection.

It should be recognized that none of these volumes stands alone, and that criteria in more than one volume will apply to the design of any particular system facility or equipment element. A summary table of contents for each individual volume is included in the foreword to that volume as an aid to the designer.

VOLUME III, STATIONS

SUMMARY OF CONTENTS

(Major Headings Only - See Appropriate Section for Detailed Contents)

Volume III, Stations (cont'd)

Volume III, Stations (cont'd)

Volume III, Stations (cont'd)

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 1

GENERAL CRITERIA

REVISION RECORD

NOTICE NUMBER	CR NO/REV	DATE APPROVED	AFFECTED	COMMENTS
1	4-015/1	4/18/84	1.6.4 A 1.6.4 D (deleted) 1.6.8 (added)	Replaces 6/30/83 issue Spelling, punctuation, and format corrections.
2	4-060/2	12/5/84	1.1 1.2 1.3 1.4.1 1.4.2 1.4.3 1.4.4 1.4.5 1.4.6 1.5 1.5.1 A-E 1.5.2 1.5.3 A 1.6.3 B,C,E 1.6.4 A-D 1.6.5 1.6.6 1.6.7 1.6.8 Table III-1-1 Table III-1-2 Table III-1-3 Table of Contents List of Tables	Replaces 7/02/84 issue.
3	6-037/	7/7/87	Table III-1-1 Table III-1-3	P.4 P.20

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 1

GENERAL CRITERIA

REVISION RECORD

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4	7-017/	10/26/87	1.2.1.A.5 Table III-1-3	P.4 P.20
5	8-010/	03/07/88	1.6.9	p. 23 New paragraph

VOLUME III, SECTION 1, GENERAL CRITERIA

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VOLUME III, SECTION 1, GENERAL CRITERIA

LIST OF TABLES

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 1

GENERAL CRITERIA

VOLUME III, SECTION 1

GENERAL CRITERIA

1.1 INTRODUCTION

This manual of architectural design establishes general guidelines and specific standards for the planning and design of Southern California Rapid Transit District Metro Rail stations. It includes space requirements, approved materials and finishes, standards for planning and construction, and other pertinent information.

The manual contains a program for the station, and contains only enough Ways and Structures/Subsystems engineering information (such as civil and structural requirements, mechanical and electrical systems, communications systems, fare collection, and train control systems) to enable the Designer to configure the space required. Additional information will be provided, as needed, by the General Consultant (G.C.).

The Designer should become familiar with the general aspects of the entire system in order to see how its individual project relates to the whole. It is essential, for example, that the relationship between patron flow, space design, and equipment layout be maintained throughout the system, for the convenience of passengers. Administrative processes and operational and maintenance requirements must also be taken into account in order that each station and the entire system may be operated with the greatest economy and efficiency.

1.2 DESIGN PHILOSOPHY

The District has determined that each station shall be designed in accordance with its individual requirements including line location, patronage requirements, topographic and geologic configurations, economy of function and construction method and surface interface requirements. A basic functional and structural design for each station is being established as a part of the definitive design process to provide a significant degree of standardization throughout the Metro Rail System. This is necessary in order to establish an identity for the

system as a whole, thus enabling patrons to find their way easily even in a station new to them. Standardization is also necessary from the standpoint of economy and proper function. Certain standard items and prefabricated units, types and sizes of spaces, and relationship between spaces will be followed in all stations. Design elements are divided into two classifications by the District: Elements of Continuity and Elements of Variability.

To accomplish the total design process, the work is divided into two phases: Preliminary Engineering (P.E.), and Continuing Preliminary Engineering/Final Design. During P.E., a General Consultant (G.C.) was retained who had responsibility for the preliminary design for each station. Continued Preliminary Engineering/Final Design will be accomplished by Section Designers who have been retained for either one or two stations to prepare design and construction contract documents. The General Consultant (G.C.) will monitor this work for the balance of the architectural work program.

In the process of developing the station design, subjective aesthetic considerations and judgments must be made and agreed upon by the G.C. and the District, whose broad viewpoint is therefore expressed briefly here for the information of designers:

A. The Elements of Continuity of the system are established by the District for purposes of station identity, functional consistency, and reduction of capital operations and maintenance costs.

B. The Elements of Variability, as established by the District, define the areas wherein individual design within specified parameters is allowed as long as the overall station budget is maintained.

C. The design of all elements should anticipate a service life that will minimize future replacement and maintenance.

D. Considering the anticipated growth and longevity of the system, careful consideration must be given to station compatibility with future development in the neighborhood of each station.

1.2.1 Elements of Continuity/Variability

TABLE III-1-1

ELEMENTS OF CONTINUITY/VARIABILITY

A. Procurement Items (All Elements of Continuity)

1. Information Devices (all signs/graphics)

Station Identification Pylons
Maps - System and Station Vicinity
Bus Information
Signing and Graphics (exterior and interior)
  Directional
  Identification
  Regulatory

2. Vertical Movement

Escalators
Elevators
Safety/Security Signing
  (elevators and escalators)

3. Communications and Train Control

Public Address Speakers
Radiax Cable
Fire Phones
Emergency Telephones
Administrative Telephones
Patron Assistance Intercom
Maintenance Telephones
Public Telephones
Linear (Graphic, Lighting,
  & P.A. Speaker) Housing

VOLUME III, SECTION 1 GENERAL CRITERIA (Cont'd.)

TABLE III-1-1 (Cont'd.)*

4. Station Control and Security

Intrusion Alarms
CCTV Equipment
Station Fare Collection Control Unit
Emergency Management Panel[1]
Command Post Panel[1]
Emergency Trip Station[1]

5. Fare Collection Equipment

Ticket Vending Machines
Fixed Barriers
Fare Gates (entry and exit)
Emergency Exit and
Handicapped Gates
Add fare Machines

B. Materials, Building Components, and Fixtures Integral with Station Construction

1. Site Development

Plazas	O
Paving	O
Streets, Curbs, and Gutters (L.A. City Standards)	X
Walkways	O
Retaining Wall (site specific)	O

*X Continuity
O Variability

[1] Interior Cabinet only - door and frame in station contract

TABLE III-1-1 (Cont'd.)

Bollards, Bumpers	O
Handrails/Railings	O
Landscaping	O
Fences	O
Benches	O
Bus Stop Shelters (freestanding)	O
Trash Receptacles	X
Planters	O
Ash Receptacles	X
Lighting (pedestrian and vehicular)	X
Bicycle Racks	X
Bus Bays (dimensional)	X
Station Entry Portal Configuration	O
2. Station	
Platform Configuration	X
Platform Seating	O
Trash Receptacles	X
Ash Receptacles	X
Public Address Speaker Housing	X
Fare Collection Equipment and Gates (locations)	X
Drinking Fountains	X
Doors, Gates, and Hardware	X
Floor, Wall, and Ceiling Finishes - Public Areas (within a controlled palette)	O
Hose Bibbs	X
Lighting Fixtures	X
Security Gates at Entry Portals	X
Acoustical Materials and Details (controlled)	O
Mezzanine Configuration	X
Smoke and Exhaust Enclosure	O
Railings/Handrails - Public Areas	O
Railings/Handrails - Emergency Exits	X
Support for Linear Platform Edge Light Housing	X

*X Continuity
O Variability

TABLE III-1-1 (Cont'd.)

Stairs	X
Electrical Outlets	X
Platform Edge	X
Platform Service Gates	X
Fire Hose Cabinet and Fire/Emergency Telephone	X
Crowd Control Devices	X
3. Ancillary Rooms/Facilities Integral with Stations	
Train Control/Communication Rooms	X
Substations	X
Auxiliary Electrical Rooms	X
Battery Room	X
Miscellaneous Auxiliary Rooms	X
Toilet Room - Fixtures, Accessories, Materials	X
Custodial Rooms	X
Trash Room	X
Staff Room	X
Fan Rooms	X
Storage Rooms	X
Utility Boxes	X
Doors and Hardware	X
Ejector Room	X
Sump Room	X
Elevator Machine Room	X
Mechanical Grates, Louvers, and Grilles	X
C. Structural Framing Systems (Basic Configurations)	X
D. Air Distribution Systems	X
E. Art Work	O
F. Advertising	X

*X Continuity
O Variability

1.3 DEFINITIONS

Aboveground Station. A station in which the tracks and platform are either located on an aerial structure or rest directly on grade.

Aerial Structures. Any Metro Rail structure, other than a culvert, which carries transit tracks and spans above land or water surfaces.

Architect. The General Consultant (G.C.) to the District.

Central Control Facility. The facility in the system in which all train control systems and communication systems are operated and monitored. It is also the area where all emergency and malfunction alarms are sounded and recorded.

Continuing Preliminary Engineering. Refinement of the Definitive Design Documents by individual Section Designers progressing to Final Design. During this phase, each discipline will clearly define all systems, materials, quantities, qualities, sizes, finishes, etc.

Definitive Design. General plans and written documents prepared by the G.C. for each station project to define the special limitations governing both building design and site development, as generally agreed between the District and the various public and quasi-public agencies concerned. Definitive design, a product of the Preliminary Engineering Phase, will normally show the essential requirements and limitations of all major elements for the station and its site.

Design Development. Refinement of Definitive Design Documents to refine architectural configuration along with structural, HVAC and lighting systems. Upon the District's approval, the Section Designer will proceed with Continuing Preliminary Engineering.

Designer (also identified as Section Designer). The A/E firm responsible for design of the Metro Rail station or other facility, under contract with the District.

Directive Drawings. Drawings prepared by the G.C. defining the arrangement or configuration of specific components of facilities. They provide direction to the design office but shall not be used as Contract Drawings.

District. The Southern California Rapid Transit District (SCRTD), as created by law. It has overall authority and responsibility for the development and operation of the Metro Rail Project.

Fare Barrier. The separation between the paid area and the free area consisting of fare collection gates and other devices.

Final Design. Drawings and written documents prepared by the Designers that, upon approval of the District, are ready for issuance to construction contractors for bidding.

Free Area. That portion of public space within the station structure which lies outside the fare barrier. Any person may enter this area without paying a fare, provided the station is open and in operation.

General Consultant (G.C.). Also defined as Metro Rail Transit Consultants (MRTC).

General Plans. Definitive Designs for stations developed and issued by the G.C. with the approval of the District.

Metro Rail Project. The SCRTD rail transit system designated as Alternative II, Wilshire-Fairfax corridor, in the approved Alternatives Analysis/Environmental Impact Statement/Report, and including all rights-of-way, easements, tracks, structures, vehicles and other equipment and appurtenances required for revenue operations.

Mezzanine. The public area, including both free area and paid area, which lies between the station entrances for patrons and the platform or platforms. It can be at street level or below grade above the platform.

Off-Street Entrance. An entrance to a station in which the point of access to the vertical circulation elements is located within an adjacent property, at-grade plaza, or area other than the sidewalk.

Paid Area. That portion of the public space of a station which lies inside the fare collection gates. Any patron legally inside this area will have paid a fare either on passing through a fare collection gate or on boarding a bus which discharges passengers within the paid area.

Platform. That portion of the station within the paid area which is directly adjacent to the tracks, where trains stop to load and unload passengers. The full platform is 450 feet long, the length of the 6-car trains which will ultimately operate at peak hours. All platforms (except Wilshire/Fairfax) are center platforms with the platform between the tracks.

Preliminary Engineering. See Definitive Design.

Right-of-Way (ROW). All land purchased by the District for the development and operation of the Metro Rail Project.

Section Designer. See Designer.

Sidewalk Entrance. An entrance to a below-ground station located in sidewalk right-of-way, between the building line and the street curb line, and usually adjacent to the curb line.

Special Entrance (Public or Private). An entrance to a subway station from a store, office building, or other private building.

Standard Drawings. Drawings, prepared by the G.C. defining elements of continuity and facilities which will be repetitively used throughout the SCRTD System.

Station. All of the area and improvements within the boundaries of the station site; the complex of structures, platforms, entries, approaches, and the parking lots.

Station Core/Station Centroid. The portion(s) of the station which contains facilities such as fare vending equipment, fare collection equipment, and all major vertical circulation elements.

Station Scope of Work. An outline of the work of the Designer defining scope, states of design at submittals, budget and schedules.

Subway Station. A station in which the major portion of structure is located below the finished grade - underground station.

Superelevation. The vertical height, measured at the centerline of the tops of rails, between the outer rail and the inner rail, where the track is on or approaching a curve.

Superstructure. All those parts of an aerial structure or bridge which extend above the bridge seats, tops of piers, haunches or rigid frames, or the spring lines of arches.

Top of Rail Profile. The profile line representing the elevation of the top of running surface of rails. Where superelevation exists, the top of rail profile represents the inside or lower running rail, unless otherwise indicated.

Trainway/Trackway. That portion of a station through which the trains run.

Underground Station. A subway station.

1.4 REFERENCE DATA

1.4.1 Patronage Analysis

The key to the organization of a station is its relationship to the surrounding area in terms of vehicular and pedestrian movement. Therefore, it is essential that patronage analysis, which is the study of the movement data pertaining to the area immediately surrounding the proposed station, be studied prior to the development of any design. Patronage analysis studies, based on recent

projections of future employment, population, building development, and other activities in areas adjacent to the Metro Rail stations, have been prepared under the direction of the District. These studies identify such fundamental factors as potential locations of trip origins, expected modes of access to the station, and how these will vary with the time of day and time of year.

The Patronage Analysis will be prepared by the District and will be given to the Designer as part of the Definitive Design Package. This information will provide station sizing in terms of number of entries, mezzanines, fare devices, and vertical devices (stairs, escalators, and elevators).

1.4.2 Definitive Design

The Definitive Design will be furnished to the Section Designer. From this design, the Designer will prepare Design Development documents for review and approval by the G.C. and the District as a part of Continuing Preliminary Engineering.

1.4.3 Final Design Specifications

The G.C. will provide Standard Specifications for Station Construction Contracts, to be applied by each Section Designer. Certain specialized sections may not be included, and will require preparation by the Designer.

1.4.4 Station Scope of Work

This document outlines the work of the Section Designer and includes stages of design and submittals, budget, and schedules.

1.4.5 Utility Locations

Utility drawings for the various sites will be made available by the G.C. with assistance from the District.

1.4.6 Other General Data

Master plans, urban renewal plans, and plans for specific future projects in the area of influence for a particular station should be reviewed by the Section Designer for pertinent information that might influence site development and design possibilities.

VOLUME III, SECTION 1 GENERAL CRITERIA (Cont'd.)

1.5 STATION CAPACITIES

General capacities and circulation standards are listed herein. For more specific requirements, see Section 23, Vertical Circulation.

1.5.1 Station Patronage

A. The Station Patronage for each station is outlined in patronage estimates for year 2000 (Design Directive DD-001) as furnished by the District.

B. These estimates of station patronage have been prepared for the a.m. and the p.m. peak hour.

C. The sizing of station elements has been done on the basis of the ultimate station capacity which shall be 150% of the station patronage. Parking lot capacity shall be as established on the General Plans.

D. For purposes of design, the peak fifteen-minute patronage shall be 28.2% of the Ultimate Station Hourly Volume.

E. Emergency Conditions: All stations must also meet requirements for emergency evacuation as established in Volume I, Section 2, Fire/Life Safety. The G.C. will prepare exit capacity requirements for each station.

1.5.2 Platform Area

Station platforms have been sized to accommodate site specific patronage projections on the platform. The space within one foot of any wall or one and one half feet from the platform edge shall not be included in this area.

1.5.3 Station Capacity

A. Operating Conditions

All station elements such as escalators, stairs, corridors, doors, and gates have been sized to accommodate the peak fifteen-minute patronage at the levels of service outlined above and as established in Section 23, Vertical Circulation.

B. Emergency Conditions

All stations must also meet requirements for emergency evacuation as established in Volume I, Section 2.

1.6 DESIGN GUIDELINES

1.6.1 Site Development

In urban centers, the new traffic patterns established by station entrances may seriously conflict with existing pedestrian and vehicular movement. Organization of external station areas as shown in the General Plans will minimize these conflicts to the greatest extent feasible and in a manner acceptable to governing authorities.

1.6.2 Entrances

Plaza type entrances, where economically feasible, are favored by the District rather than "on-street" elements with stairs and/or escalators leading directly from the sidewalk to the fare collection areas at a lower level. These "off-street" entrances will relate to existing and future business and urban activities. Where plans are under way for extensive redevelopment of the whole street, special public entrances for the Metro Rail may be designed in conjunction with these new developments.

It is assumed that various business enterprises located near the stations will wish to have direct access from the station to their facilities. Any such entrances will be financed and maintained by the private enterprises, and will have lockable close-down doors. While such entrances should be considered as valuable elements, they

will not take the place of any of the required station entrances, unless permanent access to a public right-of-way is provided.

The number of entrances to any station depends upon a series of factors. First, they must handle the expected patron loading; second, they must relate to the site itself and respect the direction of the patron loading; and third, they must be sufficient to handle the emergency egress requirements from the lower levels. All entrances should be designed so that the station can be closed for a short period of time every day, or for a longer period of time in emergencies.

1.6.3 Patron Circulation

Passenger traffic is composed of two distinct groups: regular commuters and infrequent users or strangers to the Metro Rail System. Once passenger flows have been established, and the majority of commuters have become familiar with the process, many directional problems will be eliminated. In planning both the layout and the signing, consider that the commuter generally knows his way around that station, and that detailed guidance is needed for only infrequent users or strangers.

Some basic principles which have been considered in planning station circulation are as follows:

A. People tend to keep to the right, and for that reason, right-hand flows are recommended, although not mandatory.

B. Any cross-flow of passengers is highly undesirable, and the layout is such that passenger flows moving in the opposite direction will be separated at all times.

C. Dead-end conditions have been avoided wherever possible. Where some are unavoidable, comply with governing code.

D. Whenever there is more than one opening, people tend to move toward the nearest one, even if they are not sure it is the right one.

E. People will tolerate longer delays in entering than exiting the Metro Rail System, but designs of stations have attempted to eliminate waiting.

F. In general, circulation patterns and station layouts should enable the patron to know where he is and where he is going at all times.

1.6.4 Internal Space Organization

A. Mezzanine

In order to separate some of the complex activities involved in moving people in large numbers in and out of the stations, a mezzanine area will be required. Depending on site and aboveground or subway conditions, this area may be at street level, or below grade above the platform.

The mezzanine functions as a transition area between the points of entry into the station and the access ways to the train platforms. The mezzanine also provides space for various functions including the entire fare collection process, directional and informational signing, and various amenities for the patron's needs and comforts.

The mezzanine will also enable the patron to move horizontally to a passageway in the station where stairs, escalators, or elevators will take him directly up to his immediate objective - an exit, or down to a train platform.

Private entrances from various adjacent buildings can also be accommodated along the length of a mezzanine in the free area.

B. Surge/Queing Space

Adequate space has been provided around the fare vending machines and fare collection gates to allow patrons to buy their tickets and pass through the gates without undue crowding. Section 1.6.7, Queuing Distance Requirements, contains minimum dimensions which have been used in determining these surge or queuing spaces. Consideration has also been given to provisions for exiting through this space in case of emergencies.

C. Emergency Conditions

The organization of circulation within the station also meets both limited and extensive emergency situations. In emergencies, it must be possible to move patrons efficiently and rapidly from the trains, platforms, and other parts of the station to an area of safety. For further information, refer to Volume I, Section 2.

D. Clearances

In all public areas, minimum overhead clearance to obstructions shall be 11'-0" above finish floor. However, at localized critical points such as portals, clearance may be reduced to not less that 9'-0".

1.6.5 Ancillary Space Requirements

Ancillary spaces shall be provided in subway stations as shown in the General Plans and in Table III-1-2, Ancillary Space Requirements. Specific requirements for train and station operation related spaces are specified in other sections of these criteria. Spaces such as sewage ejector rooms, sump pump rooms, and valve rooms shall be provided as required, of a size to house the required equipment. Appropriate access shall be provided. Specific layouts for major equipment rooms are provided on the Standard and Directive drawings.

1.6.6 Safety and Security

See Volume I, Sections 3 and 4.

1.6.7 Queuing Distance Requirements

Minimum queuing distance requirements which have been used are given in Table III-1-3.

TABLE III-1-2

METRO RAIL STATIONS
ANCILLARY SPACE REQUIREMENTS
(equivalent areas permitted on a station-by-station basis due to specific configuration requirements)

Functional Element	Standard Station Min. Size	Clg. Hts.*	Further Requirement Section
1. Traction Power Substations	50' x 80'	14'	14.4.1
2. Auxiliary Power @ each end	17' x 31'	14'	14.5.2
3. Train Control/Communications			
w/crossover @ station	45' x 40'	12'	20.4
w/o crossover @ station	22' x 42'	12'	
4. Battery Room for:			
Train Control/Communications	7' x 20'	12'	
Auxiliary Power	11' x 17'	12'	14.5.3
5. Elevator Equipment (for two machines)	8' x 13'	8'	23.7.1
6. Storage (space provision on site specific basis)			
7. Mechanical Room for Anciliary Room @ the end w/Train Control/ Communications	16' x 15'	12'	10.4.4
for Anciliary Room @ the end w/o any Train Control/ Communications	12' x 12'	12'	
8. Fan Room (for traction power)	25' x 40'	14'	14.4.1.C

*Clear of any obstruction.

VOLUME III, SECTION 1 GENERAL CRITERIA (Cont'd.)

TABLE III-1-2 (Cont'd.)

Functional Element	Standard Station Min. Size	Clg. Hts.*	Further Requirement Section
9. Emergency Fan Room			
@ platform level @ each end	55' x 45'	14'	
@ mezzanine level @ each end	18' x 80'		
10. Chiller Room	30' x 44'	14'	10.4.5
11. Air Supply Unit Room			
@ mezzanine level			
@ each end	32' x 44'	14'	
12. Smoke Exhaust Room	Incl. in air supply		
@ mezz. level @ each end	unit room or under platform exhaust room		
13. Under Platform Exhaust Room			
@ each end	10'6" x 30'	14'	10.4.1
14. Under Platform Exhaust Plenum	42 sq. ft./Track		10.4.1
15. Ejector Room	8'0" x 12'	11'	1.6.5
16. Sprinkler Valve Room			
@ each end	8' x 7'6"	10'	1.6.5
17. Sump Pump	10' x 10'	8'	1.6.5
18. Gap Breaker Station	16' x 22'	12'	
19. Emergency Equipment			
@ platform level	4'6" x 8'	8'	
20. Custodial Room			
@ Platform level	8'6" x 16'	8'	16.4.3
Custodial closet			
@ Mezzanine level	3'6" x 8'	8'	
21. Electrical Room			
@ each platform level	8' x 10'	8'	
@ each end			

*Clear of any obstruction.

VOLUME III, SECTION 1 GENERAL CRITERIA (Cont'd.)

TABLE III-1-2 (Cont'd.)

Functional Element	Standard Station Min. Size	Clg. Hts.*	Further Requirement Section
22. Toilet Mezzanine level	6'6" x 8'	8'	15.3
23. Trash room Mezzanine level	8' x 10'	8'	16.4.4
24. Staff/Security room Mezzanine level	8' x 12'	8'	18.5
25. Auxiliary Power Substation	42' x 50'	14'	14.5.1
26. Electric Incoming Service Room	40' x 40'	16'/14'	14.3.1

*Clear of any obstruction.

VOLUME III, SECTION 1 GENERAL CRITERIA (Cont'd.)

TABLE III-1-3

MINIMUM QUEUING DISTANCE REQUIREMENTS

		C.B.D. Station		Suburban Station	
		Entry	Exit	Entry	Exit
Fare Gate		20'-0"	20'-0"	15'-0"	15'-0"
Ticket Vendor *		8'-0"		6'-0"	
Escalator	2 Device	20'-0"		15'-0"**	
Stair	4 Device	30'-0"		25'-0"**	
Elevator		12'-0"		8'-0"	

* Includes Ticket Vending Machines and Add Fare machines.

** Minimum criteria unless site specific conditions do not permit this distance. Distance is measured to property line or any obstruction, structure, or curb.

1.6.8 Elderly and Handicapped Accessibility

Specific provisions shall be made by the Designers for the reduction and elimination of operating barriers in all Metro Rail elements (passenger stations, vehicles, platforms, fare barriers, operating and maintenance facilities) which impede the mobility of elderly and handicapped patrons and system employees. The design criteria referenced and contained herein denote special requirements mandated by State and Federal regulations and are intended to make all Metro Rail elements usable by people with such physical disabilities as the inability to walk, difficulty walking, reliance on walking aids, sight and hearing impairments, incoordination, reaching and manipulation impairments, lack of stamina, difficulty interpreting and reacting to sensory information, and extremes of physical size. These provisions will afford accessibility and usability of the Metro Rail elements to disabled persons and will allow them an opportunity to travel in safety and comfort equal to that afforded other patrons.

The criteria referenced and contained herein are based on space, equipment and human data as related to wheelchairs, walking aids and reach limitations, and shall be incorporated into the design and specifications for all Metro Rail elements.

A. State Requirements

The State of California regulations pertaining to barrier free design are contained in Title 24 of the California Administrative Code (CAC), Parts 2, 3 and 5. These regulations are adopted by reference, with exceptions as noted in Article 1.6.8-B. A compilation of the State accessibility requirements is contained in the document Regulations for the Accommodation of the Disabled in Public Accommodations, available from the Office of the State Architect.

B. Federal Requirements

The General Services Administration has developed a minimum accessibility standard which is applicable to the Metro Rail project through the Department of

Transportation, Urban Mass Transportation Administration. The requirements of this standard parallel the State requirements for the most part; however, the conditions listed below are more stringent than the State requirements and therefore shall be incorporated into the design.

1. Where public parking is provided, the minimum number of accessible spaces provided shall be determined as follows:

   a. If the number of parking spaces for a facility is between 2 and 400, provide accessible spaces as indicated.

TOTAL NO. SPACES	ACCESSIBLE SPACES REQUIRED
2-80	2
81-120	3
121-160	4
161-274	5
275-324	6
325-374	7
375-400	8

   b. Provide 1 additional parking space for each 100 parking spaces provided over 400.

2. Accessible walks from a handicapped parking space, a public sidewalk or public transportation stop to an accessible primary building entrance shall be provided with a minimum 60" X 60" level zone suitable for wheelchair passage or rest, spaced at no more than 200 feet apart, when the width of the accessible walk is less than 60".

3. All handrails for stairs, ramps and along accessible walks shall comply with the following, in conjunction with additional requirements contained in the applicable sections of Title 24, CAC.

   a. The nominal diameter or horizontal cross section of the gripping surface of a handrail shall be 1¼" to 1½".

b. Anchoring for components of handrails shall be capable of supporting a 250 lb force applied in any direction at any point along the handrail.

c. The top of a handrail shall be mounted at a height from between 32" to 34", measured from finished floor, ramp surface or tread nosing to the top of the handrail.

4. In the design of signage and identification, the following requirements shall be met, in conjunction with additional requirements contained in Title 24, CAC.

a. For raised or recessed letters, numbers or symbols, the maximum height shall be 2".

b. Character identification shall be mounted at a height of 54" - 66" above finished floor, and wherever possible, mounted on the wall at the latch side of the door.

c. A combination of upper and lower case lettering shall be utilized in all signage, arranged to provide greater readability to persons with visual impairments.

d. Doors leading into hazardous areas that might prove dangerous to a blind person shall be made quickly identifiable to the touch by knurling, roughening, or applying an abrasive coating to the surface of the door handle, knob, pull or other operating hardware.

5. The mounting height of handrails in elevator cabs shall be 31" - 33" above the floor to top of rail.

1.6.9 Seismic Criterion for Equipment

As a minimum, equipment installed in District facilities shall have seismic restraints in accordance with City of Los Angeles Building Code and CAC Title 24. Equipment shall be considered as essential equipment within seismic hazard Zone 4.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 2

REVISION RECORD

NOTICE NUMBER	CR NO/REV	DATE APPROVED	AFFECTED	COMMENTS
1	4-060/1	12/5/84	Table of Contents 2.1 2.4.1 A,B 2.4.2 A,B 2.4.3 B 2.4.4 2.4.5 2.4.6 A	Replaces 6/30/83 issue. Spelling, punctuation and format corrections.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 2

ACOUSTICS

VOLUME III, SECTION 2, ACOUSTICS

CONTENTS

VOLUME III, SECTION 2

ACOUSTICS

2.1 INTRODUCTION

The purpose of this section is to provide and define noise criteria which will result in a desirable acoustical environment at and around stations throughout Metro Rail System. The amount of control of sound energy and the consequent reduction of noise obtained is dependent upon the area of the acoustical treatment, the absorption coefficient, and the placement of the treatment. (For further information, refer to Volume IV, Section 7, Noise and Vibration Control.)

2.2 BASIC GOALS

A. To control and reduce noise from transit train operations.

B. To provide for good intelligibility of announcements from the public address system.

C. To control general crowd noise generated by patrons speaking and walking or noise from exterior sources.

D. To assist in the control of noise from station mechanical and electrical equipment.

2.3 GENERAL CRITERIA

A. No long distance echoes should be audible in public spaces when they are nearly empty.

B. Flutter echo between parallel surfaces should be minimized.

C. Consideration must be given to the effect of Metro Rail generated noises on the area surrounding the line and station, and of street, highway, and railroad operation noises entering the station.

VOLUME III, SECTION 2 ACOUSTICS (Cont'd.)

2.4 SPECIFIC CRITERIA

2.4.1 Subway Station Areas Directly Related to Street Traffic Noise

A. Areas Involved

1. Mezzanine level passageways
2. Vent shafts from street level.

B. General Considerations

1. These areas should assist in the damping of traffic noise where practicable.
2. The reverberation time of the areas should be in the range of 1.2 to 1.4 seconds at 500 Hz when areas are unoccupied.
3. The acoustical treatment should have a Noise Reduction Coefficient, NRC, of at least 0.60 and a minimum absorption coefficient of 0.06 at 500 Hz.
4. Station Entrance Portals from grade to mezzanine level passageways shall have no acoustical treatment.
5. Mezzanine Level Passageways shall have 100% of the ceiling covered with acoustical material. No acoustic treatment is required on the walls.
6. All acoustical material shall be mechanically fastened.

2.4.2 Mezzanine Areas

A. Areas Involved

1. Fare collection areas
2. Stairs and escalators

B. General Considerations

1. The maximum noise level should not exceed 55 dBA in the absence of occupants.

2. The reverberation of the area should not exceed 1.2 seconds at 500 Hz when area is unoccupied.

3. The underside of the mezzanine level roof slab shall have a minimum of 60% coverage of acoustical material. Sidewall coverage is not required.

4. All acoustical material shall be mechanically fastened.

2.4.3 Areas Related Directly to Transit Train Noise

A. Subway Stations

For design purposes, assume the following on-platform train noise level:

1. Trains entering and leaving will not exceed 80 dBA at a point six feet from the edge of the platform.

2. Trains passing by will not exceed 85 dBA at a point six feet back from the edge of the platform.

3. Trains stopped and idling at the platform will not exceed 68 dBA at a point six feet from the edge of the platform.

B. Design Requirements

1. Maximum noise level on platform due to station ventilation system and other operating auxiliaries should not exceed 55 dBA.

2. The underside of the mezzanine level floor slab shall have a minimum of 60% coverage of acoustical material. Sidewall coverage is not required.

3. The underside of the platform edge and the wall of the underplatform refuge space should be lined with acoustical material having a minimum absorption coefficient of 0.40 at 250 Hz and 0.65 at 500 Hz.

4. All acoustic material shall be mechanically fastened.

2.4.4. Exterior Noise from Ancillary Facilities

The following criteria apply to noise from transit system ancillary facilities:

	COMMUNITY AREA CATEGORY	CRITERIA TRANSIENT	CONTINUOUS
I	Quiet Residential	45 dBA	40 dBA
II	Average Urban Residential	50	45
III	Semi-Residential/Commercial	55	50
IV	Commercial	60	55
V	Industrial & Highway Corridor	65	60

These criteria should be applied at 30 feet from the shaft outlet or other ancillary facility such as substations, or should be applied at the setback line of the nearest building or occupied area, whichever is appropriate. Transient criteria apply to short duration events such as train passby noise transmitted from a vent shaft opening. Continuous criteria apply to noises such as fans, cooling towers, or other long duration noises except electric transformer hum. The criteria for transformer noises or hum should be 5 dBA less than given in the table for continuous noise.

2.4.5 Interior Noise from Emergency Ventilation Fans

Fan Rooms & Blast Relief Shafts will have acoustical treatment as specified by the acoustical consultants Wilson, Ihrig, and Associates on a station-by-station basis. The emergency ventilation fan noise should not exceed 70 dBA at 75 feet from the fan.

2.4.6 Vending Devices

A. Equipment Involved

1. Ticket vending machines

2. Fare gates

3. Addfare and bill changing machines

B. General Considerations

For all normal operating conditions the noise level at 3 feet from the above listed equipment should not exceed 55 dBA for steady-state noise and transient noises shall not exceed 60 dBA measured using the fast meter response.

2.4.7 Ventilating and Air Conditioning Equipment

Spaces for fans and other potentially noisy equipment shall be separated from public areas insofar as is possible. If direct access into such rooms from public areas cannot be avoided, provide doors having a suitable sound rating. Control sound transmission through other openings by appropriate means.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 3

REVISION RECORD

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 3

ADVERTISING

VOLUME III, SECTION 3, ADVERTISING

CONTENTS

VOLUME III, SECTION 3

ADVERTISING

3.1 INTRODUCTION

Advertising will be permitted in the Metro Rail System on a carefully controlled basis. Marketable advertising space will be provided in the design of Metro Rail stations wherever feasible.

3.2 BASIC GOALS

In order to produce significant revenues for the Metro Rail System, SCRTD will:

A. Establish a controlled advertising program that will provide an attractive, informative, and enjoyable environment for its patrons.

B. Ensure that advertising, by its placement and treatment, does not interfere with orderly patron circulation. Placement of advertising on or adjacent to escalators, stairs, or system graphics will not be permitted.

C. Discourage defacement or damage by placement and form of advertising. Because of potential vandalism, merchandise display cases will not be permitted.

3.3 GENERAL CRITERIA

A. All advertising space in the Metro Rail System will conform to the standard sizes of advertising in general use in the United States.

B. Advertisements will be carefully located, adjacent to areas of heavy traffic, but out of the direct passenger flow, so that they do not obstruct or retard such flow.

C. Advertisements should, where possible, be located out of public reach to prevent defacement.

VOLUME III, SECTION 3 ADVERTISING (Cont'd.)

D. No advertising will be visible from outside the Metro Rail System.

E. For related information, refer to Section 17, Signing.

F. No special lighting will be provided by the SCRTD for advertising displays.

3.4 SPECIFIC CRITERIA

A. Platform Level: The standard nominal 11'-6" x 5'-3" advertising posters will be used.

B. Frame and mounts shall conform to systemwide standard provided by the advertising agency.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 4

REVISION RECORD

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 4

ARTWORK

VOLUME III, SECTION 4, ARTWORK

CONTENTS

VOLUME III, SECTION 4

ARTWORK

4.1 INTRODUCTION

The purpose of this chapter is to identify areas within the station complex which lend themselves to integral or applied artwork and color and to outline a procedure to be followed by the Designer.

4.2 BASIC GOALS

A. To provide stations with visual interest, local color, and identity through artwork. It is anticipated that resulting local pride in community stations will have the effect of reducing vandalism.

B. To avoid the appearance of "afterthought" or "tack-on" artwork, by planning for its original design.

C. To provide a plan for initial budgeting of funds for artwork and/or a donor program.

4.3 GENERAL PRINCIPLES

4.3.1 Art in Structures

A. Rapid transit system lines offer inherent sensory experience not often found in large-scale building projects. The patron is a captive audience moving through at high speeds, experiencing transitions, such as from subway to aerial line structure, and viewing stations, subway line sections, and diverse elements within the surrounding exterior environment.

B. The patron, entering or exiting the system, and the nonpatron will be subject to the more traditional visual and audio sensations. All transit structures should impart the feeling of strength, speed, and efficiency which are inherent in a contemporary rapid transit system, and all artwork should accentuate this effect.

4.3.2 The Subway Station

A. Entrances to stations which have high ceilings may be found suitable as locations for hanging sculpture, such as mobiles, if all parts are above the reach of patrons.

B. Where wall sculpture, mosaics, or painting are considered, a location out of public reach is preferred.

C. If tile mosaics are considered, and are within reach of the public, the pieces should be carefully abutted to avoid giving a vandal the leverage needed to pry pieces loose with a coin or knife.

D. Artwork should be avoided within all areas where it might distract from directional signing.

E. Plaza approaches to stations should be considered for sculpture, particularly the indestructible type of work which invites public participation by touching, child crawling, etc. Scale should be large. Materials should be maintenance free.

F. Where clearance permits, hanging sculpture should be considered, but must be out of reach and so located that it will not interfere with building maintenance work. Wall sculpture, reliefs, mosaics, and murals may also be found suitable, if carefully placed in locations where they will not conflict with signing and where viewers will not block normal traffic flow.

4.4 ART PROGRAMS

4.4.1 Budgeted Artwork

At each station, funds will be allocated as part of the station design budget. The actual allowance will be determined only after preliminary station design is complete and the Designer's recommendation can be reviewed in context with the station design. Once an allowance has been determined and the artist is selected as described below, final design of both station and artwork can proceed together.

A. The Designer will be responsible for clearly establishing the interface between artwork and other station work in the Contract Documents.

B. Artwork will be set up as an allowance in the specifications, not as a competitive bid item.

4.4.2 Donor Program

At specific locations, where future donor funds are anticipated, a donor program may be implemented. In this program the station designer will make recommendations at completion of the design development. However, further design must proceed on the assumption that this artwork will not be added until the donor commitment has been made. Provisions such as spare electrical panels, buried structural connections, and knockouts in floors or walls may be required, and should be included to avoid unnecessary alteration later.

4.5 SELECTION OF THE ARTIST

4.5.1 Procedures

Selection procedures must be in harmony with overall SCRTD policy. The selected artist(s) for each station will be placed under a two-stage contract with the Section Designer to:

A. Develop a conceptual scale model or replica of the artwork and submit it for review and approval.

B. Upon approval, execute and install the work. This portion of the contract will be subject to award of a station finish construction contract, and will be transferred to the contractor at that time.

4.5.2 Qualification/Selection Committee

A Qualification/Selection Committee will review the response of artists to a Request For Interest and Qualifications (RFIQ) solicited by SCRTD, and will determine those artists most qualified to be commissioned for the Project. The Committee will then choose from among the qualified artists those appropriate for each station assignment.

Make-up of the Committee will consist of five (5) permanent members appointed by the District, and both the Section Designer and a local representative of each station, whom will join the Committee as voting members on matters concerning the individual station. The Section Designer will also act as the station technical advisor.

4.6 MATERIALS AND COLOR

4.6.1 Materials

Avoid the use of applied finishes whenever feasible in order to minimize maintenance. Examples of materials capable of having a pleasing natural finish are as follows:

A. Precast concrete

B. Cast-in-place concrete

C. Clay unit masonry products

D. Stone

E. Prefinished metals such as stainless steel, anodized aluminum, and bronze.

4.6.2 Color

Applied color used for station identification, aesthetic stimulation, and interest should be harmonious with natural materials used and with Metro Rail systemwide colors.

When the object is located in an area subject to artificial lighting, the type of light source should be considered so it will not distort the true color of the artwork. (See Section 12, Lighting, for additional criteria.)

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 5

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 5

CODES

VOLUME III, SECTION 5, CODES

CONTENTS

VOLUME III, SECTION 5

CODES

5.1 INTRODUCTION

The Metro Rail System in its initial development will pass through a single city and county; however, it is anticipated that future extensions may impact other counties and many municipalities. It is the District's intention to adopt a single set of codes and regulations for use throughout the System. Therefore, this chapter lists the building codes, legal regulations and criteria to which the design of Metro Rail stations shall conform. Because of the unique nature of rail transit, variances from existing specific codes and standards have been provided for certain functional elements.

In the event that a condition is found which is not covered by the codes, regulations and criteria outlined herein, the Section Designer should refer the matter to the G. C. for guidance in reaching an acceptable solution.

5.2 BASIC GOAL

Providing facilities which are free of recognized hazards that could compromise the health and safety of the public or the District's employees.

5.3 APPLICABLE CODES AND STANDARDS

5.3.1 Compliance

A. The design of station(s) shall comply in all respects with the codes and standards listed below with the exception of the variances identified in Volume I, Section 2, Fire/Life Safety Criteria.

B. These codes and standards shall in each instance be the latest edition or issue, and the most recent revision, amendment, or supplement in effect at the date of notice to proceed with the design of each specific project, unless noted otherwise below.

C. With the exception of the variances described herein, where the requirements of more than one code or standard are applicable, the more restrictive shall govern.

5.3.2 Codes and Act Standards

A. Uniform Building Code (UBC) 1979

B. California Administrative Code (CAC), Title 19

C. California Administrative Code (CAC), Title 24, Part 2 (State Building Code)

D. Los Angeles County Building Code

E. Los Angeles County Fire Code

F. Los Angeles City Building Code

G. Los Angeles City Fire Code

H. Other city and county codes as applicable

I. ANSI 117.1, Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

J. Occupational Safety and Health Act (OSHA) Standards California Administrative Code (CAC), Title 8

K. Occupational Safety and Health Act (OSHA) Standards 29, CFR Part 1910

L. American Public Transit Association 1981 Guidelines for Design of Rapid Transit Facilities

M. National Fire Protection Association (NFPA) 101, Life Safety Codes

N. National Fire Protection Association (NFPA) 70, National Electrical Code

O. National Fire Protection Association (NFPA) Fire Codes as applicable

P. Los Angeles City Mechanical Code

VOLUME III, SECTION 5 CODES (Cont'd.)

Q. Los Angeles City Plumbing Code

R. Los Angeles City Elevator Code

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 6

REVISION RECORD

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1	4-015/1	4/18/84	6.3.1 A 6.3.6 A 6.3.9 B.1 6.3.9 B.4 6.3.10 6.4.5 B	Replaces 6/30/83 issue. Spelling, punctuation, and format corrections.
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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 6

COMMUNICATIONS

VOLUME III, SECTION 6, COMMUNICATIONS

CONTENTS

VOLUME III, SECTION 6

COMMUNICATIONS

6.1 INTRODUCTION

This chapter identifies the general requirements for the installation of communications systems and equipment to be provided in Metro Rail stations, and establishes the minimum provisions necessary to accommodate them. For equipment information, refer to Volume V, Section 3, Communications.

6.2 BASIC GOALS

To alert the Section Designer to systems which must be accommodated in each station to ensure:

A. Proper allocation of space to house and maintain equipment.

B. Proper arrangement of the spaces to minimize electromagnetic interference from electrical systems, and to avoid costly and inefficient layout of equipment.

C. That housings, trim, and architectural elements exposed to public view are aesthetically pleasing and that their impact on the surrounding community is minimized.

6.3 COMMUNICATION SYSTEMS

A. Communication systems will include all apparatus required to transmit data within the Metro Rail System and public telephone service to the outside.

B. Central Control will be the hub of all operations oriented systems. It will also act as the proprietary alarm center for fire and emergency systems.

C. Central Control functions will be synonymous with those of police department precincts. The primary functions to be accomplished are security oriented, i.e., passengers/employee security, passenger assistance, crowd control, etc. (See Section 18, Station Control, for additional information.)

D. Conduit and wall recesses shall be provided under Station Construction Contracts for the telephone systems. Cabinets, handset enclosures, telephone sets and wiring shall be provided under separate contract. (For details, refer to Volume V, Section 3.)

6.3.1 Emergency Telephone

This system will provide voice communication between patrons or transit personnel and Central Control, for the reporting of fire or other emergency situations, and also for communication between firefighting personnel during a fire or other emergency condition. Sets will be provided throughout the station, surface mounted or recessed and labeled "Fire/Emergency."

A. Emergency telephones shall be placed in station mezzanine, platform(s), and ancillary spaces. Sets shall be located adjacent to fire hose cabinets.

B. One in each station staff room, and emergency trip stations.

C. One at each station emergency management panel and at each fire command post.

6.3.2 Fire Phones

This system shall be utilized to meet requirements for establishment of point to point communication for tactical emergency operation within a local area. A telephone jack shall be installed at each fire department inlet connection, emergency trip stations, emergency management panel, fire command post, fire hose cabinet, and at each hose connection along the wayside.

6.3.3 Patron Assistance Intercom (P.A.I.)

A. This system will provide voice communication between patrons and communication console attendant at Central Control. Remote intercom units shall be installed within elevator cabs and at the fare collection area.

B. P.A.I. will be surface or recessed wall mounted. The unit locations at each station are as follows:

1. At fare gates: one set each at paid and at free side, or one set accessible to patrons, including handicapped patrons, from either side.

2. At or near fare vending machines in both free and paid areas.

C. P.A.I. will provide "hands free" operation and include:

1. Call button to activate

2. Speaker for two-way communication

3. Braille strip for blind or partially sighted use.

6.3.4 Administrative Telephone

This system will provide voice communication links for Metro Rail system personnel. Telephone set shall be installed at each staff room, Train Control/Communications room, and emergency management panel.

6.3.5 Maintenance Telephone

This circuit will be provided for use by installation and maintenance crews throughout the entire system. Telephone jacks will be provided under a separate contract for use with portable handsets. Telephone jacks will be located at major equipment locations and at emergency telephones as follows:

A. One at each group of fare collection and ticket vending equipment (in equipment).

B. At each escalator or elevator pit, elevator machine room, substation, mechanical equipment, auxiliary power, fan, chiller, smoke exhaust, ejector, sump pump, gap breaker, electrical equipment, and electrical incoming service rooms. When rooms for different functions have been combined, only one jack need be provided.

6.3.6 Public Telephone Service

Public telephones will be provided both in free and paid areas of each station in cooperation with the local telephone company.

A. Provisions for service, the number and location of sets, and the size of equipment space required will be determined by the District in consultation with the local telephone company. Total number of telephones will be determined by the District. A minimum of two sets should be provided both in free and in paid areas at the station core. One telephone in each group will be suitable for use by the handicapped. Reference Title 24, Section 2-1713, CAC for detailed requirements.

B. Terminal cabinets shall be located as follows:

1. Mezzanine paid area Telephone/Map Case: locate in Staff/Security Room

2. Ancillary area: in recessed cabinet in Service Corridor, if required

3. Details for these conditions will be provided in the Standard and Directive drawings.

C. Provide conduit for this service under station contract. Telephone sets and wiring will be provided by the utility.

6.3.7 Public Address

A public address system will be used by Central Control Facility to make general announcements and to give fire alarms and evacuation instructions in stations. Central Control Facility can select any or all stations. In addition, access to the P.A. will be provided from the E.M.P. and one location at the platform.

A. Loudspeakers should be located at intervals frequent enough to ensure intelligible speech in public and ancillary areas. Spacing will depend upon station design and will be established in accordance with the provisions of Volume V, Section 3.10.1.B.5.

B. Enclosure for each speaker will be in an acoustically-treated metal box with a grille providing 75% free opening, as part of a standard design element.

C. Conduit, and speaker enclosures, shall be provided under station construction contract. Speakers, microphones, amplifiers, and wiring will be provided under separate contract.

6.3.8 Radio System

A. The radio system, which will be furnished and installed under a separate systemwide contract, will include transit police, emergency and train radio. Of interest to the Designer is the need for a distributed antenna system (lossy line) within all subway structures and the need to avoid obstructing the "line-of-sight" between the transmitter and the antenna on the roofs of transit vehicles. This facility (the lossy line) allows constant communication between train operator and Central Control Facility.

B. Although this distributed antenna system will be furnished and installed under a separate (systemwide) contract, provisions for this installation must be made in station designs as follows:

1. Only one line will be required in a station platform area provided it can be located where it is in "line of sight" and within 20' of the antenna at the roof centerline of every passenger vehicle within the station and within 20' of any point of personnel passage.

2. The line must run through a station area continuously, without any breaks.

3. The line may be "sleeved" through floor or wall under certain conditions which must be separately evaluated for each station design.

4. Provision must be made for a connection between the line and the station Train Control/Communications room.

5. Location of antenna shall be coordinated and integrated with overall station design.

6. Minimum forming radius for the distributed antenna is fifteen inches. Provision must be made for supporting the line at no greater than three foot intervals in ancillary spaces. The line will be suspended on nonconductive brackets to be furnished and installed by the line's installer. These brackets will hold the line a minimum distance of three inches from adjacent construction. Provision to be made in the station design and construction will consist of internally threaded cast-in-place sleeves or threaded bolts set in concrete, or welded or bolted equivalents, if structure is steel. The line will be supported in a nontoxic plastic pipe in the public spaces.

7. The Section Designer must provide for concealment of the lossy line by use of a cover or other means which will not interfere with radio transmission between the line and the train. Materials and finishes containing metals or masonry of any kind are unacceptable.

8. Additional data will be furnished by the District as needed on request.

6.3.9 Closed Circuit TV System

(See Section 18, Station Control, for general details and requirements.)

A. Purpose

Closed circuit television will be used as a means of maintaining surveillance over station areas from the Central Control Facility. The G.C. will establish locations of cameras, and the Section Designer will indicate their precise locations in coordination with other equipment locations such as lighting, PA speakers and signing. The Section Designer will make provision for attachment, provide conduit runs and outlet boxes for power and control for the system.

B. Camera Locations

Those facilities requiring supervision should be within range of view of a closed circuit television camera (CCTV). The exact number of cameras and their specific location will be furnished by the G.C. to

the Section Designer on a station-by-station basis. These include:

1. Priority A (required)
   a. Fare gate array
   b. Fare media dispensing area
   c. Platform edges
   d. Platform safety zone (approximately the center third of the platform)
   e. Entrance to trainways
   f. Special case long passageways
2. Priority B (if practicable)
   a. Escalators
   b. Stairs
3. Priority C (if not within the field of view of cameras in Priority A or Priority B)
   a. Patron Assistance Intercom
   b. Trackway

6.3.10 Fire Detection/Intrusion Alarm Annunciator Equipment

The fire detection and intrusion alarm systems are defined in Volume I, Section 2, Fire/Life Safety.

6.3.11 Cable Transmission Service (CTS)

The cable transmission service shall link the stations and other primary areas with each other. It shall transmit signals for telephone, public address, supervisory control and data acquisition service, radio, television, and miscellaneous remote control equipment. For design criteria and requirements, see Volume V, Section 3, Communications.

6.4 STATION COMMUNICATION ROOM

The communication equipment at each station will be housed in the combined Train Control/Communications room. Communication room requirements are as follows:

6.4.1 Location

Location should be as shown on the Directive drawings. No access to or through the room shall be permitted to service or transport any equipment not installed in the communication room. Communication room shall be enclosed completely and provided with restricted access hardware and intrusion alarms (see Volume V, Section 3, Communications).

6.4.2 Sizes and Headroom

Communication room sizes and headroom are given in Subsection 1.6.5. The overhead clearance shall not be encroached upon by HVAC ducts, room lighting and/or station structure that would interfere with cable trays and equipment racks.

6.4.3 Access

Three (3)-foot by seven (7)-foot-high pair of outswinging doors with three (3)-foot-high removable transom panel, are to be provided for access.

6.4.4 Separation

To prevent electromagnetic interference with communications equipment, communication rooms must be physically separated from other electrical facilities as follows:

A. Traction power substations: 25 linear feet and two walls of separation

B. Auxiliary power substation: 0 feet and one wall of separation

C. These walls shall be of masonry or concrete and shall have a two-hour fire rating (see Volume I, Section 2).

6.4.5 Miscellaneous

A. Provision shall be made to hang exposed cable trays, raceways, etc., from the ceiling. Troughs or boxes in the floor will not normally be required. Generally, conduit access from outside areas will terminate at a wall inside the Communications equipment room.

B. Temperature and cleanliness of the room air must be maintained within established limits. (See Section 10, Heating, Ventilating and Air Conditioning, and Volume IV, Section 1.)

C. All walls shall have an applied sealer. The floors shall be covered with vinyl tile.

D. Provisions will be made to allow monitoring the room for abnormal conditions such as smoke, fire, or intrusion.

E. Provisions will be made for the grounding of equipment.

F. The room shall be waterproof.

6.5 COMMUNICATION

For requirements of conduit routing from train control rooms to trainway ductbanks and other facilities, see Volume V, Section 2, and pertinent Directive drawings.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 7

REVISION RECORD

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 7

CONCESSIONS

VOLUME III, SECTION 7, CONCESSIONS

CONTENTS

VOLUME III, SECTION 7

CONCESSIONS

7.1 INTRODUCTION

It is the policy of SCRTD to establish controlled and limited concession programs to provide for patron convenience, while at the same time maintaining an attractive, functional, and enjoyable environment for its patrons. Accordingly, the concessions permitted by SCRTD shall conform to the general standards set forth below.

7.2 BASIC GOALS

A. To provide limited facilities and spaces for concessions which may be required for the convenience of Metro Rail patrons.

B. To ensure that concession operation does not produce a negative impact on the Metro Rail System, in the form of litter, security, pest infestation, or other undesirable conditions.

C. To insure that concession operation does not interfere with patron circulation and transit operation.

D. To generate revenue.

7.3 GENERAL CRITERIA

Concessions may be located only on the mezzanine level in the Free Area. No concessions operations will be allowed on the platforms. No food or drink concessions will be permitted.

7.4 SPECIFIC CRITERIA

7.4.1 Coin-operated Equipment

A. Public telephones will be provided in all transit stations as indicated in Section 6, "Communications."

B. Coin-operated newspaper vending machines may be authorized for stations. They will be systemwide, standardized, machines designed for mounting in wall recesses.

C. Provisions for possible future vending machines will be limited to space that is available.

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 8

FARE COLLECTION

REVISION RECORD

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 8

FARE COLLECTION

VOLUME III, SECTION 8, FARE COLLECTION

CONTENTS

VOLUME III, SECTION 8

FARE COLLECTION

8.1 INTRODUCTION

A Barrier Fare Collection system is described in the Metro Rail Criteria and Standards. For MOS-1, per direction from the SCRTD Board, a Barrier-Free Fare Collection System will be implemented on a trial basis. The Barrier-Free equipment and system design are in accordance with the Long Beach-Los Angeles Light Rail System Criteria and Standards.

Implementation requirements for the Barrier-Free system in Metro Rail are shown in Volume 5, Section 5.8.

The fare collection system will be based on a check-in/check-out operation with fare gate arrays separating the free area from the paid area on each mezzanine. The layout of the fare collection equipment shall be such that the equipment can be used easily and quickly.

A. Barriers shall be provided to prevent anyone from reaching the paid area without passing through an entry gate, or from leaving the paid area without passing through an exit gate. Emergency exit and handicapped gates will be required to supplement the regular fare gates.

B. Barriers between paid and free areas should be designed to provide appropriate physical separation without excessive visual emphasis on security.

8.2 BASIC GOALS

A. To control passenger movement and usage in such a way that an automatic fare process operates smoothly, economically, and with greatest passenger convenience

B. To allow sufficient flexibility in station layout for future expansion or any change in the fare collection system

C. To handle the transfer of passengers to and from buses and LRT vehicles in a speedy, simple manner.

VOLUME III, SECTION 8 FARE COLLECTION (Cont'd.)

8.3 DESCRIPTION OF SYSTEM

A. In order to accomplish payment of correct fare, all passenger fares will be checked by entry and exit gates throughout the Metro Rail System. Such checking will be done automatically on insertion by the patron of a machine readable ticket or pass into the fare gate.

B. Fare collection equipment consists of bidirectional entry/exit consoles and associated gates; ticket vending machines; add fare machines and an intercom and ticket reader in Passenger Assistance Centers (PACs). (The add fare machines are not required for MOS-1.)

C. All necessary patron information relating to the fare collection procedure will be included in station signage. A patron assistance intercom will be available in case of difficulty.

8.4 SEQUENCE OF OPERATIONS

A. Patrons entering a station pass a ticket vending array before entering the paid area. The ticket vending array consists of ticket vending machines.

B. The free and paid areas in a station are separated by fare gate arrays, consisting of fare gates (ticket reading consoles plus barrier in aisle) with special gates for handicapped use and emergency use, and fences. At the free side of the fare gate array, a PAC consisting of a passenger assistance intercom and ticket reader, and local control panel (Station Fare Collection Control Unit) are provided.

C. On the paid side of each fare gate array, addfare machines and a passenger assistance intercom are provided.

VOLUME III, SECTION 8 FARE COLLECTION (Cont'd.)

8.5 TICKET VENDING EQUIPMENT

8.5.1 Location

A. The Ticket Vending Machines (TVMs) will be located in the free area of each mezzanine.

B. The TVM installations will be placed to serve incoming passengers only and will not normally be used by those exiting.

C. The TVMs must be clearly visible on entry to the station but placed so as not to impede the direct flow between entry and ticket gates.

D. All TVMs shall be in recesses having flush front panels.

E. Addfare machines (AFMs) shall be located in proximity to the exit gates in the paid areas and shall be located so as to obey the "right-hand rule" for exiting patrons except for those stations where undesirable cross-flow patterns would be created. (The AFMs are not necessary for MOS-1.)

F. The AFMs will be used only by exiting passengers who must pay additional fare in order to exit.

G. The ticket readers, intercoms and local control panel will be wall-mounted adjacent to the fare gate array on each mezzanine.

H. All equipment, except the fare gates, shall have front access for maintenance and servicing. The fare gates shall be accessible from the top and sides.

8.5.2 Quantities

A. The disposition of TVMs within each station should reflect the loads at the various entrances projected by the patronage analysis and station layout.

B. Quantities of fare collection equipment shall be determined from Volume V, Section 5.6, calculations.

VOLUME III, SECTION 8 FARE COLLECTION (Cont'd.)

8.5.3 Dimensions

The following nominal dimensions are to be provided for the ticket vending equipment:

A. Ticket vending machines - 4'-0" wide x 3'-0" deep x 6'-6" high

B Addfare machines - 4'-0" wide x 3'-0" deep x 6'-6" high

C. Passenger Assistance Center - 2'-0" wide x 3'-0" deep

D. The station Fare Collection Control Unit - wall mounted 3'-10" wide x 1'-0" deep x 3'-6" high with the top 6'-6" from the floor.

8.6 TRANSFERS

A. Transfers from one Metro Rail line to another within the ultimate Metro Rail System should be possible without passing through a fare collection gate. For the passenger who inadvertently goes beyond his stop, easy recirculation should also be possible without passing through a fare collection gate.

B. Transferring between the Light Rail and Metro Rail systems may require the use of fare gates.

8.7 FARE GATE AND BARRIER

All entry to and exit from the Metro Rail System will be controlled through gates. Some gate arrays will be noncontiguous. Therefore, the extreme right-hand gate to the entering flow will be designated "entry gate;" the extreme right-hand gate to the exiting flow will be designated "exit gate." See Volume III, Section 1.6.3.

8.7.1 Quantities and Dimensions

A. The nominal dimensions of the consoles are 6'-0" long by 3'-3" high by 12" wide, and 2'-8" on centers (leaving a path 1'-8" minimal wide). A clear space

1'-6" wide is required between the end consoles and walls or rails parallel to patron flow for maintenance access to the console. This space will be closed with a short section of railing at the center line of the console.

B. Space provided for fare gate arrays shall be as determined from Volume V, Section 5.6.2, calculations. Removable sections of fare barrier fence shall be provided for required gate locations over and above initial installation. Fare barrier fence shall be 3'-3" high. These sections shall be modular to fare gate size for easy removal without requiring fence alteration.

C. Distribution of the gates within the station should reflect loading at entrances, as projected by the Patronage Analysis for each station developed under Design Directive DD-001.

D. Queueing space on either side of the gates (in paid and free areas) is based on the possible failure of one or more gates during the peak hour in normal usage. (See Volume III, Section 1.6.7, Queuing Distance Requirements and Table III-1-3.)

1. In no case should less than three aisles be provided in any single gate array. This will allow at least one aisle for exit, one for entry, and the third for the direction of major flow or an emergency standby.

2. See Fare Collection contract drawings for gate/barrier layout.

8.7.2 Emergency Egress at Fare Gates

In the event of power failure, gates will automatically revert to a free-wheeling or open condition. In addition, gates can be switched to a free-wheeling or open condition to facilitate emergency exiting. Volume I, Section 2.2.5.3.5.(D), gives detailed exiting criteria.

8.7.3 Handicapped Fare Gate

A. There must be a single handicapped gate through the barrier separating paid and free areas of the mezzanine where an elevator is located. This gate may be used by elderly and handicapped patrons, the maintenance and service staff, and emergency crews (police, fire, etc.). The gate should be located to minimize the travel distances.

B. The handicapped gate fare will be controlled by equipment similar to that controlling fare gates. A console shall be provided at the handicapped gate at a height suitable for operation by a handicapped person in a wheelchair. Operation of the handicapped gate equipment will alert the RCC in order to assure proper usage of the gate.

C. The handicapped fare gate area will consist of a 6" x 6" post to which the gate will be hinged, a 3'-8" gate opening and a 6" x 6" latching post. The console to be used by the handicapped will be 3'-3" high. The total width required is 4'-8". The gate will be equipped with self-closing double-acting hinges for bidirectional traffic, and panic hardware to ensure free exit in case of emergency. The gate shall be operable when applying 5 lbs. of pressure.

8.7.4 Emergency Exit Gate

A. In stations where an additional emergency exit is required over that provided by the fare and handicapped gates, and in secondary fare barrier locations where no handicapped gate is provided, emergency exit gate(s) shall be provided.

B. The emergency exit gate will consist of a 6" x 6" post to which the gate will be hinged, a 3'-8" gate opening, and a 6" x 6" post containing the gate latch. The gate will be equipped with self-closing, double action hinges, panic hardware to insure free exit in case of emergency, and a key-operated lock to allow authorized entrance. Operation of the emergency gate will alert the RCC in order to assure proper usage of the gate.

B. The elderly/handicapped gate will be controlled by equipment similar to that controlling fare gates. A console shall be provided at the elderly/handicapped gate at a height suitable for operation by a handicapped person in a wheelchair. Operation of the service/emergency gate equipment will alert Central Control in order to assure proper usage of the gate.

C. The elderly/handicapped gate area will consist of a 6" x 6" post to which the gate will be hinged, a 3'-8" gate opening and a 6" x 6" latching post. The console to be used by the handicapped will be 3'-3" high. The total width required is 4'-8". The gate will be equipped with self-closing double-acting hinges for bidirectional traffic, and panic hardware to ensure free exit in case of emergency. The gate shall be operable when applying 5 lbs. of pressure.

8.7.4 Service/Emergency Gate

A. In stations where an additional emergency exit is required over that provided by the fare and elderly/handicapped gates, and in secondary fare barrier locations where no elderly/handicapped gate is provided, service/emergency gate(s) shall be provided.

B. The service/emergency gate will consist of a 6" x 6" post to which the gate will be hinged, a 3'-8" gate opening, and a 6" x 6" post containing the gate latch. The gate will be equipped with self-closing, double action hinges, panic hardware to insure free exit in case of emergency, and a key-operated lock to allow authorized entrance. Operation of the service/emergency gate will alert Central Control in order to assure proper usage of the gate. The gate latch may be released by the designated Central Control personnel to provide part of the required emergency egress width.

8.8 MONEY COLLECTION PROVISIONS

(To be provided)

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 9

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Volume III, Section 9

See Volume I, Section 2 Fire/Life Safety

SYSTEM DESIGN CRITERIA AND STANDARDS

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 10

HEATING, VENTILATION, AND AIR CONDITIONING

VOLUME III, SECTION 10, HEATING, VENTILATING, AND AIR CONDITIONING

CONTENTS

VOLUME III, SECTION 10

HEATING, VENTILATING, AND AIR CONDITIONING

10.1 INTRODUCTION

In this chapter, the minimum criteria for heating, ventilating, and air conditioning (HVAC) of station spaces is presented. Individual station designs will require specific solutions to achieve the basic goals. (See Volume IV, Section 1, for more specific requirements.)

10.2 BASIC GOALS

A. To provide temperature, ventilation, and draft control in order to achieve a physical environment that provides maximum comfort with minimum of initial and maintenance costs.

B. To provide necessary environmental conditions as required for the proper operation of all mechanical, train control, electrification, lighting, and auxiliary electrical systems.

10.3 GENERAL CRITERIA

A. Provisions must be made for the rapid purging of smoke from all areas in case of fire, in both public and nonpublic areas. Such purging must be achieved in a manner that will prevent panic and aid fire control.

B. Controls, vents, louvers, etc., should be flush and smooth, providing no sharp or projecting edges or natural hazards to the public or maintenance crews. In public areas, all such devices must be installed with theft-proof attachments and tamper-proof cages or guards.

C. To reduce airborne pollution, outdoor air should be filtered where necessary, and air intakes should be so located as to avoid the introduction of dirt,

debris, fumes, odors, noise, and irritants from traffic and other external sources into the Metro Rail station. Air intakes should also be located to avoid "short circuiting" of station exhaust air.

D. Depending on external factors such as site configuration and availability of real estate, locations of intake and exhaust shaft outlets should be as follows:

1. Openings above grade located in street medians when approved by the City of Los Angeles' Department of Transportation, at off-street locations which are not pedestrian ways, or in planters.

2. Shaft openings in sidewalks or other pedestrian ways. In sidewalks, locate gratings covering such openings minimum 4 feet away from the street curb. Extent of sidewalk width occupied by these gratings shall conform to the following limitations:

   a. Sidewalk width from 0 feet to 6 feet: No gratings allowed.

   b. Sidewalk width from 6 feet to 10 feet: 4 feet maximum.

   c. Sidewalk width 10 feet or more: 40% of sidewalk width.

In other pedestrian ways, avoid locating gratings between the far tangent points at street intersections and in crosswalk areas.

E. Intake and exhaust shaft openings should be fitted with storm-proof louvers with birdscreens, or offsets, and drains to prevent the intrusion of storm water. All shafts terminating at or near grade should be equipped with gratings suitably designed to accommodate the loads to be anticipated. Surfaces should be pitched away from openings to ensure proper drainage. See Fire/Life Safety Criteria, Volume I, Section 2.3.2.3 for further requirements.

F. Sound attenuators should be provided in heating, ventilating and air conditioning systems to meet the requirements of Volume IV, Section 7, Noise and Vibration Control.

10.4 SPECIFIC CRITERIA

10.4.1 Under-Platform Exhaust

A. In all subway stations, an under-platform exhaust system will be provided to capture a portion of the heat produced by the Metro Rail train below platform level and exhaust it out of the station, thus reducing the station air conditioning load. This system will exhaust this heat by drawing air through openings evenly spaced along the full length of the rear wall of under-platform refuge space. Ducts or plenums, of adequate cross-sectional area will be provided under the platform to conduct the exhaust air to station fan rooms. From these fan rooms, fans will exhaust the air out of the station.

B. In a typical subway station, two separate fans will be required, each handling one trainway.

10.4.2 Station Public and Ancillary Area Environmental Control

See Volume IV, Section 1, Environmental Control for specific requirements.

10.4.3 Mechanical Equipment Rooms

Station mechanical equipment rooms shall be sized to house the equipment required and shall be located to minimize duct runs. Convenient maintenance access shall be provided. Openings shall be sized for the installation and removal of each piece or component of factory-built item of equipment through doors, hatches, removable panels, or shafts directly to the exterior. Where removal directly to the exterior is not feasible, openings may be provided into the trainway for removal of equipment by work train.

Room sizes and locations are given in Section 1, General Criteria of this volume, as well as on Standard and Directive Drawings.

10.4.4 Chiller Plants

Chiller plants and related cooling towers will be located at selected stations as established by Volume IV, Section 1. Where chiller plants are located in stations, they shall be sized to house the equipment required, shall be provided with convenient maintenance access, and shall have equipment access, sized for the installation and removal of each factory-built item of equipment as noted above.

At stations served by remote chiller plants, provision shall be made for ingress and egress of chilled water piping to station fan rooms. Cooling towers will not be provided as a part of the initial development.

SYSTEM DESIGN CRITERIA AND STANDARDS

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 11

LANDSCAPING

VOLUME III, SECTION 11, LANDSCAPING

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VOLUME III, SECTION 11

LANDSCAPING

11.1 INTRODUCTION

The landscape architectural design criteria have been established to provide the designer with the basic landscape requirements necessary and acceptable for design of the project. The design criteria establish specific plant material uses and provide a planting material "palette" which allows for the development of special areas while precluding the use of high maintenance and the need for special care.

11.2 BASIC GOALS

A. To solve aesthetic problems unique to Southern California climatic conditions regarding plant materials, local construction materials as well as their historical, contemporary, social and cultural expressions.

B. To control the appearance of the transit system in conjunction with lighting and graphic elements.

C. To control the movement of patrons, providing ease and safety in segregating the pedestrian, bus, and automobile users in a clearly definable way.

D. To respond to the environment made up of several distinct climatic zones within the greater Los Angeles area, to varying geologic conditions, as well as to existing and proposed zoning and land use patterns.

E. To design the landscape development with elements which reflect long term commitment involved in the completed Metro Rail Project. Selections of materials must reflect this long term commitment and must stress durability, hardiness, vandal resistance, and low maintenance.

F. To coordinate interfaces between landscape architecture, architecture, graphics, and lighting, creating a harmonious overall development insuring ease and simplicity of systemwide maintenance programming.

G. To adhere to the budget of the landscape design program and ensure cost effectiveness. The budget

allocation for planting and irrigation is to be determined on a square foot basis. The allowance shall be separated from the station cost so that adequate landscaping can be achieved independently. The District shall determine the allocation and the Designer shall maintain it as a maximum allowance.

H. To conform to all codes and regulations governing landscape development.

11.3 GENERAL CRITERIA

A. Create pleasing microclimatic conditions.

B. Provide safe and pleasing pavements and surfaces.

C. Coordinate proper grading and drainage.

D. Provide automatic irrigation where required.

E. Control development of special areas, including public gathering spaces and joint development areas.

F. Establish guidelines for preserving existing desirable plant materials.

11.4 SPECIFIC CRITERIA

Based on the goals and in light of the unique environmental conditions, the following landscape design criteria insure homogeneity of design form.

11.4.1 Climate Control

Placement of plant materials and landscape elements should create a positive microclimate regarding sun and shade patterns. It should also control undesirable and direct desirable winds and breezes. Also, to a lesser extent, landscape elements, i.e., walls, berms and planting, can control undesirable noises in heavily trafficked areas.

11.4.2 Movement Control

The patron must have relatively unobstructed access to the transit system but be separated from bus and auto

traffic where possible. Creation of waiting areas at bus stops and Kiss and Ride areas should be pleasant and comfortable for short term use but be visibly "open" for security reasons.

Areas shall be created for bicycle storage.

11.4.3 Pavements and Surfaces

The patron must feel at ease when walking in transit areas. Walking surfaces must be slip resistant and reduce glare as much as possible.

11.4.4 Grading and Drainage

Planting and other landscape elements must allow for positive civil engineered drainage where required.

11.4.5 Lighting and Signage Interface

Planting, when combined with lighting and signage, shall not interfere with ease of access to the units for maintenance. Plant material selection and location must be designed so as to coordinate with lighting placement clearances and with the lighting limits of the signs and the luminaire palette.

11.4.6 Planting Criteria

A. Good landscape architetural design principles must be followed.

B. Areas of concealment must be avoided.

C. Plant material selection shall be based on mature growth and minimal maintenance requirements.

D. Major maintenance efforts must be avoided. Mowed lawns, clipped formal hedges, espalier or pleached materials must not be specified. It is understood that a maintenance free landscape in an urban setting is not feasible, but materials can be selected and placed to reduce maintenance.

11.4.7 Irrigation

Irrigation of plant materials is necessary in Southern California to keep plants green year-round. The water

source shall be the public water system. Design techniques shall be used which provide 100 percent coverage. The designer shall carefully coordinate location of components for minimal accessibility by the public. Plant materials shall be selected which have a low water requirement to minimize water usage.

11.4.8 Preserving Existing Plant Material

Every effort shall be made to retain existing plant materials where practical and appropriate. Construction technique shall dictate which trees and shrubs can be saved. It is not desirable to complicate and/or financially impede the contractor's work on the grounds that every tree must be saved: trees removed due to construction will be replaced in-kind after construction. Municipal trees which were planted as street-trees, etc., must be replaced with a 24" box of the same variety as required by the Los Angeles City Street Tree Division.

11.5 MASTER PLANT LIST

The master plant list provides an alphabetical listing of all trees, shrubs, groundcovers, and vines which may be used on the Metro Rail System. The Landscape Architect shall use only those plants listed with the associated standard specifications unless specific approval to vary from the list has been granted. The list was chosen to give the Landscape Architect a working platte with a variety of aesthetic and functional characteristics and potentially available sizes.

11.5.1 Explanation of Terms

Item Number: Lists individual plants and plant sizes in numerical order based on alphabetical listing.

Plant Name: The specific botanical name, including variety to be used on all drawings and bidding documents.

Common Name: A name listed from local sources for convenience.

Procurement -
Specifications: Based on potential availability. Note that one plant variety may be specified several ways for use in various situations and in response to budgetary constraints. Generally, plants should be specified as large as possible to avoid theft and to give immediate effect on the project.

Container: Indicates the minimum and maximum size container accepta ble for that specified plant size.

11.5.2 Master Plant List

Note: Plants identified as (var.)or "species" are to be completely identified on the drawings by the landscape architect. Variations from the Master Plant List must receive prior approval before being incorporated on final drawings.

BOTANICAL NAME / COMMON NAME	CONTAINER
1. Abelia grandiflora Glossy Abelia	1 - 15 Gallon
2. Acer palmatum (var.) Japanese Maple	15 Gallon - 36" Box
3. Agapanthus africanus Lily of the Nile	1 Gallon
4. Ajuga reptans Carpet Bugle	Flats

5.	Albizia julibrissin Silk Tree	24" - 36" Box
6.	Alsophili australis Tree Fern	15 Gallon - 24" Box
7.	Archontophoenix cunninghamiana King Palm	24" - 36" Box
8.	Arctostaphylos 'Point Reyes' Bearberry	1 Gallon
9.	Arecastrum romanzoffianum Queen Palm	24" - 36" Box
10.	Asparagus sprengeri Asparagus Fern	1 Gallon
11.	Asplenium bulbiferum Mother Fern	1 Gallon
12.	Baccharis pilularis 'Twin Peaks' Coyote Brush	Flats
13.	Bauhinia blakeana Hong Kong Orchid Tree	24" - 36" Box
14.	Betula alba White Birch	24" - 36" Box
15.	Bougainvillea hybrids Bougainvillea	1 - 5 Gallon
16.	Brachychiton acerifolius Flame Tree	24" - 36" Box

17. Brachychiton populneus Bottle Tree	24" - 36" Box
18. Brunfelsia calycina "Floribunda" Yesterday, Today & Tommorrow	5 - 15 Gallon
19. Callistemon citrinus Lemon Bottlebrush	15 Gallon - 24" Box
20. Callistemon viminalis Weeping Bottlebrush	15 Gallon - 24" Box
21. Carissa grandiflora (var.) Natal Plum	1 - 5 Gallon
22. Cassia leptophylla Gold Medallion Tree	24" Box
23. Chamerops humilis Mediterranean Fan Palm	24" Box
24. Chorisia speciosa Floss Silk Tree	24" - 36" Box
25. Cinnamomum camphora Camphor Tree	24" - 30" Box
26. Cissus antarctica Kangaroo Vine	1 - 5 Gallon
27. Cistus purpureus Rockrose	1 - 5 Gallon
28. Clivia miniata "Belgian Hybrid' Kaffir Lily	1 - 5 Gallon

VOLUME III, SECTION 11 LANDSCAPING (Cont'd.)

29. Cocculus laurifolius Snailseed	5 - 15 Gallon
30. Cotoneaster "species" Cotoneaster	5 - 15 Gallon
31. Cupaniopsis anacardiodes Carrotwood	24" - 36" Box
32. Cupressocyparis leylandii Leyland Cypress	15 Gallon - 25" Box
33. Dicksonia antarctica Tasmanian Tree Fern	5 - 15 Gallon
34. Dodanaea viscosa "Purpurea' Purple Hop Seed	5 Gallon
35. Duchesnea indica False Strawberry	Flats
36. Elaegnus pungens (var.) Silverberry	5 - 15 Gallon
37. Eriobotrya deflexa Bronze Loquat	15 Gallon - 24" Box
38. Eucalyptus (var. listed below) E. Citriodora E. Ficifolia E. Maculata E. Nicholii	5 Gallon

E. Polyanthemos

E. Rudis

E. Sideroxylon

39.	Fatsia japonica Japanese Fatsia	1 - 5 Gallon
40.	Ficus nitida Indian Laurel	24" Box
41.	Ficus pumila Creeping Fig	1 Gallon
42.	Fraxinus velutina 'Modesto' Modesto Ash	24" - 36" Box
43.	Gazania "species"	Flats
44.	Geijera parviflora Australian Willow	24" - 30" Box
45.	Ginko biloba Maidenhair Tree	24" - 36" Box
46.	Gleditsia triacanthos 'Sunburst' Honey Locust	15 Gallon - 24" Box
47.	Hedera helix (var.) English Ivy	Flats
48.	Hemerocallis "species" Daylily	1 Gallon

49.	Hibbertia volubilis Guinea Gold Vine	5 Gallon
50.	Ilex altaclarensis 'Wilsonii' Wilson Holly	15 Gallon
51.	Ilex cornuta (var.) Chinese Holly	5 - 15 Gallon
52.	Jacaranda acutifolia Jacaranda	24" - 36" Box
53.	Juniperus chinesis (var.) Juniper	5 - 15 Gallon
54.	Juniperus horizontalis (var.) Juniper	5 Gallon
55.	Juniperus sabina (var.) Juniper	5 Gallon
56.	Koelreuteria bipinnata Chinese Flame Tree	24" - 36" Box
57.	Lagerstroemia indica (var.) Crape Myrtle	24" - 36" Box
58.	Laurus nobilis Sweet Bay	15 Gallon
59.	Leptospermum scoparium (var.) Tea Tree	15 Gallon - 24" Box
60.	Ligustrum japonicum (var.) Japanese privet	5 - 15 Gallon

61. Magnolia grandiflora Southern Magnolia	24" - 36" Box
62. Magnolia soulangiana Saucer Magnolia	24" - 36" Box
63. Mahonia lomariifolia NCN	5 Gallon
64. Melaleuca quinquenervia Cajeput Tree	24" - 36" Box
65. Microlepia strigosa Microlepia Fern	1 Gallon
66. Myoporum parvifolim NCN	Flats
67. Nerium oleander (var.) Oleander	5 - 15 Gallon
68. Ophiopogon japonicus Mondo Grass	Flats - 1 Gallon
69. Pachysandra terminalis Pachysandra	Flats
70. Phoenix 'species' Date Palm	24" - 36" Box
71. Photinia fraseri NCN	5 - 15 Gallon
72. Photinia serrulata Chinese Photinia	5 - 15 Gallon

VOLUME III, SECTION 11 LANDSCAPING (Cont'd.)

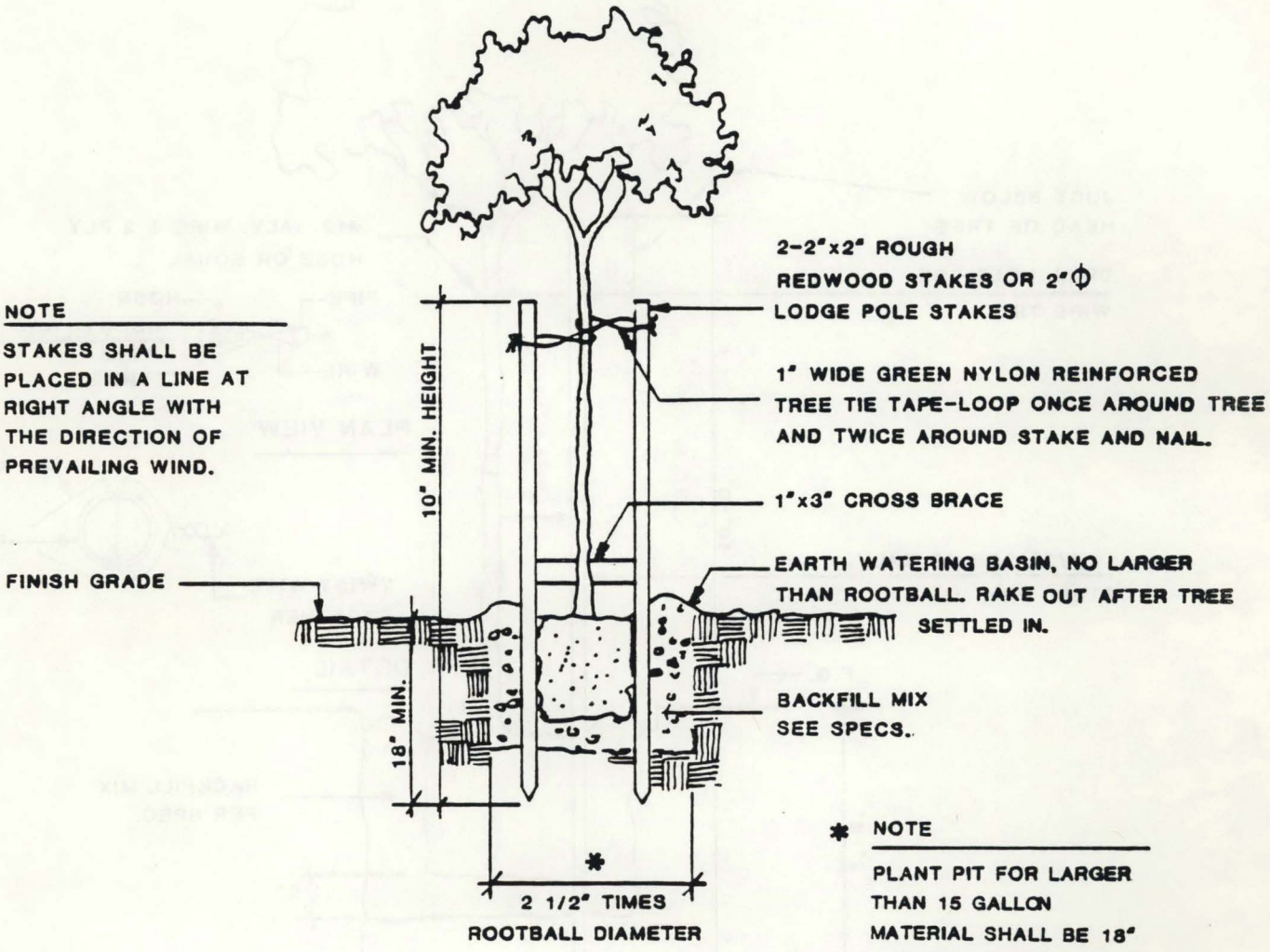
73. Pinus (var. listed below)	24" - 36" Box
P. Canariensis	
P. Pinaster	
P. Pinea	
P. Thunbergii	
74. Pistacia chinesis	24" - 30" Box
Chinese Pistache	
75. Pittosporum rhombifolium	15 Gallon - 24" Box
Queensland Pittosporum	
76. Pittosporum tobira	5 - 15 Gallon
Pittosporum	
77. Pittosporum undulatum	24" - 36" Box
Victorian Box	
78. Platanus acerifolia	24" - 36" Box
London Plane Tree	
79. Podocarpus gracilior	15 Gallon - 36" Box
Fern Pine	
80. Pococarpus macrophyllus	24" Box
Yew Podocarpus	
81. Potentilla verna	Flats
Spring Cinquefoil	
82. Prunus caroliniana	15 Gallon - 24" Box
Carolina Laurel Cherry	

VOLUME III, SECTION 11 LANDSCAPING (Cont'd.)

83. Prunus cerasifera Purple Leaf Plum	24" - 36" Box
84. Psidium littorale Straberry Guava	24" Box
85. Pyracantha 'species' Firethorn	5 - 15 Gallon
86. Pyrus calleryana "Bradford" Evergreen Pear	24" - 36" Box
87. Pyrus kawakamii (var.) Evergreen Pear	24" - 30" Box
88. Quercus agrifolia Coast Live Oak	24" - 36" Box
89. Quercus llex Holly Oak	24" - 36" Box
90. Raphiolepis indica (var.) Indian Hawthorn	1 - 15 Gallon
91. Rhapis excelsa Lady Palm	15 Gallon - 24" Box
92. Schinus terebinthifolius Brazillian Pepper Tree	24" - 36" Box
93. Sequoia semperviren 'Aptos Blue' Coast Redwood	24" - 36" Box
94. Tibouchina urvilleana Princess Flower	5 Gallon

VOLUME III, SECTION 11 LANDSCAPING (Cont'd.)

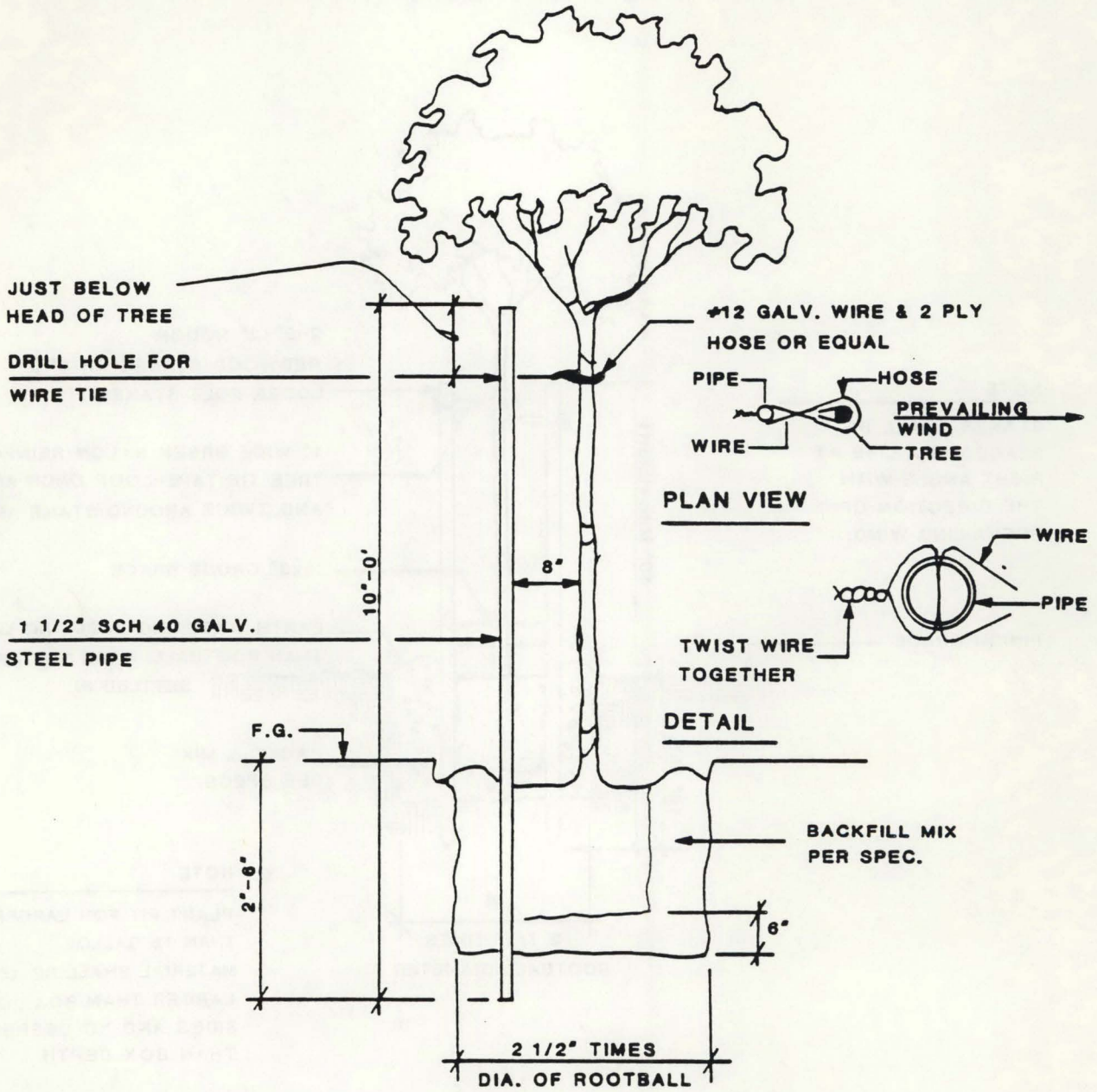
95.	Tipuana tipu Tipu Tree	24" - 36" Box
96.	Trachelospermum jasminoides Star Jasmine	1 Gallon
97.	Trachycarpus fortuni Windmill Palm	15 Gallon - 24" Box
98.	Tristania conferta Brisbane Box	24" - 36" Box
99.	Viburnum japonicum Japanese Japonicum	5 - 15 Gallon
100.	Vinca minor Dwarf Running Myrtle	Flats
101.	Washington robusta Mexican Fan Palm	24" - 36" Box
102.	Xylosma congestum NCN	5 - 15 Gallon
103.	Zelkova serrata Sawleaf Zelkova.	24" - 36" Box



1 TREE DOUBLE STAKING DETAIL

NO SCALE

Figure III-11-1



2 TREE STAKING DETAIL - STREET TREES

NO SCALE - CITY OF L.A. CITY STANDARD.

Figure III-11-2

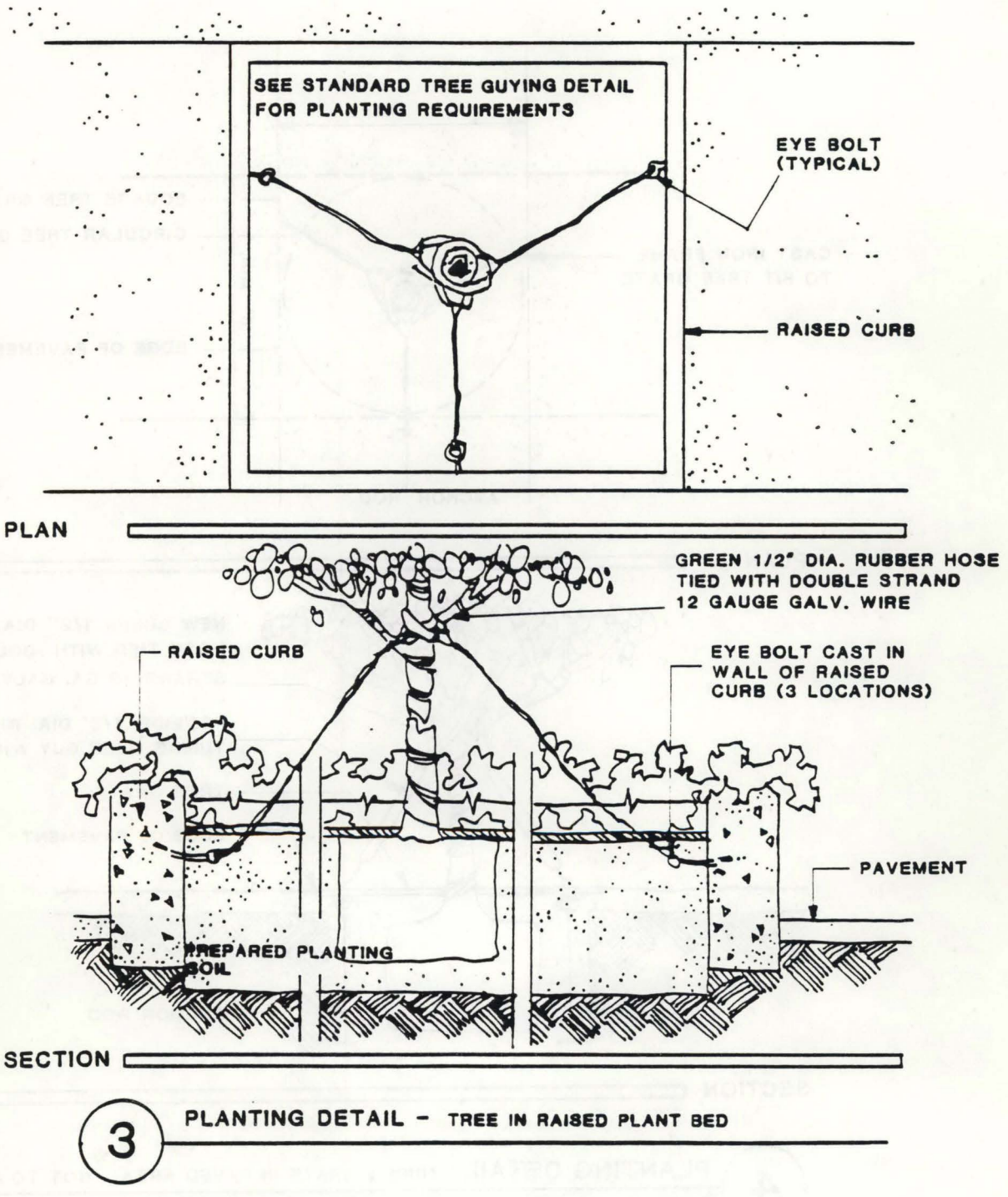


Figure III-11-3

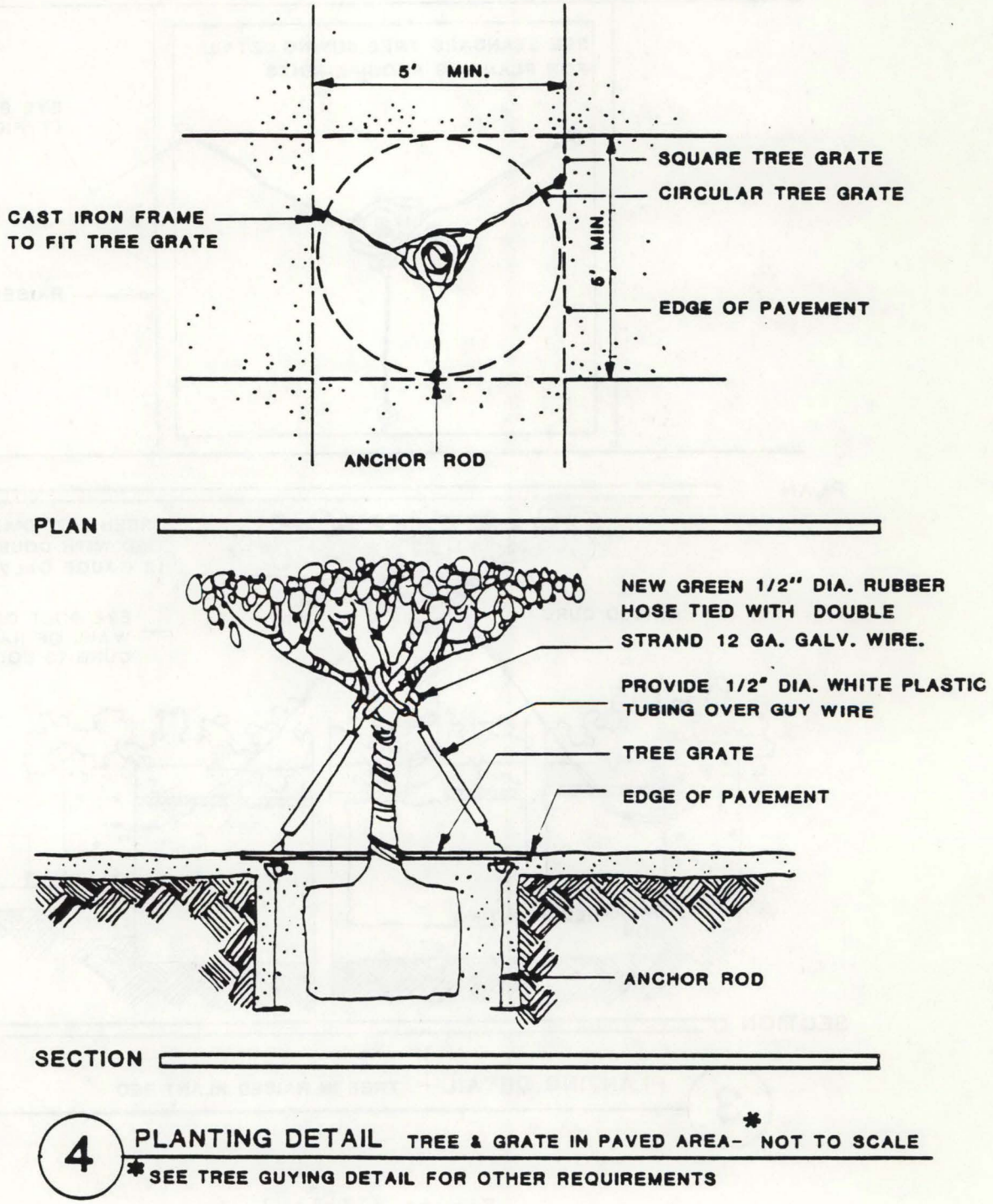
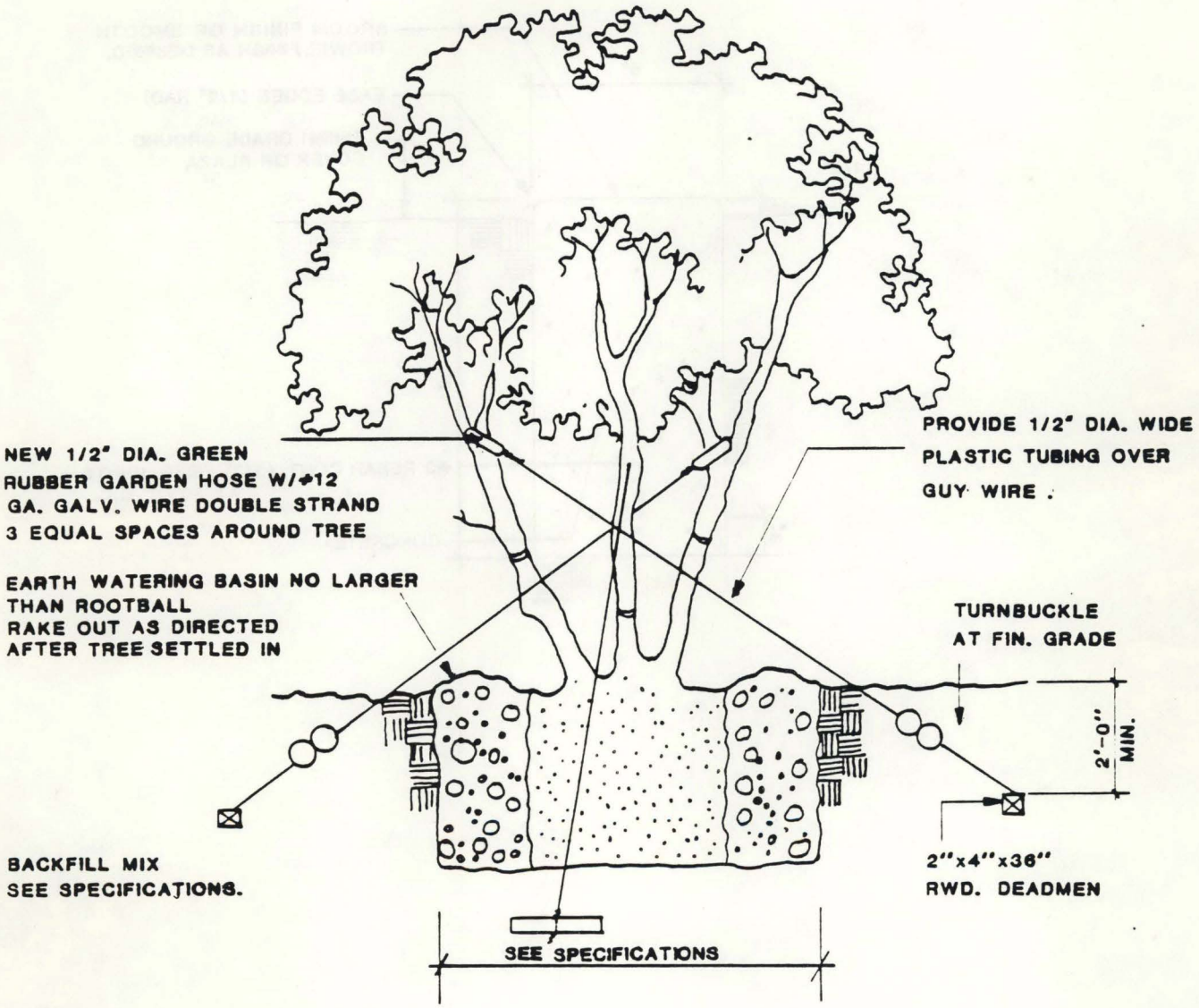
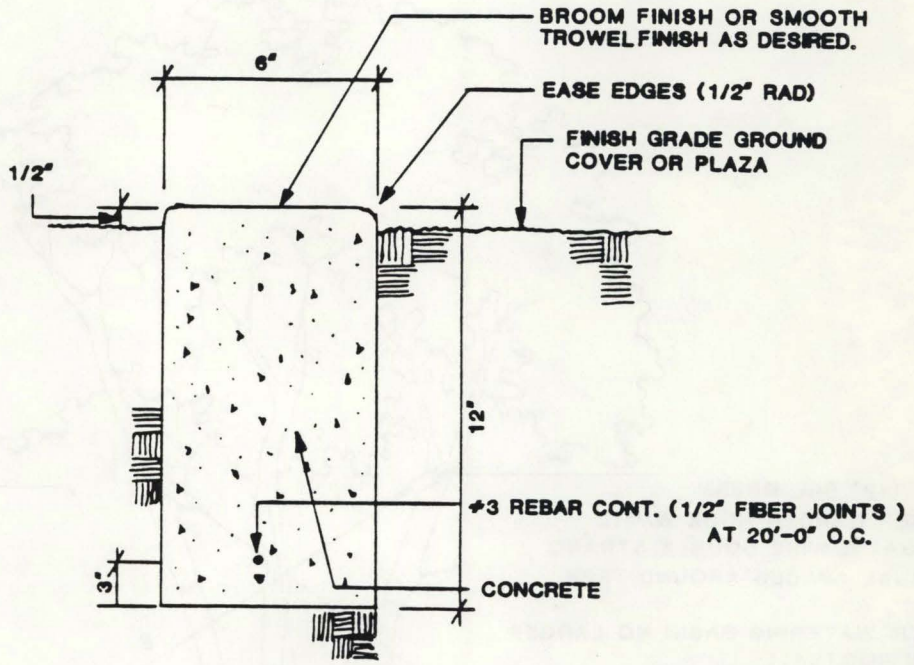


Figure III-11-4



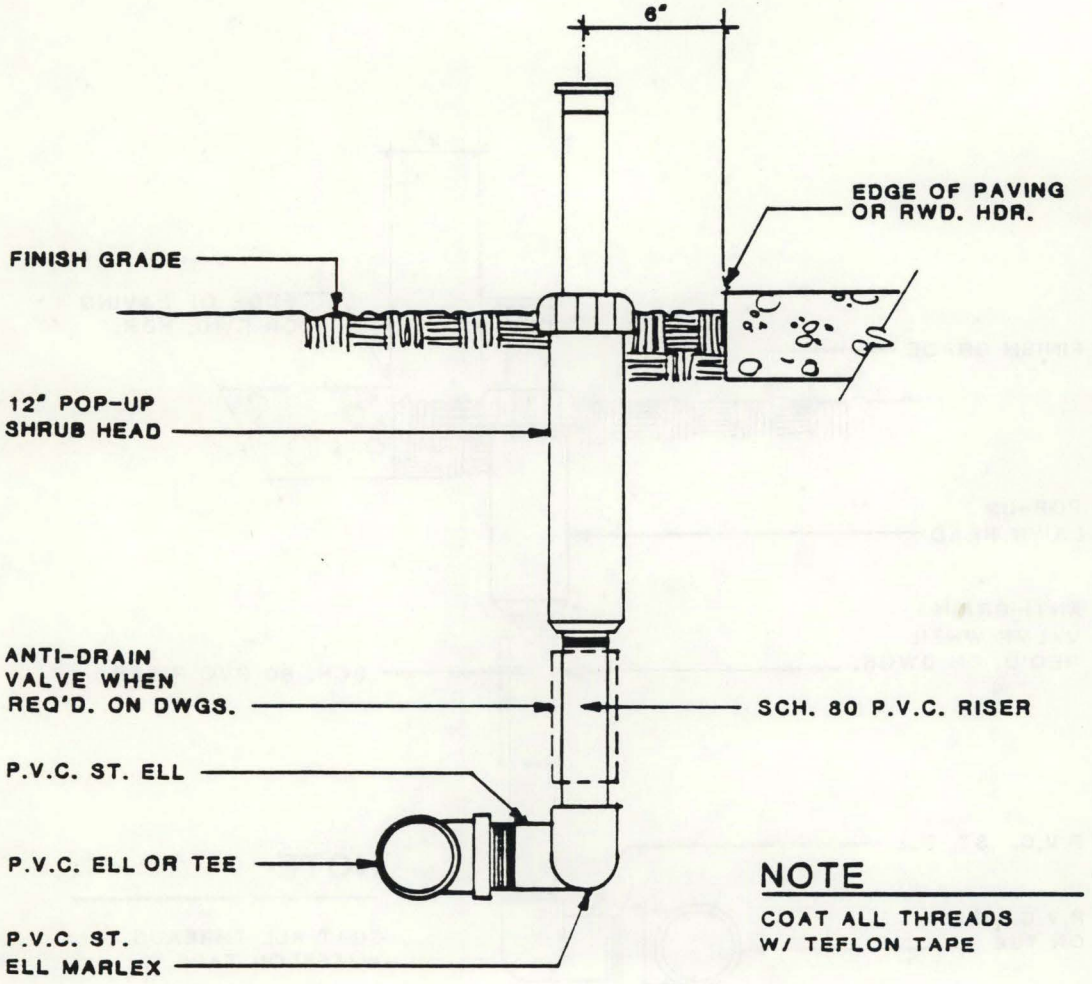
5 TREE GUYING DETAIL NO SCALE

Figure III-11-5



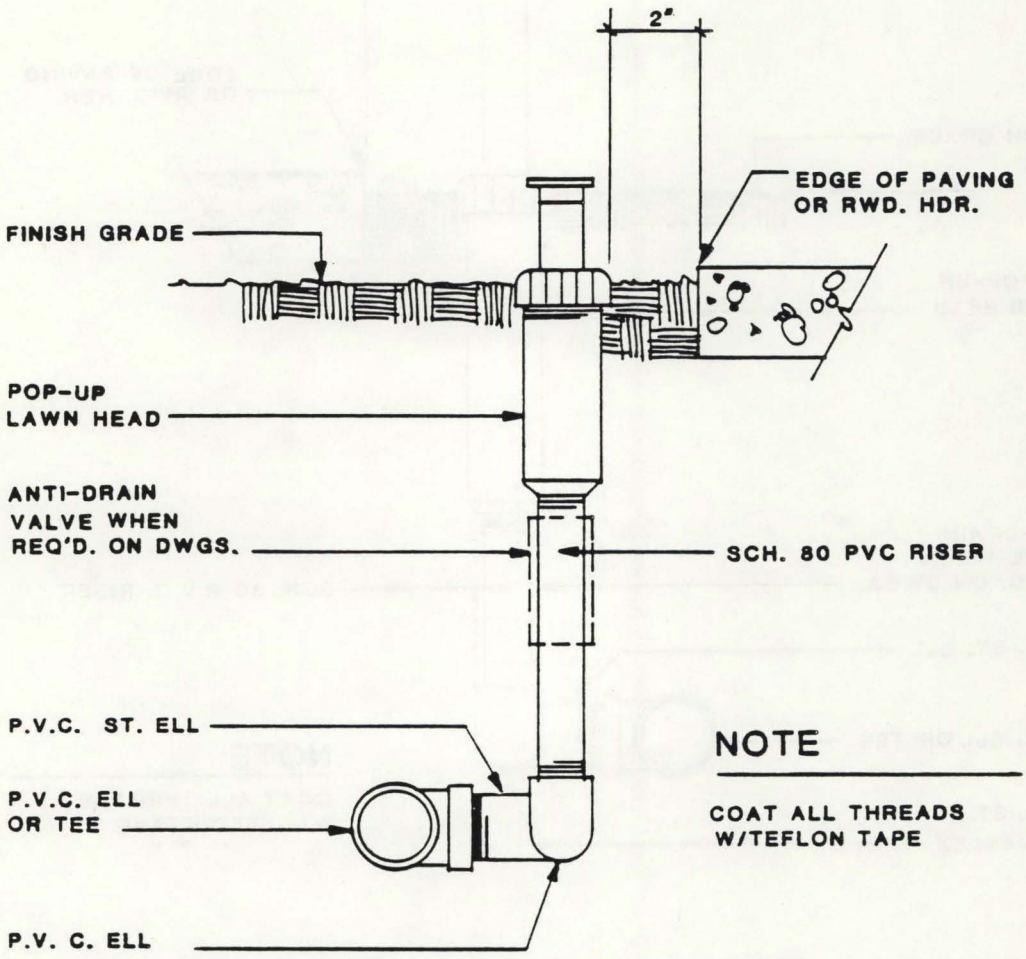
6 CONCRETE HEADER DETAIL
NO SCALE

Figure III-11-6



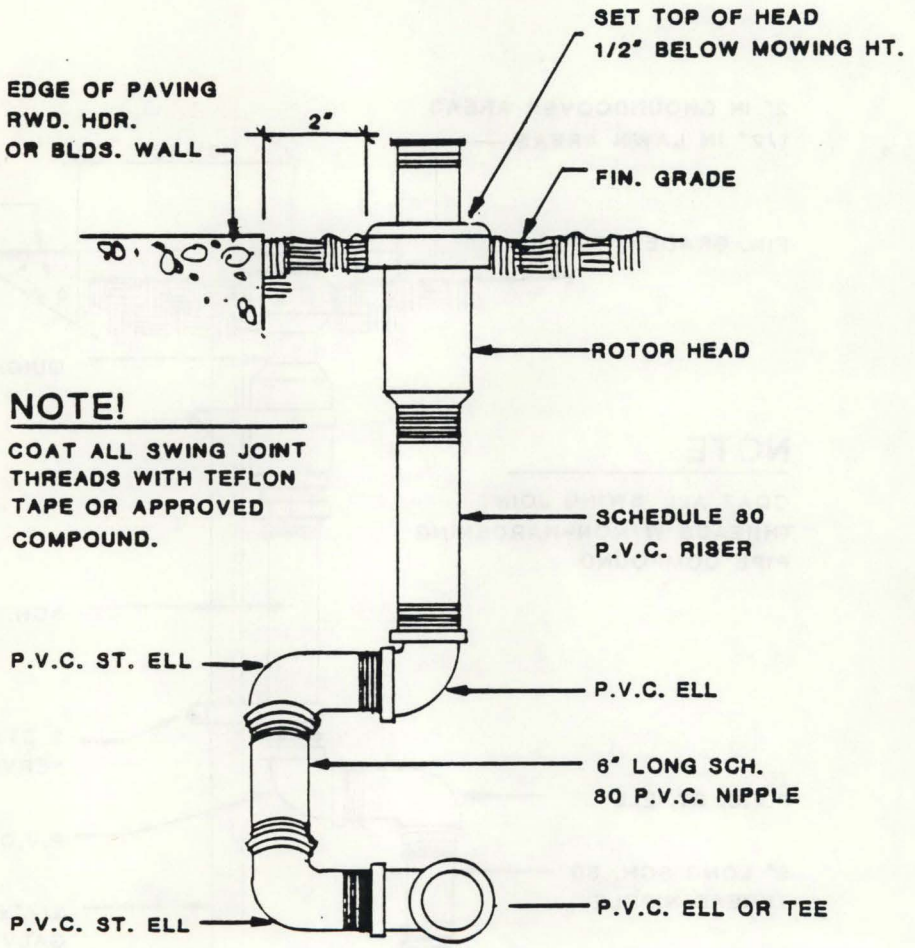
7 SHRUB POP-UP SPRAY HEAD
NO SCALE

Figure III-11-7



8 LAWN POP-UP SPRAY HEAD
NO SCALE

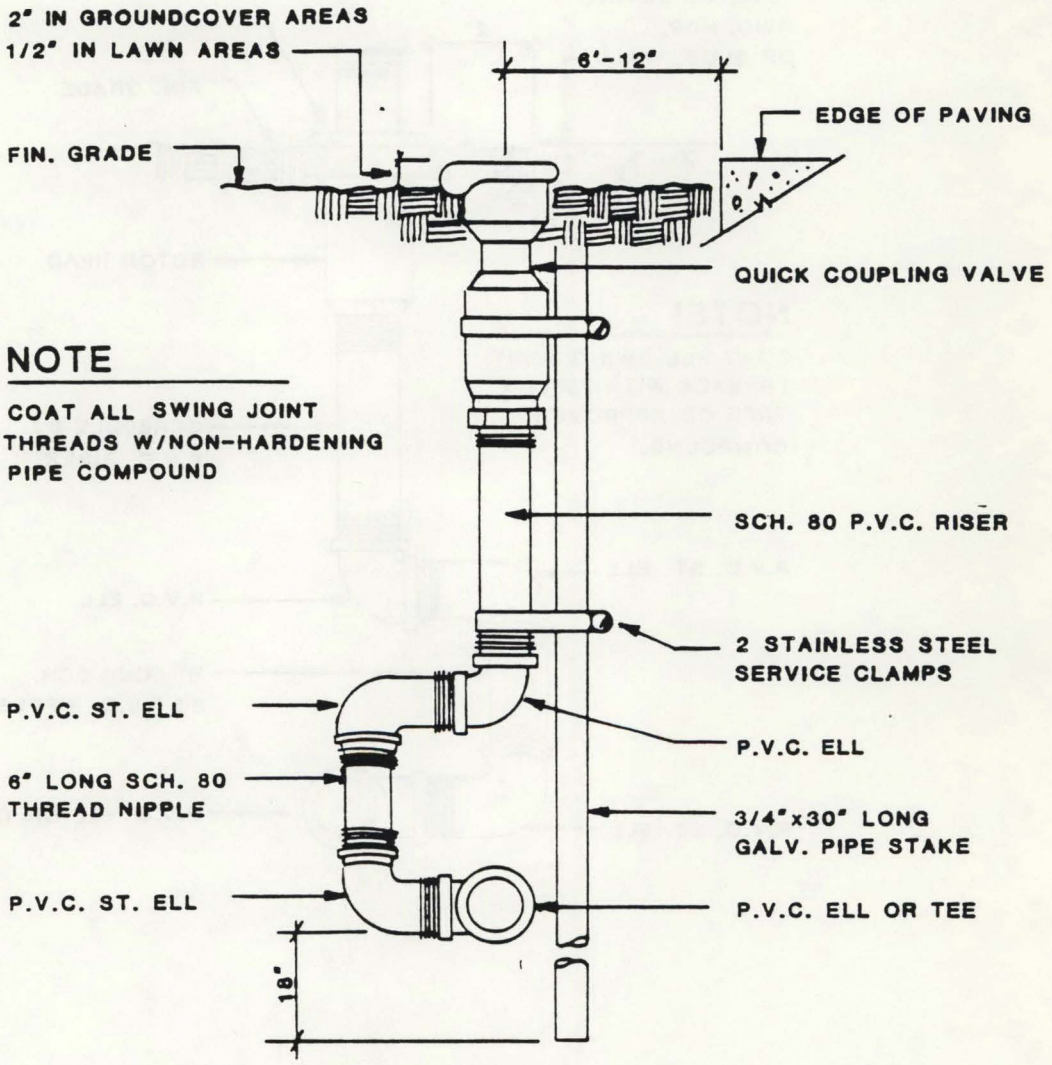
Figure III-11-8



9 LAWN ROTOR HEAD

NO SCALE

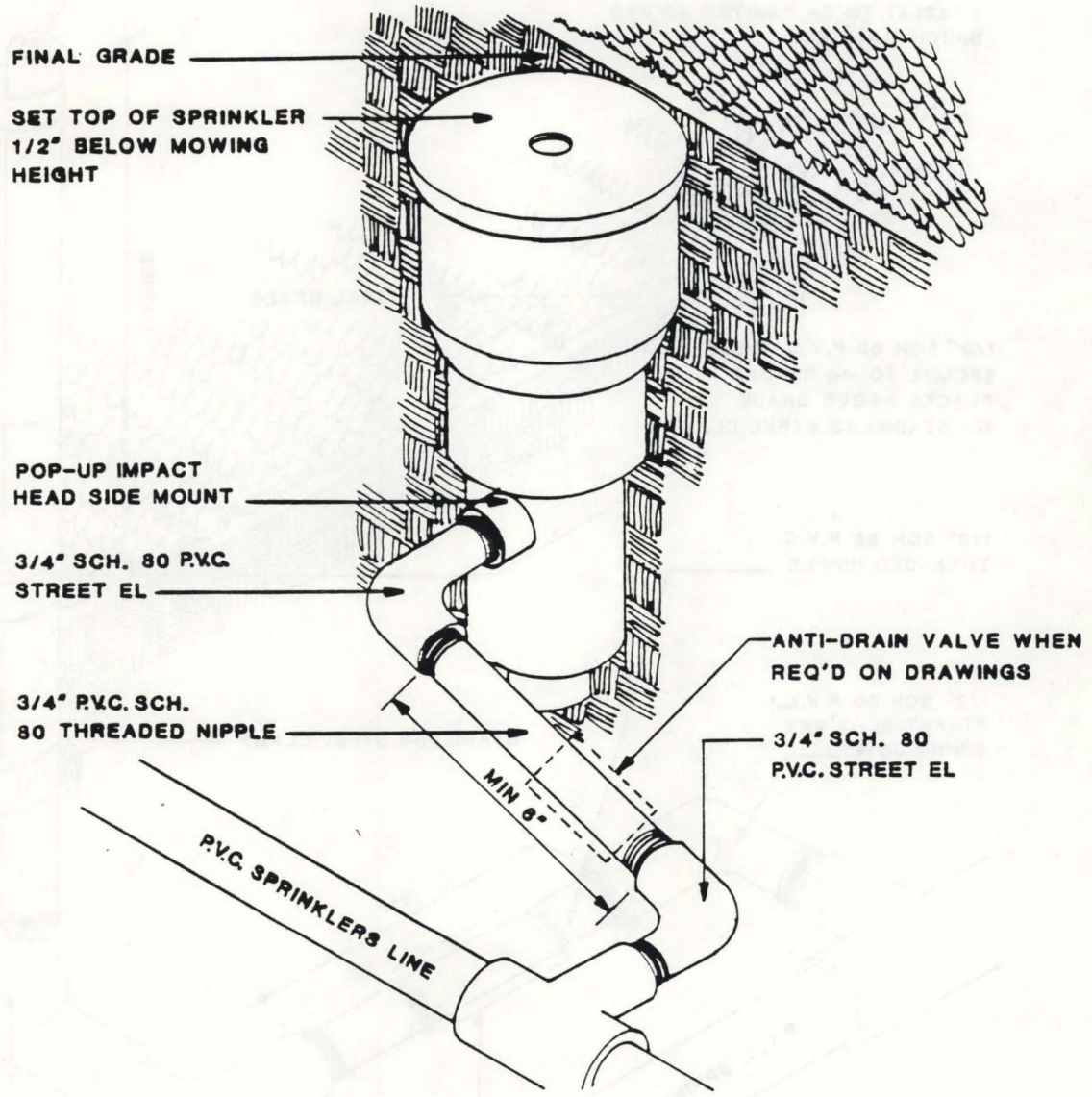
Figure III-11-9



10 QUICK COUPLING VALVE

NO SCALE

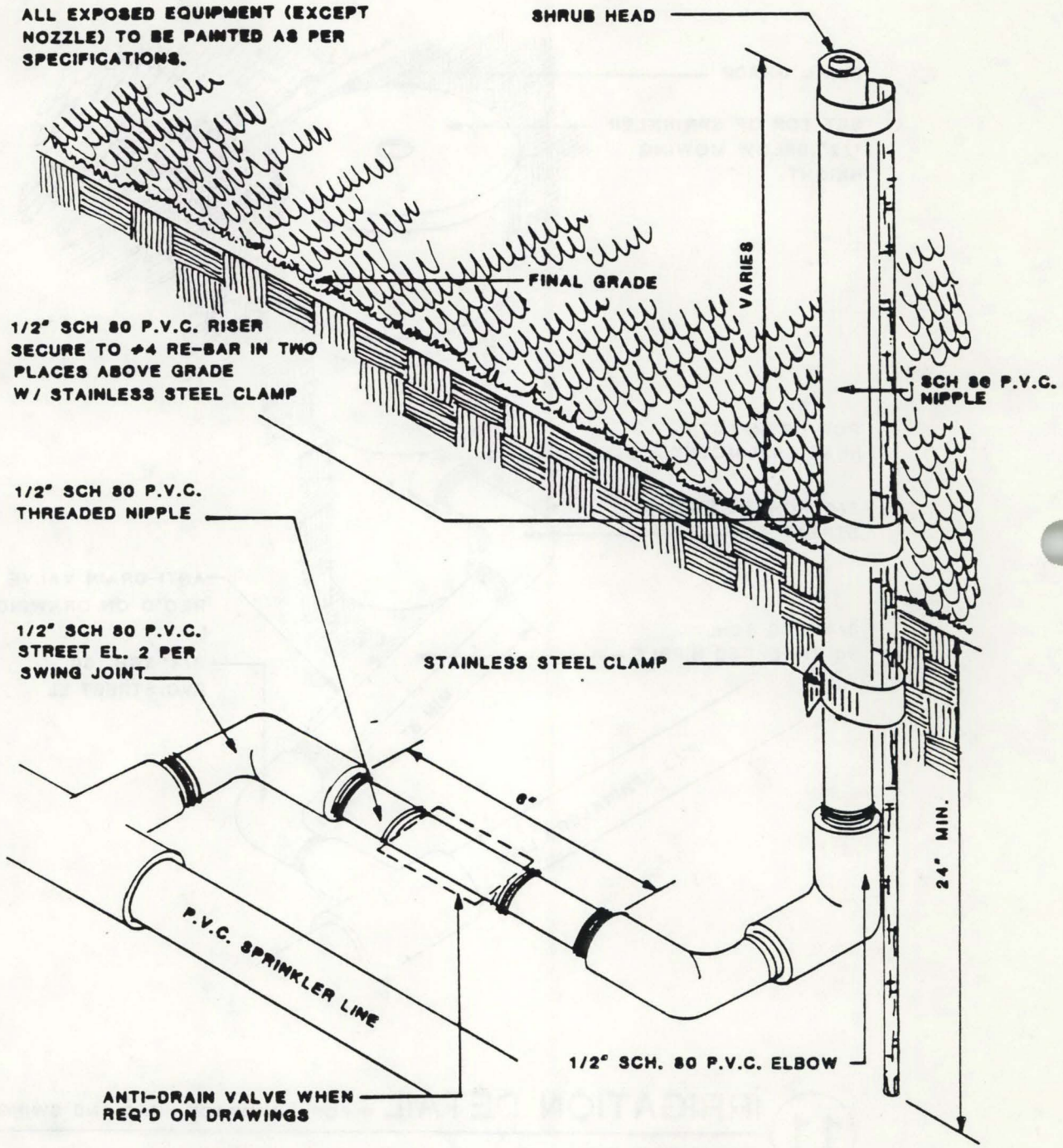
Figure III-11-10



11 IRRIGATION DETAIL — POP-UP IMPACT HEAD AND SWING JOINT

NOT TO SCALE

Figure III-11-11



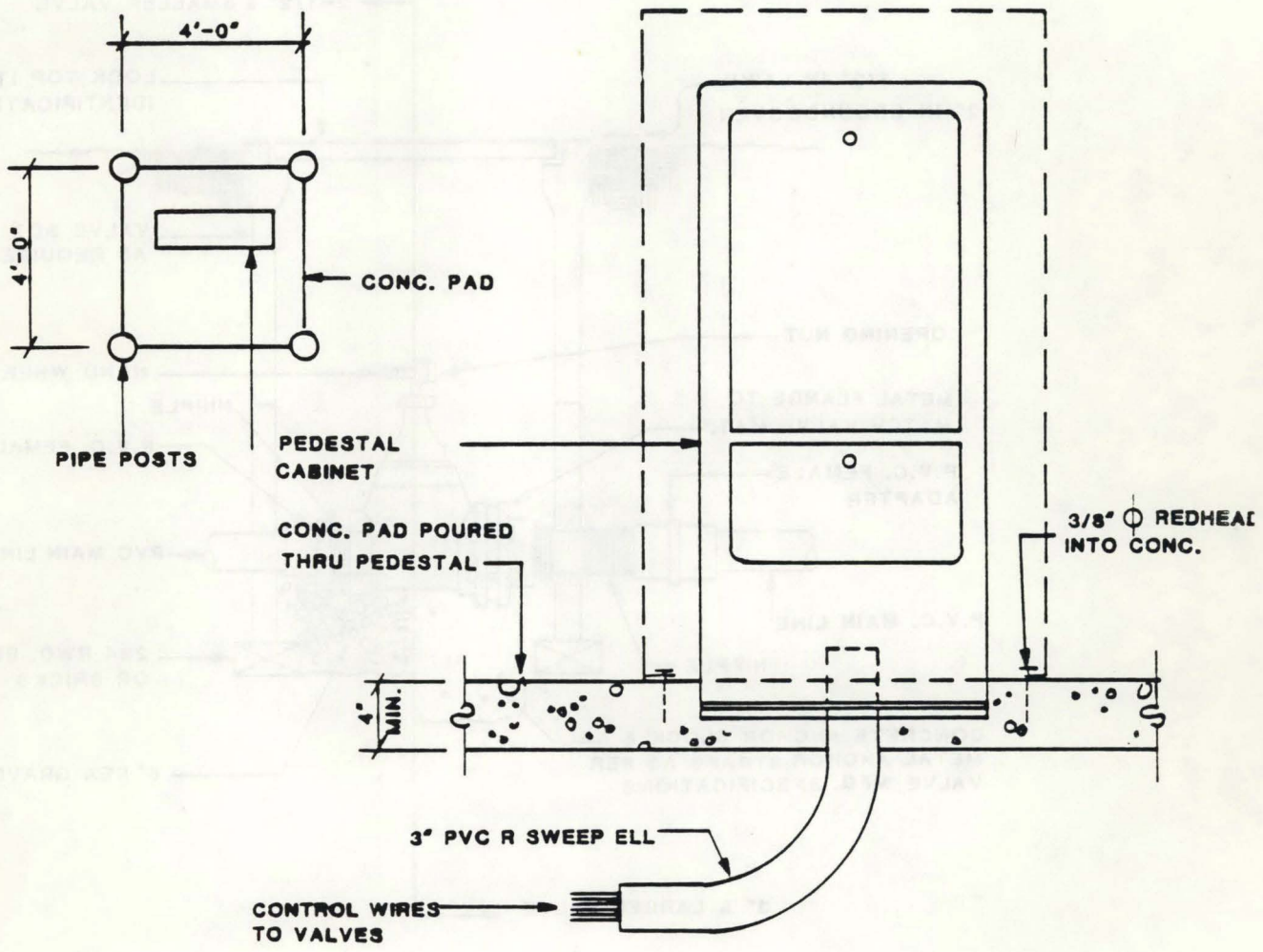
12 IRRIGATION DETAIL – SPRAY HEAD RISER AND SWING JOINT

NO SCALE

Figure III-11-12

(4) FOUR 4" O.D. GALV. SCH. 40
STEEL PIPE POSTS @ CORNERS.
INSTALL 4'-0" ABOVE F.G. W/12" ⌀ X 24"
DEEP CONC. FTG. FILL PIPE POSTS W/ CONC.

LE MUER TYPE "A"
ENCLOSURE SHOP PRIME
FINISH PAINT DARK GREEN

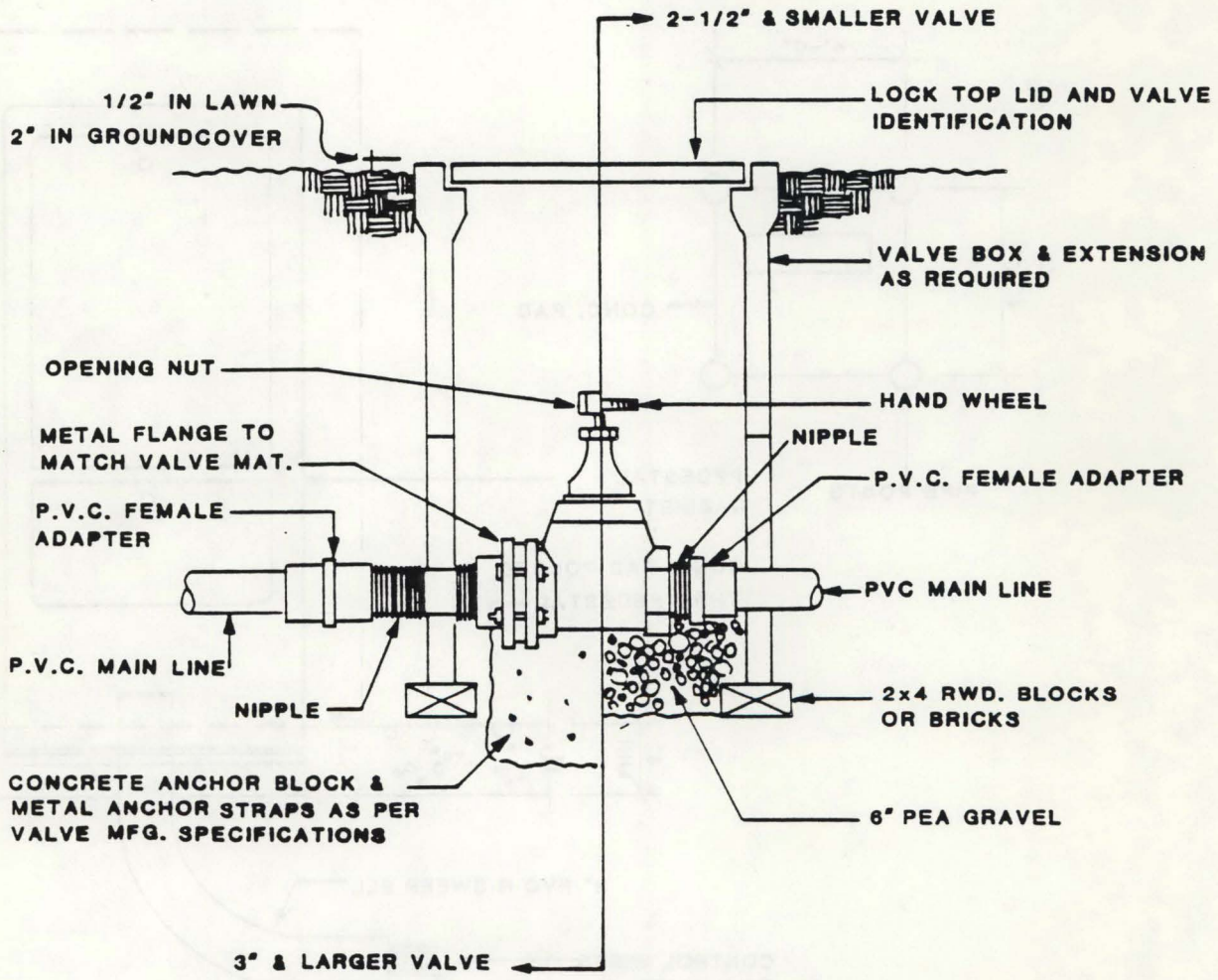


13 EXTERIOR CONTROLLER INSTALLATION DETAIL*

NO SCALE

*INTERIOR SECURED INSTALLATION DOES NOT REQUIRE LE MUER BOX OR STEEL PIPES AT CORNERS

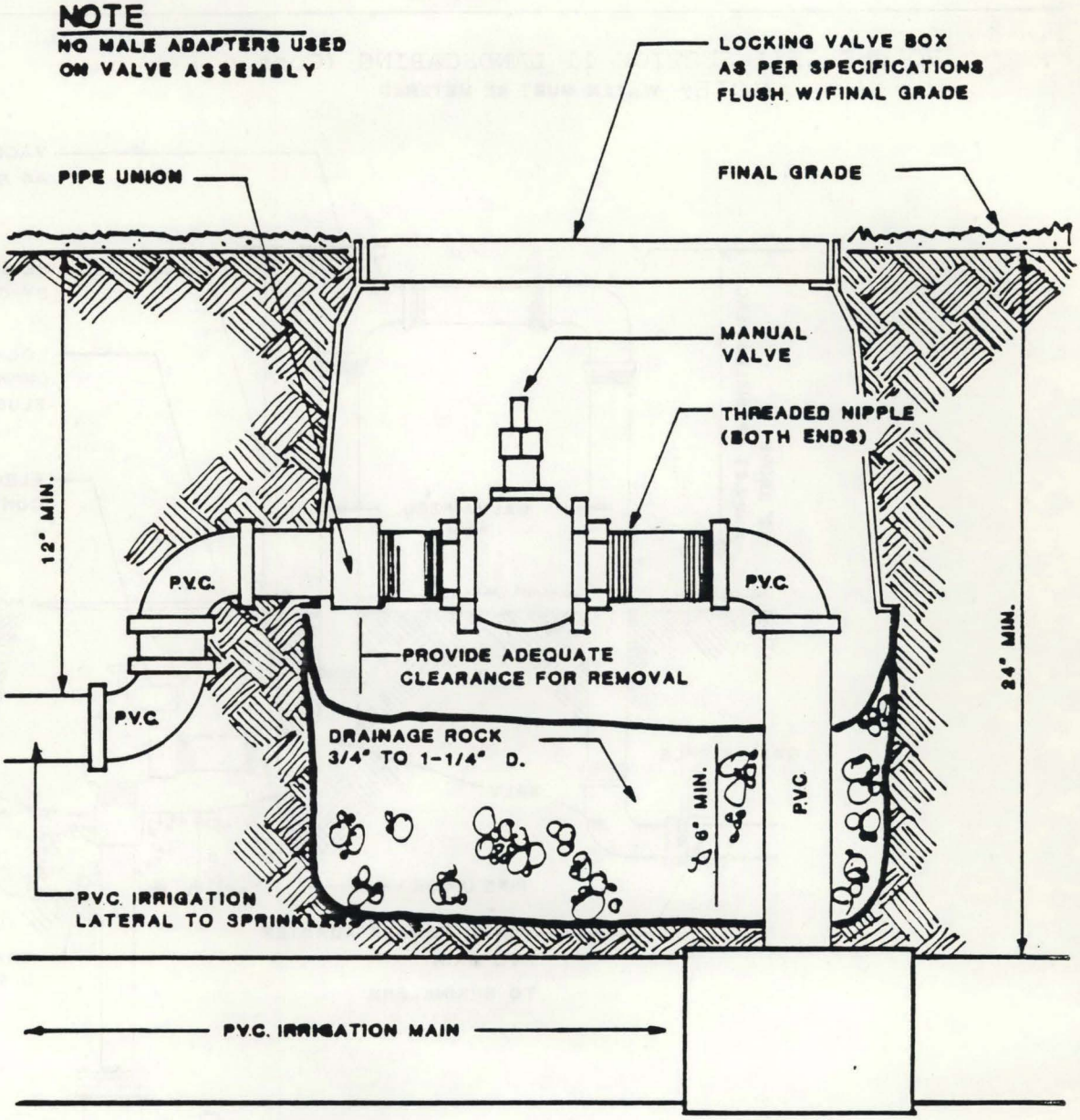
Figure III-11-13



14 GATE VALVE

ON SCALE

Figure III-11-14

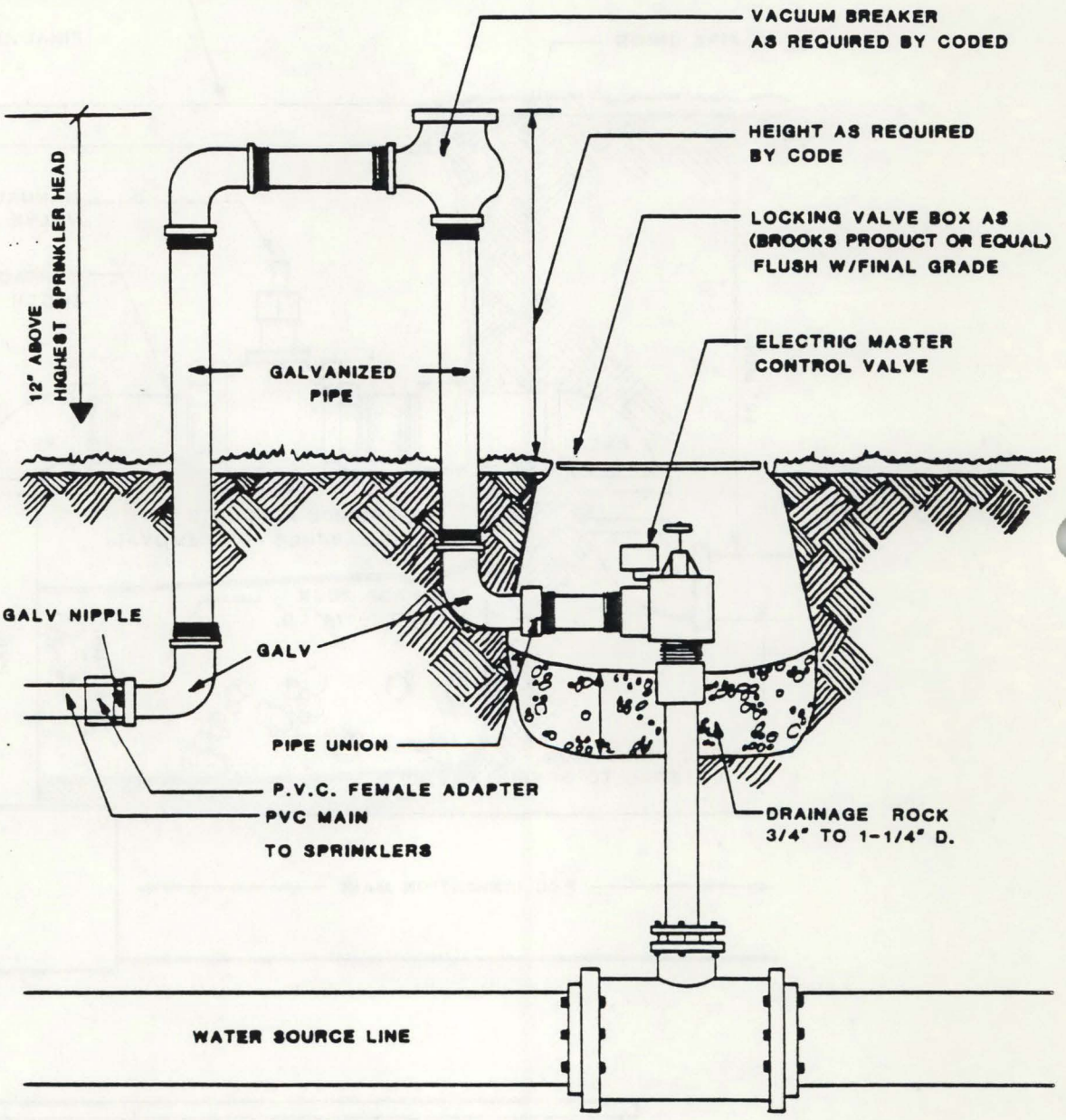


15 IRRIGATION DETAIL - MANUAL VALVE AND BOX

Figure III-11-15

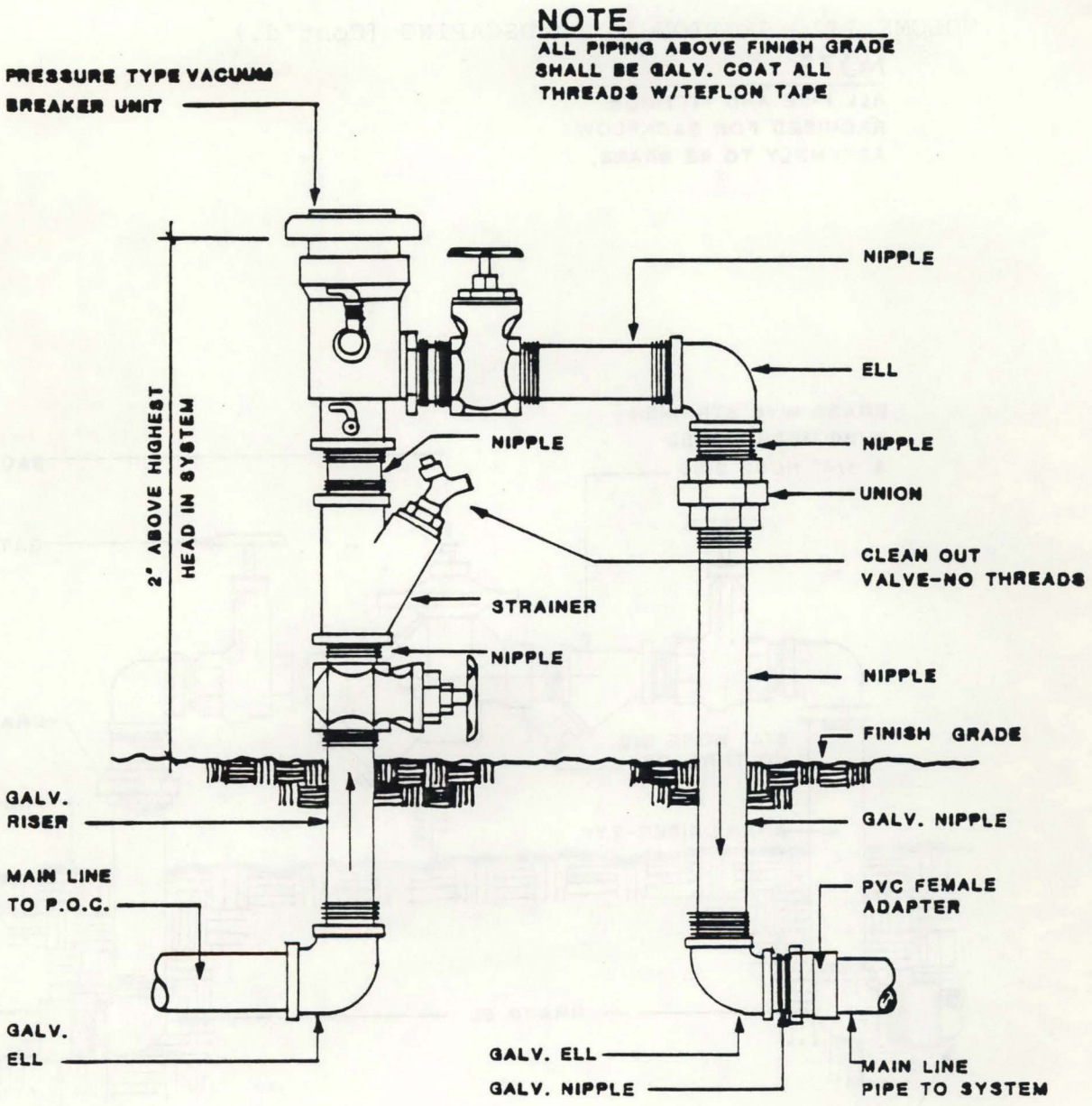
VOLUME III, SECTION 11 LANDSCAPING (Cont'd.)

NOTE: WATER MUST BE METERED



16 IRRIGATION DETAIL– MASTER CONTROL VALVE AND VACUUM BREACKER

Figure III-11-16

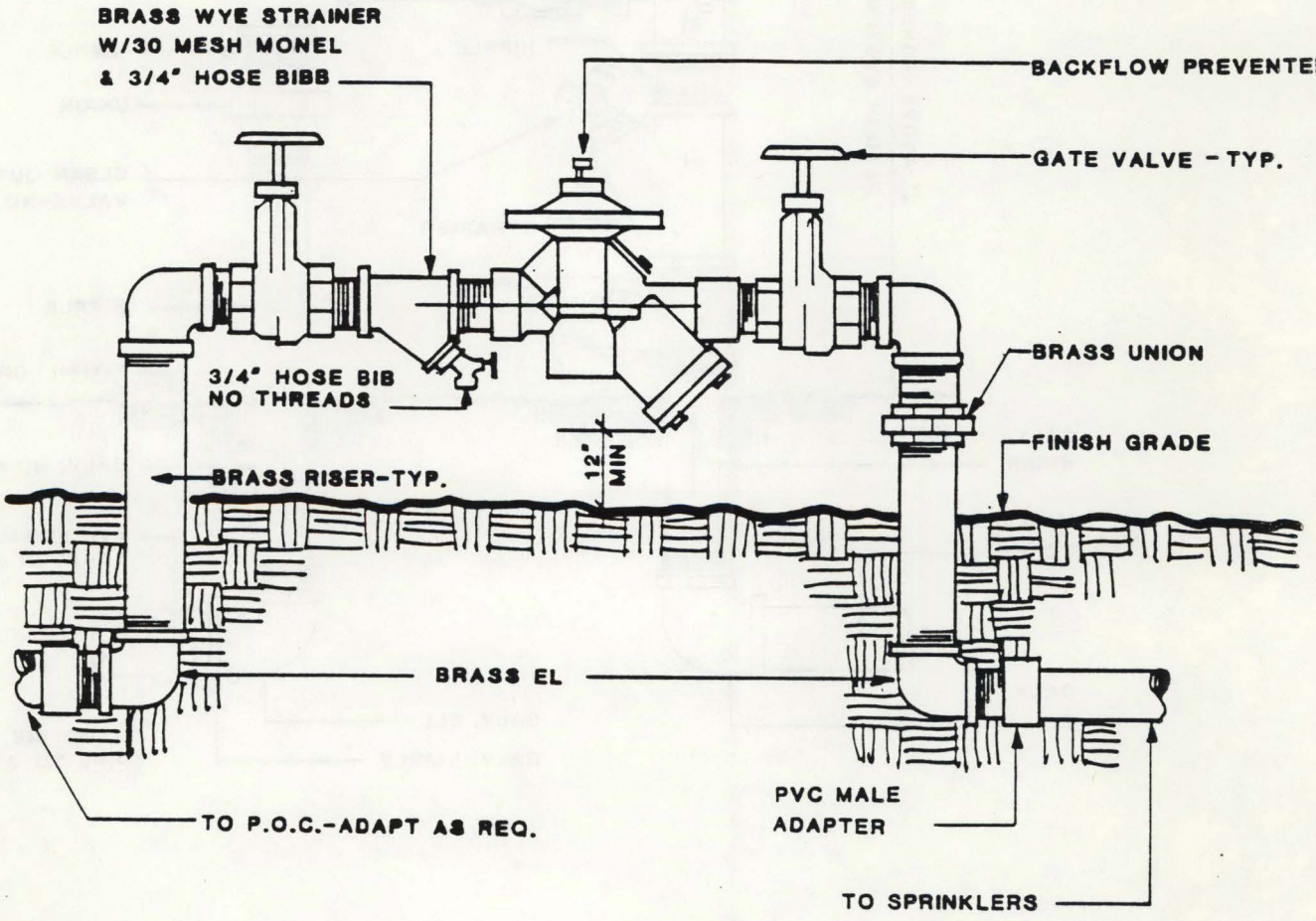


17 BACKFLOW PREVENTOR DETAIL
NO SCALE

Figure III-11-17

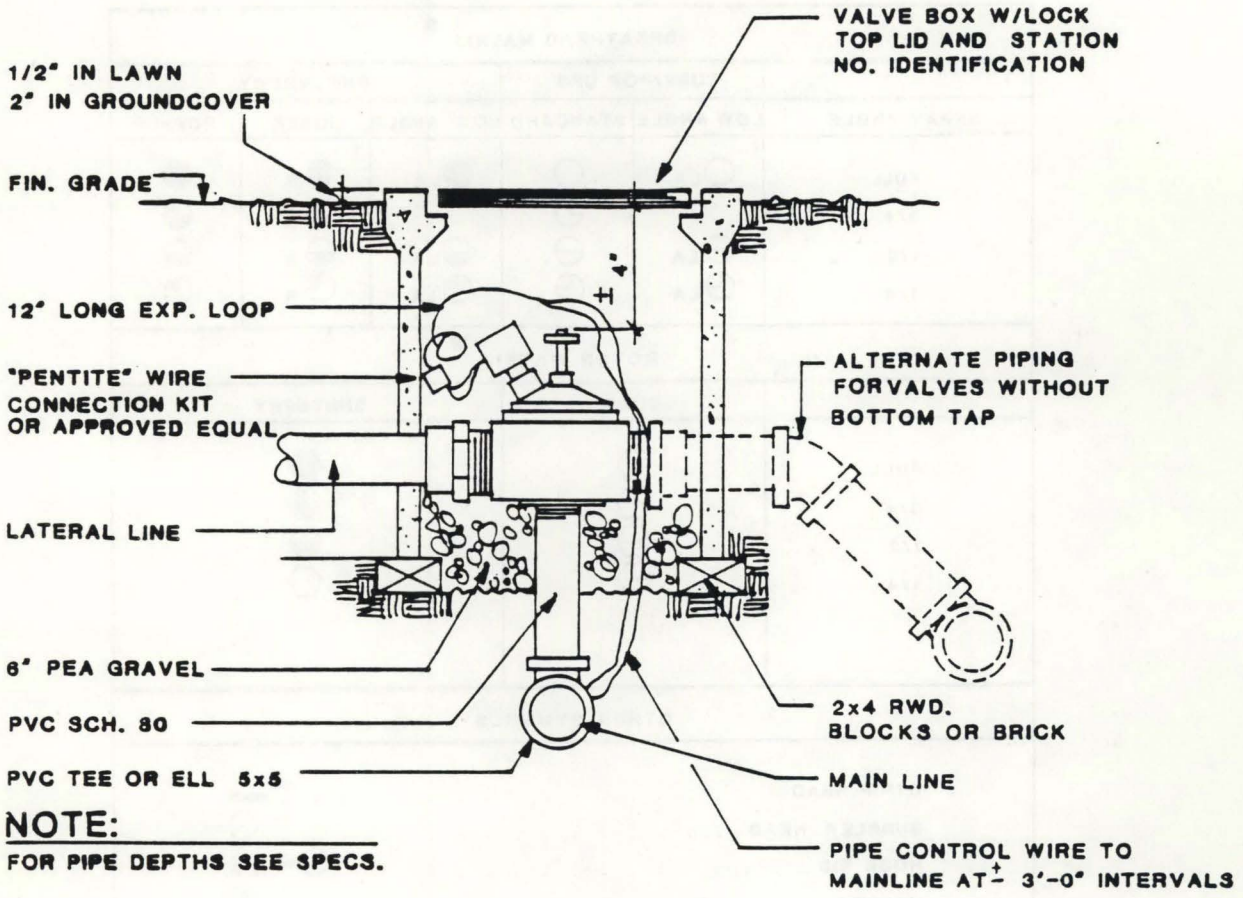
NOTE

ALL PIPE AND FITTINGS REQUIRED FOR BACKFLOW ASSEMBLY TO BE BRASS.



18 REDUCED PRESSURE BACKFLOW PREVENTER

Figure III-11-18



19 REMOTE CONTROL VALVE
NO SCALE

Figure III-11-19

VOLUME III, SECTION 11 LANDSCAPING (Cont'd.)

IRRIGATION LEGEND – GRAPHIC SYMBOLS

SPRAYHEAD MATRIX *

SPRAY ANGLE	TURF/POP UPS		SHRUBBERY		
	LOW ANGLE	STANDARD	LOW ANGLE	RISER	POP-UP
FULL	LA		LA	R	
3/4				R	
1/2	LA		LA	R	
1/4	LA		LA	R	

ROTOR MATRIX *

	TURF	SHUBBERY
FULL		
3/4		
1/2		
1/4		

OTHER SYMBOLS

STRIP HEAD . . . . . .

BUBBLER HEAD . . . . . .

HOSE BIB . . . . . H.B.

VALVES . . . . . .

VALVES GROUPING . . . . . .

VACUUM BREAKER . . . . . .

WATER METER . . . . . .

CONTROLLER C

MAIN LINES . . . . . .

SUPPLY SPRINKLER LINES . . . . . .

ROAD CROSSING/SLEEVES . . . . . .

* NOTE: THESE STANDARD SYMBOLS SHALL BE USED ON THE IRRIGATION LEGENDS IN CONJUNCTION WITH STANDARD PERFORMANCE DATA (GMP, RADIUS, NOZZLE etc.)

Figure III-11-20

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 12

REVISION RECORD

NOTICE NUMBER	CR NO/REV	DATE APPROVED	AFFECTED	COMMENTS
1	4-060/1	12/5/84	Table of Contents List of Tables List of Figures 12.1 12.2 12.3 A,B 12.4.1 12.5 A,B,C,D, H,I,J,K,L 12.6 12.6.1 A,B,D 12.6.2 A,B 12.6.4 A,B 12.6.5 A,B,C 12.7 Table III-12-1 Figure III-12-1 Figure III-12-2	Replaces 6/30/83 issue Spelling, punctuation, and format corrections.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 12

LIGHTING

VOLUME III, SECTION 12, LIGHTING

CONTENTS

VOLUME III, SECTION 12, LIGHTING

LIST OF FIGURES

LIST OF TABLES

VOLUME III, SECTION 12

LIGHTING

12.1 INTRODUCTION

An appropriate station lighting system can strengthen the identity of the Metro Rail System. It can promote the safety, security, and comfort of the transit patron while simplifying system operation.

12.2 BASIC GOALS

The following lighting design criteria collectively represent a design tool describing the systems users' visual needs and specific requirements for each station area. They will aid the Section Designer in attaining optimal design solutions.

12.3 DESIGN DOCUMENTS

These criteria describe the lighting design intent and program requirements for the system. The Standard Drawings depict a luminaire palette from which the Section Designer can select luminaires and their application. The specifications further describe the materials and provisions of lighting systems. The Section Designers must coordinate the Construction Documents to incorporate the Standard Drawings and specifications. They must also submit calculations to demonstrate conformance with the Criteria.

A. Luminaires prequalified as suitable for use in the Metro Rail system are depicted on the Standard Drawings. Each type is described by both its physical characteristics and photometric performance. Recommended applications are noted (see Figure III-12-1).

B. The Section Designer, when preparing station/site-specific lighting layouts, will select and designate the placement and control of luminaires:

   1. The luminaire symbol will indicate type, fixture, lamp, and mounting hardware options selected from the palette. No "luminaire schedule" as such will be required.

VOLUME III, SECTION 12 LIGHTING (Cont'd.)

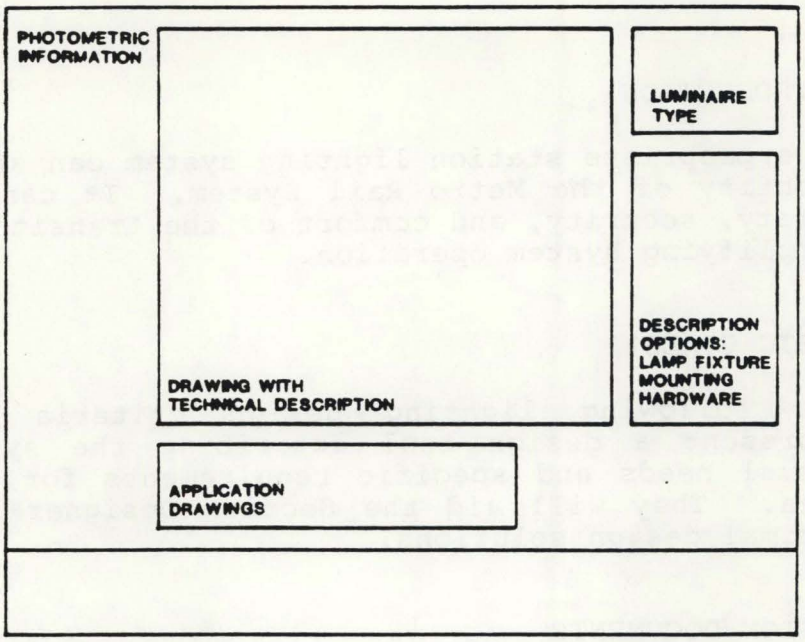


Figure III-12-1 - Lighting Standard Drawing Format

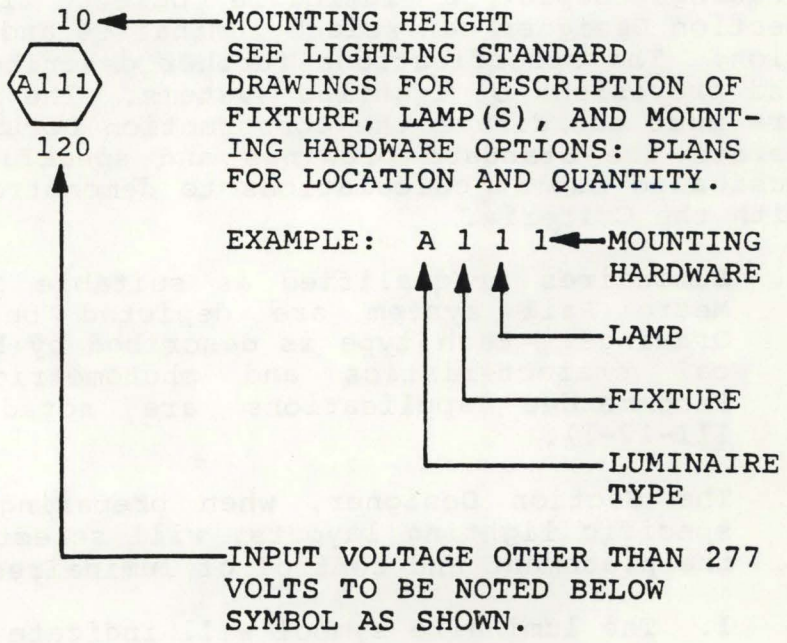


Figure III-12-2 - Standard Luminaire Symbol

2. The lighting control scheme will be developed by the Section Designer for the site-specific condition.

3. Calculations indicating compliance to these criteria will be prepared by the Section Designer.

12.4 LIGHTING TERMS AND DEFINITIONS

The following terms relate to lighting design and should be used as required to interpret these criteria.

12.4.1 Quantitative Terms

The following quantitative terms are defined by their visual objectives. They describe light and lighting levels that can be measured.

Light - is radiant energy capable of exciting the human retina and creating a visual sensation. It is measured in watts per second.

Illuminance - is the density of light flux incident on a surface measured in footcandles (lumens per square foot).

Light Loss Factor, LLF - a factor used in calculating illuminance after a given period of time and under given conditions. It takes into account temperature and voltage variations, dirt accumulation on luminaire and room surfaces, lamp depreciation, maintenance procedures, and atmosphere conditions.

Luminance - is the intensity of light emitted or reflected from a surface measured in candelas per square foot.

Luminous Intensity - is the light "strength" or "power" from a source in a particular direction measured in candelas.

Lumen - unit of luminous flux. Photometrically, it is the luminous flux emitted within a unit solid angle (one steradian) by a point source having a uniform luminous intensity of one candela.

Candela - The unit of luminous intensity. One candela is one lumen per steradian. Formerly, candle.

12.4.2 Qualitative Terms

The following qualitative terms describe the distribution of light in the environment. They are used when referring to visual performance.

Visibility - is the degree to which light is able to evoke visual sensation. It is a function of the eye, the object, contrast, brightness, and color.

Contrast - is the relationship between background brightness and object brightness. Visual acuity is reduced when background and object are of equal brightness.

Brightness - is a subjective sensation of light.

Glare - is intense contrast caused by excessive brightness. To preclude direct glare, the main direction of light should not coincide with the main direction of view.

Color - distinguishes objects of similar brightness. The lamps selected to provide maximum color discrimination should be of an apparent color near that of the surface being illuminated.

12.5 GENERAL LIGHTING CRITERIA

The following Criteria establish the "standards" for lighting the Metro Rail Stations:

A. The lighting system is to provide the intended quality and quantity of light required for each individual area.

B. The station lighting design should maximize the aesthetic effect of its relationship to urban content.

C. Lighting shall sufficiently define the decision/transition points and areas of potential hazard.

D. The lighting system installation shall be designed to minimize initial equipment and labor costs as well as maintenance expense.

E. Lighting shall be designed to satisfy security requirements but not to depersonalize the environment.

F. Back-lit advertising, if used, will provide a uniformly illuminated message surface utilizing lamps integral with the frame. (See Volume III, Section 3, Advertising).

G. Codes and Standards applicable to Lighting Systems are referenced in Volume III, Section 5, Codes.

H. Lighting must be located and focused to provide a clear visual path for station monitoring and should emphasize communications equipment placed to accommodate the patron (see Volume III, Section 6, Communications).

I. Emergency lighting will be provided in accordance with the Fire Protection Program (see Volume I, Section 2, Fire/Life Safety, and Volume III, Section 5, Codes). It shall be supplied by a percentage of normally burning luminaires and in event of normal power failure define a path of egress to assist in safe and orderly evacuation.

J. Landscape lighting shall be coordinated with feature planting (see Volume III, Section 11, Landscaping).

K. Lighting shall emphasize directional and informational signage as required.

L. The lighting system shall be controlled to effectively coincide with Station operation (see Volume III, Section 18, Station Control). The system is expected to operate continuously, relying heavily on both automatic and manual controls to provide efficient utilization of energy. Each area closed by ceiling height partitions should have an independent control switch readily accessible to personnel occupying the area. All exterior site areas shall be illuminated with provisions made for manual, time clock, and photocell control.

12.6 SPECIFIC LIGHTING REQUIREMENTS BY AREA

The following station areas should be provided with illumination as required by these criteria, utilizing the Standard Luminaire Palette. Yellow light can be used in preference to white light to define the station site and vehicular circulation. White light must be used for all pedestrian ways, landscaped areas, and station interiors.

12.6.1 Station Site Areas

The site lighting system will produce a visual "landmark" announcing the facility to potential users and identifying each station site. Lighting levels will produce a natural lead-in, guiding both driver and pedestrian to the station entrance. Lighting shall not interfere with or cause annoyance to persons on neighboring property.

A. Lighting must emphasize the bus loading/unloading, kiss-and-ride, and park-and-ride areas to provide security and deter incidents and accidents due to vehicular/pedestrian congestion.

B. Parking areas should be made brighter by placing additional luminaires between ranks of automobiles to assist in the reduction of shadowed areas.

C. Pedestrian access lighting shall define walkways, crosswalks, ramps, stairs, and bridges to facilitate movement and recognition at night.

D. Plazas should be provided with a diffused illumination to define and organize the site. Luminaires, coordinated with the urban surroundings, should highlight major traffic ways, seating, and waiting areas and provide a comfortable and pleasant environment.

12.6.2 Station Entrance

The station entrance should have the highest apparent brightness within the station area creating a quickly recognizable destination focus.

A. Entrances located either offstreet, within a sidewalk right-of-way, or in conjunction with Station Plazas should be lit to give prominence to the portal.

B. Special or storefront entrances within the public or private buildings shall be lit to stress stair head and run.

C. Elevator entrances are to be given special consideration to clearly feature them as a street level Metro Rail element.

12.6.3 Patron Circulation

Illumination shall be provided for all elements of circulation to simplify directional decisions.

A. Escalators, elevators, and stairs shall be lit to emphasize open circulation wells and transitional components, (landings, run-off areas, and entrances).

B. Passageways shall be lit to define a direct path from the station entry to the interior.

12.6.4 Station Interior Areas

Lighting in the interior areas should welcome the riders, enhance their visual response, and provide visual cues to give them an awareness of position and orientation.

A. The mezzanine lighting shall be provided for the free and paid areas and preferred circulation paths. The free area lighting shall emphasize system graphics, informational messages, fare vending equipment, and fare gates. The paid area lighting shall direct the patron to the vertical elements of circulation which lead to the platform.

B. The platform/train room shall be provided with an overall ambient light which expands peripheral vision and reduces the time required to detect potential hazards.

1. The platform edge, where transition between station and vehicle occurs, will be lit to a higher intensity than the waiting area to stress

the mode change. Lighting of the trainway shall be minimized to intensify the contrast with the platform edge.

2. Benches at the platform level will be highlighted.

3. A blue light is to be placed at the platform-end walls near tunnel entry to identify the emergency trip station locations.

C. Artwork shall be lit to reflect color and form.

12.6.5 Ancillary Areas

Ancillary areas shall be provided with illumination as required by their specific usage.

A. Electrical and mechanical equipment and train control/communications room shall be provided with good vertical illumination required for general inspection, maintenance, meter, and gauge reading.

B. Storage and trash rooms shall be provided with general illumination.

C. Toilets shall be lit to simplify maintenance.

TABLE III-12-1

ILLUMINANCE VALUE FOR STATION AREAS

The following values are presented for station area lighting:

Site Areas	Average Maintained Illuminance Levels in Foot-Candles	Advised Light Loss Factor
Bus loading/unloading	2 to 5	.65
Kiss-and-ride	2	.65
Parking - Open	0.5*	.65
- Covered	5	.65
Pedestrian ways	2*	.65
Plaza	5	.65
Station entrances	10	.65
Landscape	as required for accent	.65
Circulation		
Escalators, Elevators and Stairs	30 at point of transition	.65
Passageways	15	.65
Station Interior Areas		
Mezzanine	15	.75
Fare Vending Equipment	30	.75
Fare Gates	30	.75
Platform/Train Room	15	.65
Platform Edge	30	.65
Ancillary Areas		
Electrical Rooms	30	.75
Equipment Rooms	30	.75
Train Control/Communication	50	.75
Storage Rooms	10	.75
Staff/Security Rooms	30	.75
Toilets	20	.75
Mechanical Rooms	30	.75
Trash	10	.65

* Minimum maintained footcandle levels over 90 percent of the area.

12.7 LIGHTING LEVEL CALCULATIONS

Lighting level calculations shall be made utilizing the following recommended IES Lighting Handbook (latest edition) methods. Average illuminance levels shall be calculated by the lumen method:

$$\text{Average Maintained Illuminance Levels in Footcandles} = \frac{\text{initial lamp lumens} \times \text{luminaire coefficient of utilization} \times \text{light loss factor}}{\text{area in square feet}}$$

Minimum maintained point illuminances for task locations, uniformity ratios, or accent lighting with specific illumination requirements shall be quantified by the point-by-point method:

$$\text{Minimum Maintained Point Illuminance in Footcandles} = \frac{\text{initial candlepower of source in direction of ray} \times \text{cosine of the angle between the light ray and a perpendicular to the plane at that point} \times \text{LLF}}{(\text{distance from source to point in plane in feet})^2}$$

Illumination levels, site and interior, shall be in accordance with the average maintained and minimum maintained footcandle values listed in Table III-12-1. Lighting levels for all spaces under site areas, circulation, and station interior areas shall be calculated at the finished floor level, with the exception of fare vending equipment and fare gates where levels shall be calculated at a horizontal plane 30 inches above finished floor. In addition, all lighting levels for ancillary areas shall be calculated at a horizontal plane 30 inches above finished floor. Light loss factors may be adjusted within a range of 0.60 to 0.80 depending on the specific application. Uniformities shall be acceptable if an average-to-minimum ratio of six-to-one is not exceeded and a maximum-to-minimum ratio of ten-to-one is not exceeded.

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 13

MATERIALS

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2	7-004/	7/7/87	Table III-13-1	P.11

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 13

MATERIALS

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VOLUME III, SECTION 13

MATERIALS

13.1 INTRODUCTION

The purpose of this section is to specify basic requirements and criteria which have been established for the finish of public areas within the Metro Rail System. While convenience, comfort, and attractiveness will be considered in the selection and application of these finishes, the District must be also assured that the goals of safety, durability, and economy are achieved.

13.2 BASIC GOALS

13.2.1 Safety

A. Fire Resistance and Smoke Generation

Reduce hazard from fire by using materials with minimum burning rates, smoke generation, and toxicity characteristics for station finishes, consistent with Code requirements of Fire/Life Safety Criteria Volume I, Section 2.

B. 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.

C. Slip-resistant

Increase pedestrian safety, and recognize the presence of the handicapped and infirm by using floor materials with slip-resistant qualities. Entrances, stairways, platform edge strips, and areas around equipment should have high slip-resistant properties. Areas of less use or hazard may have lower slip-resistant properties.

13.2.2 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 in the station. The materials must maintain their good appearance throughout their useful life. Materials should be colorfast.

13.2.3 Ease of Maintenance

A. 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 cleaning agents.

B. 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 Metro Rail System. Spare materials shall be provided for tile and other unit materials in a quantity of approximately 2 percent of the total used.

C. Maintenance Manual

Provide a manual by the Station Designer detailing maintenance requirements for all materials used.

13.2.4 Resistance to Vandalism

Provide materials and details that do not encourage vandalism, that are difficult to deface, damage or remove.

All surfaces exposed to the public are to be finished in such a manner that the results of casual vandalism can be readily removed with normal maintenance techniques. Station designers are required to describe procedures for removal of more serious defacement for each finish in public areas and within nine feet of the floor surface, as part of the Maintenance Manual.

13.2.5 Aesthetic Qualities

Create a feeling of warmth, attractiveness and quality, to instill civic pride in the facility.

13.3 GENERAL CRITERIA

Certain general criteria for finish materials are indicated to achieve the goals outlined above as well as those which would result in a high level of illumination, good actual cleanliness levels, and the appearance of high cleanliness.

13.3.1 Surface

Applied materials should be hard, dense, non-porous, non-staining, acid and alkali resistant, for long life and low maintenance. Surfaces within reach of the public, up to 9' above the floor, may be finished with applied materials. Areas inaccessible to the public (such as trainroom side walls not adjacent to mezzanines) shall not have applied finishes.

13.3.2 Color

Colors should be predominantly light in tone to aid in maintaining high illumination levels, but with sufficient contrasts and accents to provide visual interest and warmth and to conceal minor soiling.

13.3.3 Texture

Smooth surfaces are preferred over rough ones for ease in cleaning and because they are less prone to catch settling dust. Rough surfaces are desirable where a slip-resistant feature is important, and are acceptable where surfaces are difficult to reach and are therefore unlikely to be cleaned very frequently. A rough surface may absorb dust without its being apparent.

13.3.4 Unit Size

Units should be large enough to reduce the number of joints yet small enough to conceal minor soiling and

scratches and to facilitate replacement if damaged. Monolithic materials may be used if they have inherent soil hiding characteristics and can be easily repaired without the repair being noticeable.

13.3.5 Joints

Since joints are a major source of maintenance problems, provide small, flush joints, limited in number and of the best possible materials. Horizontal joints should not be raked but should be flush or tooled concave. Monolithic materials should have adequate control joints and expansion joints at the proper spacing in order to prevent surface cracking.

13.3.6 Cost

Within the station budget, costs should be consistent with long life, frequency and expense of maintenance, convenience, replacement considerations, and the overall aesthetic and functional qualities.

13.3.7 Availability

Materials should be provided in sufficient quantity that delivery and/or installation, whether for one or several stations with concurrent completion schedules, will not involve cost penalties or delays for either materials or labor.

13.3.8 Nonproprietary Materials

In order to obtain competitive bids and comply with Federal regulations, proprietary items should be used only where it is established that no other materials exist which would meet the particular design requirements. Such items should be specified on a "performance specification" basis only.

13.3.9 Installation Standards

Materials shall be detailed and specified to be installed in accordance with industry standards and manufacturer's printed directions for long life and low maintenance installations.

13.3.10 Flammability

Interior finishes shall meet requirements of the Uniform Building Code (UBC), Chapter 42.

A. Finishes for all exitways shall be Class I as defined by the UBC and Class A as defined by NFPA. Platforms, mezzanines, corridors, stairways, and vestibules shall be considered exitways.

B. Finishes in all other areas shall be Class II as defined by the UBC and Class B as defined by NFPA.

C. Combustible adhesives and sealants may be used when they meet the requirements stated above.

13.4 LIST OF FINISHED MATERIALS

This list will apply to all areas of public use and contact at entrance, passageway, mezzanine and platform levels, but not to those areas used by Metro Rail personnel only. For the use of items listed as "Acceptable," installation is subject to location and environment considerations. See Directive Drawing AD-018 for more information on materials to be used in specific functional areas.

13.4.1 Floor Materials - Finish to Provide Slip-resistant Surface

A. Acceptable

1. Monolithic Materials

a. Concrete - with appropriate finish to provide slip-resistant surface in nonpublic areas. Hardened finish where shown on Palette schedule.

b. Acid-resistant applied coating - for application in Battery Rooms.

2. Unit Materials (large units - min. 8" x 8" x ¼")

   a. Natural granite (restrictive locations) - public stairs and feature strips only; finish to contrast with platform edge band

   b. Manufactured granite - finish to contrast with platform edge band

   c. Terrazzo - precast only, up to 24" x 24", slip-resistant texture, with sealed surface

   d. Quarry tile

   e. Paver brick - dense, hard

   f. Unglazed ceramic tile

   g. Vinyl tile - nonpublic areas only.

B. Not Acceptable

1. Monolithic Materials

   a. Bituminous toppings

   b. Synthetic resin toppings

   c. Terrazzo - poured-in-place.

2. Unit Materials

   a. Resilient tile and sheet products - in public areas

   b. Wood products

   c. Marble

   d. Mosaic tile.

13.4.2 Wall Materials

A. Acceptable

1. Monolithic Materials

a. Concrete with sealers (with sufficient surface texture to conceal minor soiling and damage without complicating maintenance procedures, or constituting a hazard to clothing or skin of patrons).

2. Unit Materials - min. 6" x 6" unless used for limited feature strips.

a. Unglazed ceramic mosaic tile

b. Ceramic facing veneers

*c. Glazed and unglazed brick

d. Precast concrete

*e. Structural glazed faced concrete masonry units

f. Porcelain enamel steel panel - noncombustible assembly

g. Crystallized glass panels

*h. Concrete masonry units - nonpublic areas only.

3. Surface Applied Finishes

a. Clear sealer - on concrete surfaces or concrete masonry units.

B. Acceptable for use over 9' above floor:

1. Rough or textured concrete

2. Acoustic panels - in passageway areas only.

* Masonry construction shall be used only for interior partitions. Reinforced concrete shall be used for trainway walls because of air pressure buildup, and for exterior walls of shafts and all bearing walls.

C. Base Materials

1. Ceramic Tile - Cove
2. Quarry Tile - Cove
3. Rubber/Vinyl - Cove in nonpublic areas only
4. Acid-resistant applied coating.

D. Not Acceptable

1. Monolithic Materials

a. Rough concrete (within 9' of floor immediately adjacent to public circulation and flow areas)

b. Plaster

c. Exposed steel

d. Glass (acceptable at elevator housing walls)

e. Curtain wall assemblies.

2. Unit Materials

a. Gypsum board (acceptable for 2-hour rated enclosure at smoke exhaust duct where passing through ancillary space)

b. Plastics

c. Wood

d. Glass.

3. Surface-Applied Finishes

a. Vinyl wall covering

b. Paint

c. Special epoxy coatings.

13.4.3 Ceiling Materials

A. Acceptable

1. Monolithic Materials

a. Smooth concrete.

2. Unit Materials

a. Linear metal panels with wrapped acoustical material

b. Metal panels with large perforations with wrapped acoustical material

c. Rigid, cellular glass blocks.

B. Not Acceptable

1. Surface-Applied Materials

a. Sprayed acoustic materials (plaster,vermiculite, etc.)

b. Gypsum plaster.

2. Unit Materials

a. Acoustic tile (ceramic and mineral, glass and wood fiber)

b. Gypsum board

c. Suspended plaster systems

d. Wood.

13.4.4 Door Materials and Schedule

A. Acceptable

1. Flush hollow metal doors and frames:

a. Public areas - alkyd enamel finish.

b. Nonpublic areas - alkyd enamel finish

2. Wire glass at doors with vision panels

3. Laminated safety glass at elevator, glazed doors and hoistways

4. Stainless steel overhead rolling grilles.

B. Not Acceptable

1. Stainless steel doors and frames

2. Anodized aluminum doors and frames

3. Fluoropolymer finished doors and frames

4. All upward-acting sectional doors

5. All nontempered, nonsafety glass.

C. See Table III-13-1 for Door, Hardware, and Security Schedule:

1. Refer to Standard Specifications for description of door materials, hardware, and lock functions.

13.4.5 Open Railings

(Height and spacings in accordance with applicable Codes and Standards.)

A. Acceptable

1. Public areas - stainless steel

2. Nonpublic areas - galvanized steel.

TABLE III-13-1

DOOR, HARDWARE, AND SECURITY SCHEDULE

NOTES:

1. All doors to be min. 7'-0" in ht.
2. Transoms to be 3'-0" ht. x width of door & be removable. Same fire rating as door.
3. Pair of doors
   a. 3 pair of hinges
   b. Automatic flush bolts
4. Emergency exit corridor 2 hr. rating beyond platform end.

✱ UNLESS PROVIDED OFF SERVICE CORRIDOR

		PAIR DOORS	3'-6" MIN. EACH LEAF	3'-0" MIN.	2'-6" MIN.	SOUND RATED	AIR TIGHT	HOLLOW METAL	SHUTDOWN GRILLE/DR.	1-1/2 PR BUTTS MIN. NOTE 3	CLOSER	AUTO. DR. BOTTOM	THRESHOLD	EXIT DEVICE W/ALARM	LOCK SET	DEAD LOCK	KEY-OUTSIDE	KEY-INSIDE	FIXED KNOB-OUT	FREE KNOB-IN	INTRUSION ALARM ✱	ELECT. STRIKE ✱	SPECIAL KEY	ELECTRIC RELEASE	KEY SWITCH OPERATED	POWER OPERATED	REMARKS
ENTRANCE	- EMERG. EXIT AT MEZZANINE			X				X		X	X			X			X										
	- ROLLING GRILLE								X							X	X	X			X				X	X	FULL HEIGHT
PASSAGEWAY	- ELEV. EQUIP.			X		X	X	X		X	X	X	X		X		X		X	X							
	- TOILET RM.							X		X	X		X		X		X		X	X		X					2'-8" DR WIDTH
	- STAFF/SECURITY			X				X		X	X		X		X		X		X	X							VISION PANEL
	- TRASH RM.		X					X		X	X		X		X		X		X	X							
	- CUSTODIAL CLOSET		X					X		X	X		X		X		X		X	X							
PLATFORM	- EMERG. EXIT GATES																										
	- EMERG. EXIT DOORS	X	X					X		X	X	X		X									X				SEE NOTE 4
ANCILLARY	- FAN & MECH. RM.	X		X		X	X	X		X	X				X		X		X	X			X				
	- AUX. POWER	X		X				X		X	X	X	X		X		X		X	X	X	X					
	- BATTERY RM.			X				X		X	X				X		X		X	X	X	X					
	- TRAIN CONTROL/COMM.	X				X	X	X		X	X	X	X		X		X		X	X	X	X					W/TRANSOM
	- EJECTOR RM.			X				X		X	X					X	X		X	X							
	- ELEC. EQUIP.			X				X		X	X		X			X	X		X	X		X					
	- EMERG. EQUIP.							X		X	X					X	X		X	X							
	- SUMP PUMP RM.			X				X		X	X					X	X		X	X							
	- SPRINKLER VALVE RM.			X				X		X	X					X	X		X	X	X	X					
	- STORAGE RM.			X				X		X	X				X		X		X	X							
	- CHILLER RM.	X				X	X	X		X	X				X		X		X	X							W/TRANSOM
	- CUSTODIAL RM.		X					X		X	X				X		X		X	X							
SERVICE CORRIDOR		X						X		X	X				X		X										W/TRANSOM
	- T.P.S.S.	X		X				X		X	X		X		X		X		X	X	X	X					W/TRANSOM
	- EMERG. FAN			X		X	X	X		X	X	X	X		X		X		X	X							W/TRANSOM
	- AIR SUPPLY/SMOKE EXHAUST	X				X	X	X		X	X	X			X		X		X	X							W/TRANSOM
	- FAN ROOM SHAFT ACCESS				X	X	X	X		X	X	X			X		X		X	X							NON-RATED
	- UPE FAN RM.	X			X	X	X	X		X	X	X			X		X		X	X							
	- UPE PLENUM				X	X	X	X		X	X	X			X		X		X	X							
	- INCOMING ELECT. SERVICE	X		X				X		X	X				X		X		X	X							W/TRANSOM
INCLINED LADDER ENCLOSURE				X																							
	- CROSS PASSAGE																										

B. Not Acceptable

1. Color anodized aluminum

2. Painted steel.

13.4.6 Miscellaneous Finished Components

A. Acceptable

1. Acoustic ceilings

a. Aluminum - perforated or slit and slat configurations.

2. Smoke exhaust duct cladding

a. Aluminum - natural finish

b. Aluminum with applied coating

B. Unacceptable

1. Stainless steel acoustic ceilings or smoke exhaust duct cladding.

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 14

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 14

POWER

VOLUME III, SECTION 14, POWER

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VOLUME III, SECTION 14

POWER

14.1 INTRODUCTION

This section identifies the general requirements for the installation of electrical equipment to be provided in Metro Rail stations, and establishes the minimum provision necessary in stations to accommodate them. (For more detailed information, refer to Volume IV and V of the Design Criteria.)

14.2 BASIC GOALS

To alert the Designer to systems which must be accommodated in the station to ensure proper allocation of space. This space will be used to house and maintain equipment.

14.3 ELECTRIC INCOMING SERVICE

This system will provide power to the traction power system and auxiliary power system. All equipment for electric incoming service will be furnished and installed by the utility company. All underground ducts and embedded conduits for incoming feeders will be installed by the station construction contract up to the interface point, to be designated by the utility company.

14.3.1 Electric Incoming Service Room

The electric incoming service room to be sized as indicated by Subsection 1.6.5, Ancillary Space Requirements.

A. The room will generally be located at or near each station, usually next to the substation.

B. The room shall be equipped with a controlled access for use by the utility company.

C. Other requirements shall be the same as the traction power substation room, described in Subsection 14.4.1.

D. Fire protection, ventilation, drainage, lighting, power outlet, and equipment mounting requirements shall be based on direction provided by the utility company.

E. Room configurations and locations of columns and beams shall be coordinated with the utility company.

F. Access into below-grade incoming service room shall be provided to allow the removal and replacement of the largest piece of equipment. Such access shall be directly from the surface by means of a readily removable waterproof hatch at a location accessible to trucks and cranes. The hatch shall be not less than 8' x 10' and shall be located within approximately 50 feet horizontally of the room. The hatch cover shall have removable lifting eyes. The perimeter of the hatch and the holes for the lifting eyes shall not be concealed with concrete, asphalt, or other material. The equipment passageway to the room shall be level and not less than 10'-wide and 12'-high, clear of any obstructions. A 10'-wide x 12'-high A label roll-up door shall be provided between the passageway and the incoming service room.

G. Utility company personnel shall have immediate 24-hour a day access to their incoming service room. The personnel access from the street level to underground incoming service rooms shall be provided through the general access to the ancillary room area and/or through the emergency exit stairs to the surface. Lock and key arrangements for intermediate doors and gates shall exclude access to unauthorized areas.

A recessed metering cabinet space accessible to DWP meter personnel shall be provided outside the incoming service room. The space shall be 3' wide x 2'-6" deep x 7'-2" high, with a 2'-8" x 7'-0" door.

H. Two means of egress shall be provided from each underground service room, one being through the normal access. The second exit may be to a room adjacent to the incoming service room.

I. For at-grade locations, the utility service equipment shall be located outdoors in a fenced 40' x 40' space adjacent to the substation building. Access to the fenced area shall be provided to allow the removal and replacement of the largest piece of equipment. The equipment gate shall be 10' wide. A personnel access gate 3' wide shall be provided on opposite side from the equipment gate. The gates shall be equipped with a controlled access for use by the utility company.

14.4 TRACTION POWER SYSTEM

This system includes the substations, cables, contact rails, and all protective and control equipment required for traction power.

14.4.1 Substations

Traction power substations will transform and rectify the high voltage supply to dc power. This will be supplied to the contact rail (third rail) which furnishes power to the traction equipment of the vehicles.

A. A substation will generally be located at or near each station, usually below grade.

B. Substation room sizes are given in Subsection 1.6.5, Ancillary Space Requirements. This room is required to house all traction power substation and/or auxiliary power substation equipment.

C. Provide space in (or adjacent to) substations for ventilation equipment.

D. Acceptable provisions must be made to prevent and monitor unauthorized access into substations.

E. Access into below-grade or enclosed substations must be provided to allow the removal and replacement of the largest piece of equipment on a probable time cycle of approximately 20 years. Such access into below ground substations shall be directly to the surface, preferably by means of removable hatches. Access from trainways and the moving of substation equipment through trainways shall be avoided. Minimum sizes for access shall be 14' wide x 13' high for doors or removable panels, and 12' x 14' for hatches.

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F. Access into below-grade or enclosed substations must also be provided for smaller pieces of equipment on a probable one year time cycle. For this purpose, provide a door having a 6' x 7' minimum clear opening and adequate passageway to grade, or to trainway where access to grade is not feasible.

G. Access into exterior substations must be provided to allow the removal and replacement of the largest piece of equipment. Minimum sizes for such access shall be a 12' x 12' door from the enclosed, roofed portion and a 12' wide gate or door, allowing a 14' high opening clearance, from the yard portion. The equipment gate may be replaced by a 3' x 7' door, if equipment access to the yard can be made with a crane. A 3' x 7' door shall be provided between the yard and enclosed portion.

H. Two means of egress shall be provided from each substation. One may be by means of a ladder conforming to code requirements. Doors shall be 3' x 7' minimum.

I. Doors called for in subparagraphs F and H above may be combined. Doors called for in subparagraphs G and H above may also be combined.

J. Floors in traction power substations shall be recessed to receive a minimum 3" finish concrete fill. Where possible, recessed floor should be constructed level. Finish floor and concrete curbing at transformers will be provided by the traction power system installation contractor.

K. Noise levels propagated to the community by a traction power substation shall not exceed the maximum noise levels specified in Volume IV, Section 7.

L. All traction power equipment within substations and all traction power feeders will be provided under separate contract. Embedded conduit shall be provided under station construction contracts.

14.4.2 Contact Rails

The safety of both the public and Metro Rail personnel dictates location of the third rail through stations on the opposite side of the track from platform.

14.5 AUXILIARY ELECTRICAL SYSTEMS

These systems will provide power to all auxiliary equipment and lighting within, and adjacent to each station. These systems are separate and distinct from the Traction Power System. They are also separate from the Train Control and Communication Systems, but will serve to provide power to those systems. All equipment, conduit, and wiring for Auxiliary Electrical Systems, with the exception of the auxiliary power substations, shall be provided under station construction contracts. (Functional requirements for these systems are detailed in Volume IV, Section 4.)

14.5.1 Substations

Auxiliary power substations will transform the high voltage supply to 480Y volts. This will be supplied to the station and tunnel facilities.

A. An auxiliary power substation will be located at each station. Where the traction power substation is located at the station, they will be in the same room.

B. Other requirements shall be the same as the traction power substation room (described in Subsection 14.4.1).

14.5.2 Auxiliary Power Rooms

Two auxiliary power rooms will be required for each station. These rooms, together with any associated battery rooms, must be designed to provide acoustic controls adequate to assure compliance with provisions in Volume IV, Section 7. A 480-volt distribution switchboard will be located in each auxiliary power room. In addition, space for wall-mounted panelboards, floor-mounted motor control centers, free-standing uninterruptible power supply system equipment, or dry-type wall-mounted transformers, where required, shall be provided.

A. Subway Stations

1. Size and height to be as indicated by Subsection 1.6.5, Ancillary Space Requirements.

2. Access: One pair of 3'-0" wide x 7'-0" high doors with a 3'-0" high removable transom.

3. Ventilation: Thermostatically-controlled mechanical ventilation, as described in Volume IV, Section 1.

4. Electrical equipment room, cable room, or cable vault will be located at each end of each station platform when underground.

5. Automatic fire detection devices shall be installed in each room.

14.5.3 Battery Room For UPS System

Two rooms are required for batteries which supply the uninterruptable power supply system, each located adjacent to an auxiliary power room.

A. Size and height to be as indicated by Subsection 1.6.5, Ancillary Space Requirements.

B. Access: 3'-0" wide x 7'-0" high door providing access from auxiliary power room.

C. Battery racks must have a minimum of 3 feet front clearance for one wall arrangement, and 4 feet clearance between racks for two wall arrangement. They shall be noncorrosive, coated with fiberglass or plastic, and mounted against a wall in tiers.

D. Section Ventilation: Mechanical ventilation as described in Volume I, Fire/Life Safety Criteria, Section 2.2.3.5.2.

E. Provide eyewash/emergency shower unit in each battery room.

F. Provide floor drain, but not in close proximity to eyewash/shower.

G. Floor finish to be acid resistant, waterproof, and slip-resistant carried to a 6" height at walls.

H. Provisions will be made in this room for the grounding of equipment.

I. Space shall be allocated in battery room for a five pound plastic container of sodium bicarbonate (baking soda) for use as a neutralizing agent for spilled battery electrolyte.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III **SECTION:** 15

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1	4-015/1	4/18/84	15.3 C 15.4.2 B 15.5.1 C Figure 15.1 15.7.2 15.7.2 A	Replaces 6/30/83 issue Spelling, punctuation, and format corrections.
2	4-060/2	12/5/84	Table of Contents List of Figures 15.3 15.3 A,B,C,D 15.4.1 15.4.2 B 15.5.1 C 15.6 15.7.1 B 15.7.2 A 15.7.3 A,B 15.7.4 A Figure III-15-1 III-15-2	Replaces 7/2/84 issue.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 15

PLUMBING AND DRAINAGE

VOLUME III, SECTION 15, PLUMBING AND DRAINAGE

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VOLUME III, SECTION 15

PLUMBING AND DRAINAGE

15.1 INTRODUCTION

This section describes minimum standards for plumbing and drainage at all stations. (For further information, see Volume IV, Section 2, Plumbing.)

15.2 BASIC GOALS

A. To provide toilet facilities for System staff with provisions for emergency access by patrons.

B. To minimize maintenance, operations, and security requirements.

C. To standardize plumbing fixtures and fittings throughout the System.

D. To standardize toilet room accessories throughout the System.

E. To standardize station drainage throughout the System.

15.3 STAFF TOILET

A. Each station shall have one staff toilet. Each such toilet may be located within either the "paid" area or the "free" area. Doors to these facilities will be locked. Emergency public access will be given by station personnel.

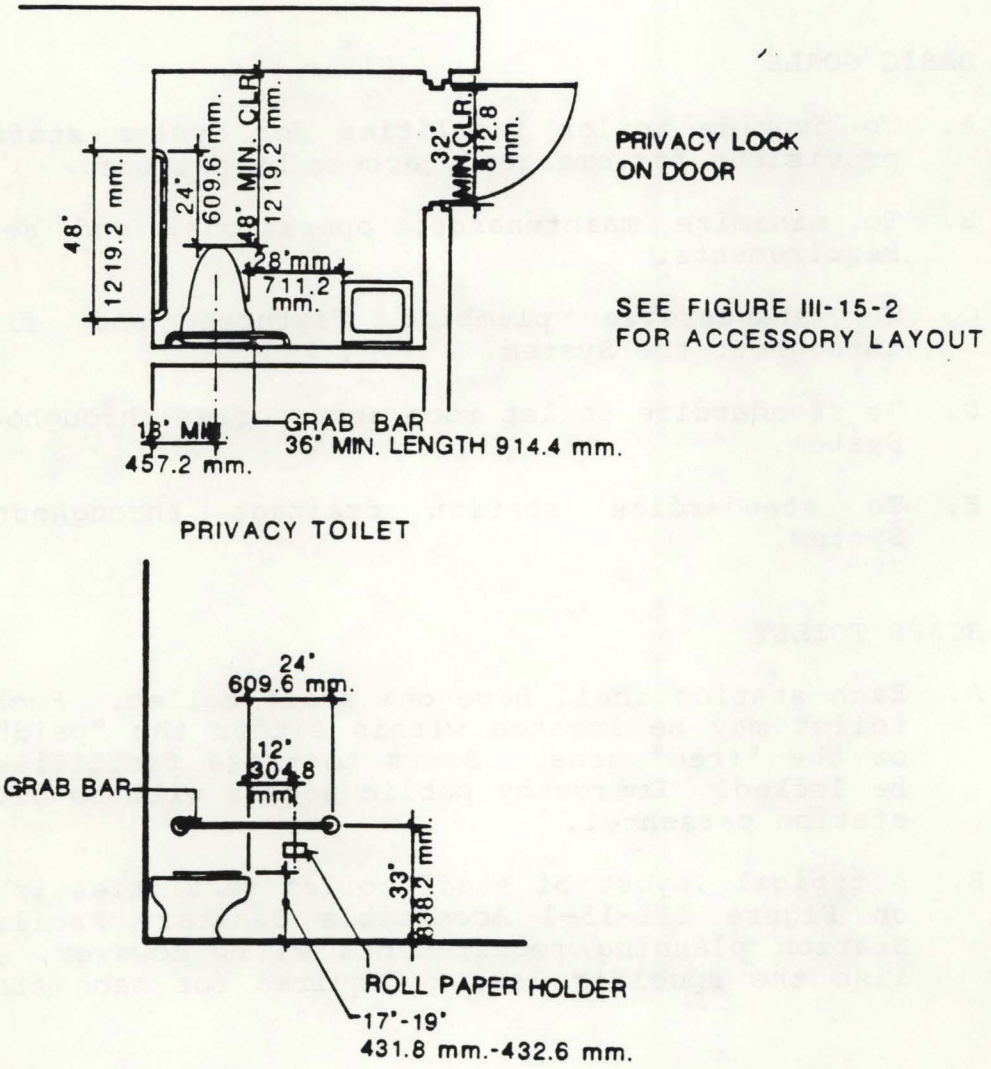
B. A typical layout of staff toilet facilities is shown on Figure III-15-1 Accessible Sanitary Facilities. Station planning requirements will, however, establish the specific layout required for each station.

VOLUME III, SECTION 15 PLUMBING AND DRAINAGE (Cont'd.)

Figure III-15-1

Accessible Sanitary Facilities

See Section 2.17.11 (e) (f)



THIS DIAGRAM ILLUSTRATES THE SPECIFIC REQUIREMENTS OF REGULATIONS AND IS INTENDED ONLY AS AN AID FOR BUILDING DESIGN AND CONSTRUCTION.

TITLE 24, PART 2, C.A.C.

C. Provision must be made for emergency use of toilet facilities by patrons, including the handicapped, subject to the controls described elsewhere in these criteria. To accommodate the handicapped, toilet rooms shall meet the requirements of Section 2-1711 and Article P-15, Title 24, CAC, as shown on Figure III-15-1.

D. Each toilet room shall have the following accessories, as shown in Figure III-15-2.

1. Paper towel dispenser and waste receptacle
2. Soap dispenser
3. Toilet tissue dispenser
4. Toilet seat cover dispenser and sanitary napkin disposal
5. Sanitary napkin-tampon dispenser
6. Mirror and shelf
7. Coat hook
8. Grab bar.

15.4 TOILET FIXTURES AND TRIM

15.4.1 General Requirements

Water closet and lavatory shall be installed with chair carriers.

15.4.2 Specific Requirements

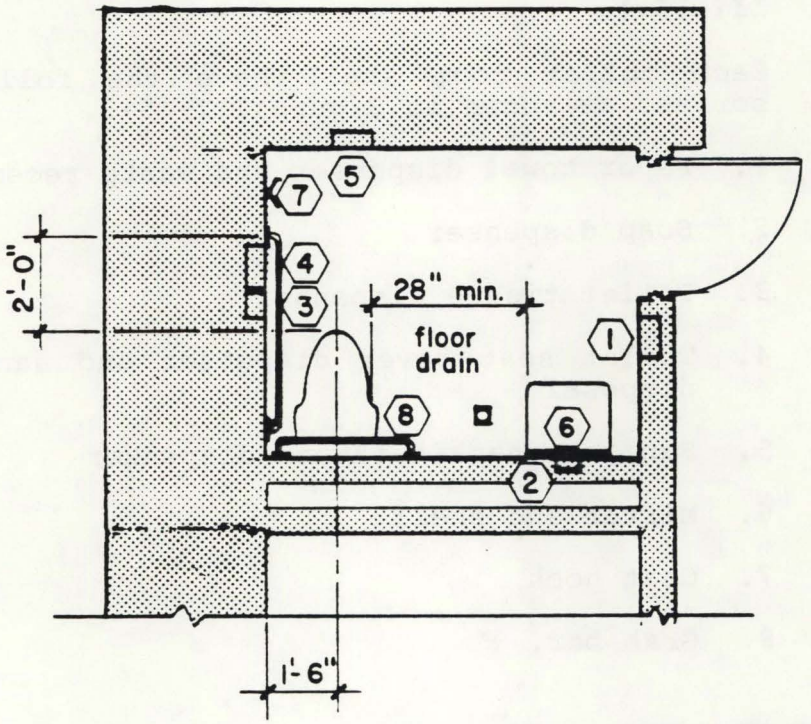
Actual fixtures to be used shall be uniform systemwide. They will be covered by a standard specification.

A. Water Closet

Water closets shall be wall mounted, elongated bowl-type with integral back spud. Water closet in each toilet room shall be mounted with seat 18" above floor.

Figure III-15-2

Toilet Room Accessory Layout



1. paper towel dispenser and waste receptacle
2. soap dispenser
3. toilet tissue dispenser
4. toilet seat cover dispenser and sanitary napkin disposal
5. sanitary napkin - tampon dispenser
6. mirror and shelf
7. coat hook
8. grab bar

Scale 1/4" = 1'- 0"

B. Lavatory

The lavatory in each toilet room shall meet the requirements of Section P1504 of Title 24, CAC. In addition, the outlet devices shall incorporate features that limit the flow and temperature of hot water. See Standard Specifications for complete description.

C. Trim for Water Closets

Provide large diaphragm flush valves for water closets, mounted 38" above finish floor.

D. Hose Bibb

Provide recessed chrome polished brass hose bibb in stainless steel box, lid to be flush with wall surface, keyed like other accessory items.

E. Floor Drain

Provide galvanized iron body with stainless steel top. Drain should be sized according to area serviced.

15.5 TOILET ROOM ACCESSORIES

15.5.1 General Requirements

A. All necessary items shall be fully recessed into the wall. Maximum projection from finished wall should not be greater than 5/8".

B. All accessories shall be constructed of Type 302 or 304 stainless steel, heavy gauge unless otherwise noted. Exposed surfaces shall have No. 4 satin finish.

C. Toilet room equipment which requires manual operation by the handicapped, such as toilet paper racks, towel dispensers, and disposer units, shall comply with the requirements of Section 2-1711 of Title 24, CAC.

15.5.2 Specific Requirements

Actual accessories to be used should be uniform system-wide. They will be covered by a standard specification.

15.6 DRINKING FOUNTAIN

A drinking fountain will be provided in the Staff/ Security Room. No public drinking fountains will be provided.

15.7 DRAINAGE IN STATIONS

15.7.1 Entrances

A. At entrances to subway stations, the first 25 feet (minimum) of floor under cover, should be sloped at a minimum of 1 percent, to drain toward the floor mat at the entrance.

B. Recesses for steel grating floor mats should be provided, under cover, at all station entrances. The length of the grating should equal the width of the entrance. The width of the grating should be approximately 10". Provide a drain in each recess.

15.7.2 Mezzanine

A. Except at entrances, floors should be level in the transverse direction and level or sloped to align with the structure in the longitudinal direction.

B. Provide floor drains at all hose bibb locations.

VOLUME III, SECTION 15 PLUMBING AND DRAINAGE (Cont'd.)

15.7.3 Platforms

A. Platforms should be level at right angles to the track and parallel with the structure in the longitudinal direction.

B. Provide floor drains at all hose bibbs located at platforms which do not slope toward trainway. Pitch floor within 3'-0" of hose bibb towards drain at 1 percent rate.

15.7.4 Roof Areas

A. Within the station, all roofs should be pitched to drain. Subway station structural ceilings shall be pitched at 2 percent minimum to provide for drainage.

B. Water should not be allowed to spill over the edge of exterior roofs, but should be carried away by concealed leaders to the storm drainage system.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 16

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1	4-061/1	9/19/84	Table of Contents 16.4.2 16.4.2 B,C 16.4.3 A,B 16.4.4 G 16.4.5 A,B Figure III-16-1 Figure III-16-2 Figure III-16-3	Replaces 6/30/83 issue. Spelling, punctuation and format corrections.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 16

SANITATION AND MAINTENANCE

VOLUME III, SECTION 16, SANITATION AND MAINTENANCE

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SANITATION AND MAINTENANCE

16.1 INTRODUCTION

This section provides the Station Designer with general standards for station sanitation and maintenance facilities. However, since SCRTD policy governing maintenance and sanitation is presently under review, modifications of these criteria may be issued at a later date.

A. The maintenance and sanitation concept being considered assumes that SCRTD will provide all necessary maintenance equipment and facilities regardless of whether the maintenance work forces consist of Metro Rail employees or contract personnel. In either case, maintenance crews will be based at the Maintenance-of-Way Facility, and possibly at other off-station locations. Most maintenance equipment, materials and supplies will be stored in the Maintenance-of-Way Facility. Provisions at stations for maintenance personnel and for storage of equipment, material, and supplies will therefore be the minimum necessary.

B. Station maintenance activities are classified under three general categories:

1. Inspection and service

2. Preventive maintenance

3. Corrective maintenance.

Work under the first two categories will be performed on a prescheduled routine basis. Work under the third category will be provided on an as-needed basis.

C. Most station maintenance activities will be performed during revenue hours. Only those activities which would seriously disrupt revenue operations will be performed during nonrevenue hours.

D. For data relative to maintenance of those areas of station complex beyond the exterior surfaces of the

station building, or buildings, including canopies and other appendages thereto, and within the boundaries of the station site, see Metro Rail Grounds and Right-Of-Way Maintenance Plan, to be issued.

16.2 BASIC GOALS

A. To create environments with an easily maintained high level of cleanliness throughout the System, which will instill pride and encourage the use of the System.

B. To provide facilities for an efficient maintenance program which operates at a minimum cost.

C. To integrate maintenance elements in the stations as a part of station design, without detracting from the appearance of the stations.

D. To provide uniform interchangeable facilities within each station or between stations where possible, to facilitate replacement of damaged items.

16.3 GENERAL PRINCIPLES

A. Maintenance and operation programs requiring the use of trainway areas and equipment should be avoided. Although some intrusion into the trainway may be necessary, each occasion will cause additional programming problems with revenue operations or high cost for providing services for limited times during premium time hours.

B. Horizontal ledges should be avoided to minimize the collection of dust. Wherever possible in above-grade stations, the exposed top surfaces of outriggers, beams, parapets and window ledges, etc., shall have a minimum slope of 30° to horizontal in order to prevent the collection of dust and debris and to discourage birds from roosting in station structures.

C. Bases should be flush with wall or recessed. If recessed, configuration must not preclude the use of

a vacuum scrubber to clean the floor within the recess. Provide cove base, integral with floor, not less than 6" high at all points of intersection between floors and walls, partitions, columns, and other surfaces in all public areas, and in toilet, custodial, trash, and battery rooms.

D. Handrails, door pulls, and other protruding elements should have a 1-1/2" minimum clear space behind them.

E. Signs, advertising panels, and art work should be designed and located to require limited maintenance.

F. Cleanouts and access panels should be located inconspicuously and, where possible, placed in pipe chases and nonpublic areas. In public areas, panels shall be provided with locks.

G. Wall mounted items of equipment, including movable equipment, should be flush. Such equipment must be accessible to the handicapped, including those in wheelchairs.

H. Notches in walls for flush mounted equipment should not extend down to the floor unless necessary to provide access for the handicapped. Bottoms of such notches should be not less than 6" above the adjacent floor at any point. Where equipment is freestanding, it should have its own integral base fitted tight to the floor. Where equipment is grouped, flush closure strips should be used to cover spaces between units.

I. Structural and architectural elements which must project from walls should be held at least 12" above the floor to facilitate cleaning. Where an element must project more than 3" from a wall, verify that floor and wall surfaces below or adjacent to the projecting element are accessible for cleaning using equipment listed in the Metro Rail Station Maintenance Plan.

J. Signs, handrails, benches, etc., should be securely anchored with tamperproof screws or bolts. If heads must be exposed, use flush spannerhead screws. Use Allen-head screws if heads are concealed from view.

16.4 SPECIFIC REQUIREMENTS

16.4.1 Entrance

A. Provision should be made at each entrance for a 110-volt ac waterproof outlet and a 3/4" hose bib in adjacent locked boxes.

B. Trash receptacles should be located at all entrances, bus dropoff areas, kiss-ride areas.

C. Steel grating floor mats in drained recesses shall be provided, under cover, across the full width of all station patron entrances.

16.4.2 Mezzanine

A. Pairs of utility outlets consisting of a 3/4" hose bib and a 110-volt ac waterproof outlet shall be provided throughout public and ancillary spaces, located so that no portion of floor area is more than 100' from such a pair. Pairs located in public areas shall be installed in a flush mounted, two-compartment stainless steel box, one compartment containing the hose bib and the other compartment containing the electrical outlet.

B. Trash and ash receptacles should be located at key points where people stop, such as at vending machines, fare gates, seating areas, etc. There will be no ash receptacles in station paid areas, which are designated as "no smoking" spaces. Ash and trash receptacles will be furnished and installed by a Metro Rail supplier on a systemwide basis.

C. See Architectural Standard and Directive drawings for specific details and mounting locations.

16.4.3 Custodial Room and Custodial Closet

These rooms are to be located as near to elevator as possible. Two such facilities are required at each station, one at mezzanine/passageway and one at platform level.

A. Platform Level Custodial Room:

Items in this area will include:

1. Mop sink - 36" x 24", floor-mounted with 6"-high rim and stainless steel rimguard, waste connection fitting.

2. Hot and cold water, single spout with pail hook at 3'-0" above bottom of mop sink, equipped with 4'-0" length low-pressure hose.

3. Floor drain.

4. 110-volt ac waterproof outlet directly adjacent to scrubber storage space.

5. Two adjustable shelves 10'-0" minimum x 1'-0" deep for storage of cleaning supplies, etc.

6. Two adjustable shelves 6'-0" minimum x 1'-6" deep for storage of toilet supplies, etc.

7. Ten sets stainless steel cam-action tool holding clips.

8. Space for double bucket and vac-scrubber machine.

9. See Custodial Room Layout, Figure III-16-1.

B. Mezzanine/Passageway Custodial Closet:

Items in this area will include:

1. Mop sink - 36" x 24", floor-mounted with 6"-high rim and stainless steel rimguard, waste connection fitting.

2. Hot and cold water, single spout with pail hook at 3'-0" above bottom of mop sink, equipped with 4'-0" length low-pressure hose.

3. Floor drain.

4. Two adjustable shelves 3'-6" x 1'-0" deep for storage.

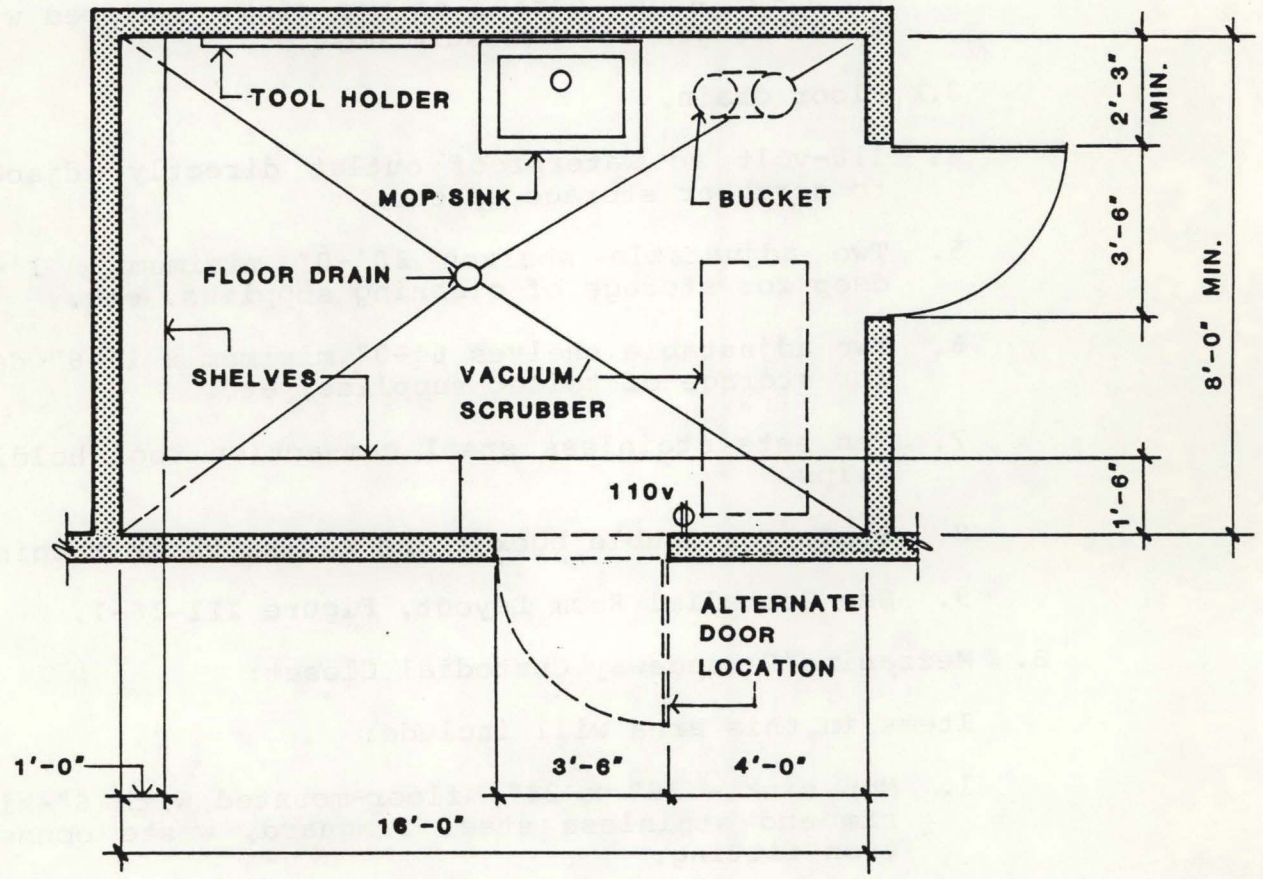
5. Minimum two sets stainless steel cam-action tool holding clips.

6. See Custodial Closet Layout, Figure III-16-2.

VOLUME III, SECTION 16 SANITATION AND MAINTENANCE (Cont'd.)

FIGURE III-16-1

CUSTODIAL ROOM LAYOUT

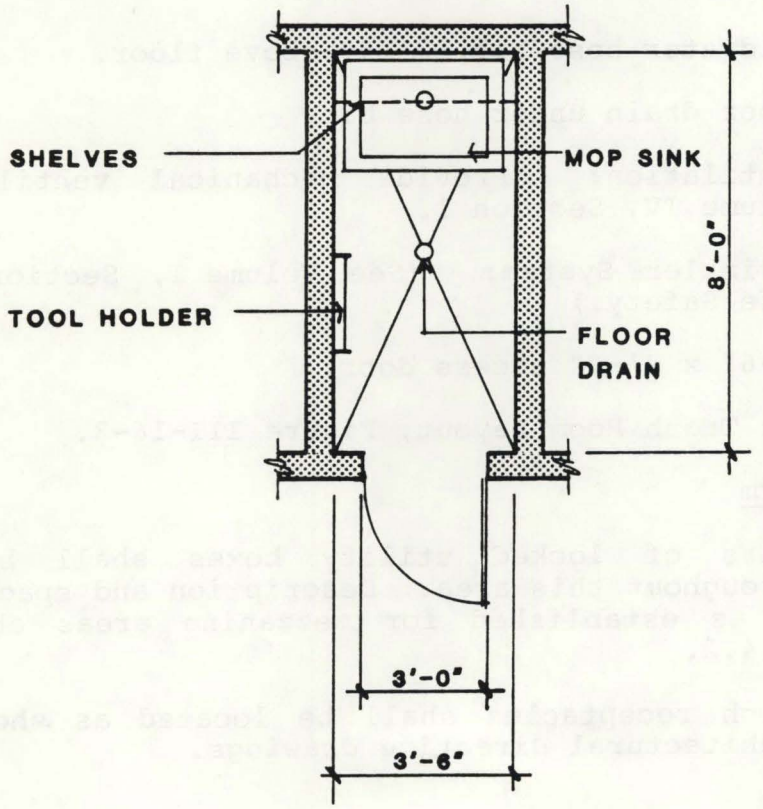


SCALE: 1/4"=1'-0"

VOLUME III, SECTION 16 SANITATION AND MAINTENANCE (Cont'd.)

FIGURE III-16-2

CUSTODIAL CLOSET LAYOUT



SCALE: 1/4"=1'-0"

16.4.4 Trash Room

This room is to be located at the mezzanine/passageway level in close proximity to the elevator.

Items in this area should include:

A. 110-volt ac waterproof outlet.

B. Coldwater hose bib, 3'-0" above floor.

C. Floor drain under hose bib.

D. Ventilation: Provide mechanical ventilation per Volume IV, Section 1.

E. Sprinkler System: (See Volume I, Section 2, Fire/ Life Safety.)

F. 3'-6" x 7'-0" access door.

G. See Trash Room Layout, Figure III-16-3.

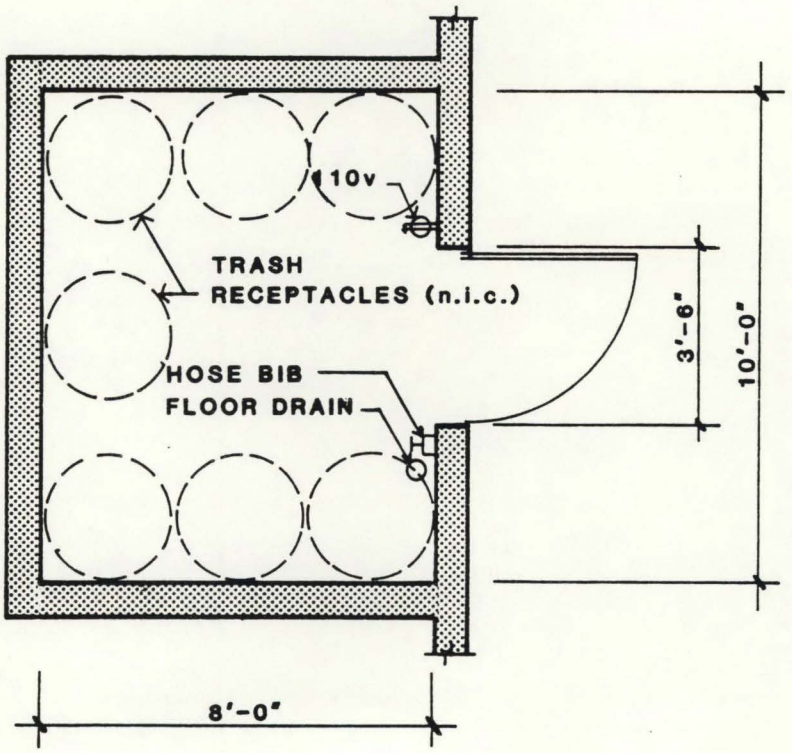
16.4.5 Platform

A. Pairs of locked utility boxes shall be located throughout this area. Description and spacing should be as established for mezzanine areas above, item 16.4.2.

B. Trash receptacles shall be located as shown on the Architectural Directive drawings.

FIGURE III-16-3

TRASH ROOM LAYOUT



SCALE: 1/4"=1'-0"

SYSTEM DESIGN CRITERIA AND STANDARDS

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 17

SIGNING AND GRAPHICS

VOLUME III, SECTION 17, SIGNING AND GRAPHICS

CONTENTS

VOLUME III, SECTION 17

SIGNING AND GRAPHICS

17.1 INTRODUCTION

This section lists the main principles and basic requirements for signing and graphics throughout the Metro Rail System. Signs will be standard throughout the System and will be designed, furnished, and installed under a separate, system-wide contract. The dimensions, locations and mounting heights of signs will be furnished by the G.C.

As the individual station design is developed, a signing layout will be prepared by the Section Designer in cooperation with the G.C. Supports for all signs and provision of electrical power, where required, will be the responsibility of the Section Designer unless specifically noted otherwise.

In areas where possible conflicts may occur, signing will take precedence over the work specified in Section 4, Art Work. Art work is to be coordinated with signing by the Section Designer to avoid conflicts.

17.2 BASIC GOALS

A. To guide patrons through the system in the most efficient and least complicated manner.

B. To provide orientation and information required by the patron to aid directional decision making.

C. To provide a safe trip for patrons, and to warn patrons and nonpatrons of potential system hazards.

D. To provide fast safe exit in case of emergency.

E. To allow the patron to know where he is and where he is going, at all times.

VOLUME III, SECTION 17 SIGNING (Cont'd.)

17.3 DEFINITIONS

Directly Illuminated. A sign for which special external illumination is required to its face.

Field. The background on which the sign legend is placed.

Fixed Sign. A sign with set format which remains constant through all applications.

Indirectly Illuminated. A sign which is illuminated by ambient light. No special means of illumination is needed.

Internally Illuminated. A back-lighted sign with its own internal illumination.

Legend. Graphic figures such as letters or symbols which are the language of the signs.

Latent Display. An internally illuminated sign having legend which can be varied by illuminating various portions of the field. When not illuminated, that portion of the sign cannot be seen.

X-Height. The vertical height of the legend.

M-Height. Preferred mounting height from the floor or grade bottom of sign.

17.4 GENERAL REQUIREMENTS

A. Signs should be kept to the minimum necessary for passenger guidance. Signs should reinforce architectural elements in identifying entrances, exits, traffic routes, etc.

B. The message on each sign will be concise, clear, and simple for easy understanding. International signs and symbols will be utilized only as necessary, e.g., handicapped, etc.

C. Signs should occur at key points of separation and at intervals frequent enough to allow patrons to find their way confidently.

D. Sign design and placement will be uniform systemwide to aid in immediate recognition by the patron at any station.

E. Because of the importance of their message, certain signs should have priority over others to achieve the prime goal of efficient movement of patrons. These signs should include signs directing the patron to exits, identification of normal and emergency exits, and direction oriented signs. This priority may be achieved by differences in size of copy, color, or location of signs. Major signs will have optimum visibility and dominance over lesser signs which may occur in the same field of view.

17.5 SIGNING SYSTEM

Architectural Directive drawings identify the format of the signing layout to be prepared by the Section Designer. The signing system will be developed by the G.C. and furnished to the Section Designers.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

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2	4-060	12/5/84	Table III-18-1	
3	4-097/2	2/12/85	18.3 E,F	Replaces 1/18/85 issue. Text shift due to insertion of 18.3 E,F.
4	5-008/3 5-009/3	3/19/85 3/19/85	18.5 B 18.7 F	Replaces 2/28/85 issue.
5	5-007	4/03/85	18.10 C	

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7	7-004/	7/7/87	18.8 18.9.A&B 18.9.C,D&E	P.5 P.5 P.6

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 18

STATION CONTROL

VOLUME III, SECTION 18, STATION CONTROL

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VOLUME III, SECTION 18

STATION CONTROL

18.1 INTRODUCTION

This section describes the supervision, administration, security, and monitoring requirements of the station and how they may be accommodated in the station design as presently anticipated. (For further information refer to Volume I, Section 3, Safety and Section 4, Security.)

18.2 BASIC GOALS

A. To provide for public safety.

B To ensure efficient operation of the station and to provide optimum service to patrons.

C. To deter crime and vandalism.

D. To accomplish the above with a minimum of manpower by utilizing automatic devices and remote Control equipment.

18.3 PLANNING CONSIDERATIONS

A. All stations shall be designed so that once unlocked and set in operation, a station agent will not be required. The station shall operate unstaffed and need only be attended in case of emergency, to activate escalators or reverse escalator direction, and to secure for shut down.

B. All station entrances, including entrances to pedestrian bridges, must be capable of being closed each day by means of rolling grilles.

C. The station design should eliminate nooks, recesses, and corners wherever possible to minimize surveillance problems. Stations should be secured at their outermost points.

D. Station supervision and administration functions will be handled by remote control systems, closed circuit

television, passenger assistance telephones, and public address systems from the Central Control Facility.

E. Main entrances to stations shall be capable of remote unlocking and opening from Central Control and the station emergency management panel. This capability is provided for possible emergency requirements only.

F. Elevators will dwell at mezzanine level when shut down, and subject to remote unlocking and starting from Central Control and the station emergency management panel.

18.4 RAIL CONTROL CENTER

The Rail Control Center will handle and monitor traction power systems, train controls, communications, and CCTV security monitoring functions. It will monitor all traction power circuits, auxiliary power circuits, patron assistance intercom, PABX telephones, electric door release, emergency fans, exhaust fans, supply fans, etc.

18.4.1 Security Functions of the Rail Control Center and Transit Police Dispatch Center

The Rail Control Cemter will monitor and control all stations. Responsibilities will include:

A. Supervision of Passenger Activity

1. Monitoring and controlling closed circuit television equipment (CCTV).

2. Monitoring fare vending and fare collecting activities.

3. Providing information and assistance to patrons.

4. Acting in emergencies such as illness or assault.

5. Reversing fare gates and monitoring escalators as required for changing traffic flow.

6. Controlling entrance and exit of special personnel, handicapped patrons, etc., via the elderly/handicapped gate at fare barriers.

7. Monitoring and activation of elevators.

B. Supervision of Station Operation and Security

1. Monitoring stations for undesirable and illegal acts against patrons, Metro Rail personnel, and station facilities.

2. Directing unlocking and opening of stations by Metro Rail roving supervisory personnel if present at commencement of the day's operations.

3. Directing station close down and locking by Metro Rail roving supervisory personnel if present at end of day's operations.

4. Directing the activities of Metro Rail personnel in stations, by means of CCTV and the Metro Rail telephone system.

5. Monitoring station intrusion alarm system and card access system.

C. Transit Police Dispatch Center

The Transit Police Dispatch Center shall direct all activity of the Transit Police. This will include:

1. Directing unlocking and opening of stations by Transit Police personnel at commencing of the day's operations.

2. Directing of station close down and locking by Transit Police at end of day's operations.

3. Directing activities of the Metro Rail Transit Police by means of a security radio system, CCTV, and the Metro Rail telephone system.

4. Monitoring station intrusion alarm and card access systems.

5. The Transit Police Dispatch Center shall have CCTV call-up monitoring capability for any CCTV camera.

18.5 STAFF/SECURITY ROOM IN STATIONS

A. Each station will have a Staff/Security Room used principally by security personnel, located off the

mezzanine/passageway. The room should be inconspicuous, yet afford, if possible, a view of the fare collection area. The Staff/Security Room shall accommodate a desk and two chairs. One-way viewing from the room shall be accomplished by a vision panel in the doors.

B. The Staff/Security Room in each station shall have the necessary conduit installed to provide CCTV monitoring capability of the individual station.

18.6 FARE COLLECTION BARRIERS AND FENCES

A. Heights of barriers adjacent to fare collection gates shall be:

1. 3'-3" in all conditions.

2. Barriers shall be visually open to provide for ease of surveillance.

B. Portions of barriers which are to be removed in future to accommodate additional fare gates shall be constructed on a modular system based on the width of the fare gate unit.

C. Where bars, slats, or pickets are used, the maximum spacing should be a 7" clear opening.

D. Fences should be nonclimbable type with horizontal members near the top and bottom only.

18.7 STATION CLOSEDOWN

A. Means must be provided to secure the station when the station or entire system is shut down. This will occur on a daily schedule and during emergencies, after the station has been evacuated by patrons.

B. Closedowns should be in the form of roll-down grilles which are key controlled from either side of the entrance.

C. Each secured station must have at least one means of emergency egress.

D. Each station must have at least one access door for use by Metro Rail Personnel when station is secured. This requirement could be combined with the emergency egress door requirement.

E. Security closure grilles should be located in such a manner as to eliminate places of concealment accessible from the street after closedown.

F. The emergency exit at all stations that is closest to the incoming electrical room shall have a direct ringdown telephone at the base of the exit.

18.8 PRIVATE ENTRANCES

Entrances to the mezzanine from non-Metro Rail structures such as stores, hotels, office buildings, etc., will be provided with closures similar in function to closedown closures. (Refer to Volume I, Section 2 for fire-rated closure requirements.) The closure will be equipped with a card access control on the station side only.

18.9 SECURITY ALARMS AND LOCKS

All ancillary spaces within the station shall be protected by locks and/or intrusion alarms. A master Security Intrusion Alarm and Keying System will be developed by the G.C. in conjunction with the District.

A. As many ancillary spaces as possible which will normally require locks shall be clustered along a corridor entered by a doorway from the station mezzanine. Ancillary spaces in this category are as follows:

1. Elevator machine rooms

2. Fan rooms.

B. The spaces indicated below will require electronic card access control which can be provided on a corridor door.

1. Electrical/Equipment Room

2. Auxiliary Power Rooms and Substation

3. Train Control/Communications Room

4. Traction Power Substations

5. Sprinkler Valve Rooms.

C. Doors to auxiliary power rooms and traction power substations will be commonly keyed, and shall be part of the station master keying system. Secure rooms will be separately keyed and access to these rooms will be monitored from the Rail Control Center and Transit Police Dispatch Center.

D. All station entrances shall be locked during nonrevenue hours and shall be equipped with an alarm signal audible at the entrance itself and directly connected to the Rail Control Center and the Transit Police Dispatch Center.

Included in this category are:

1. Entrances giving direct access to station free areas

2. Entrances to pedestrian bridges leading to stations

3. Emergency egress doors for use during nonrevenue hours

4. Metro Rail personnel access doors for use during nonrevenue hours.

E. The entrances referred to above shall have manual locking capability or card access control from either side. All entrances shall be operable by a station entrance master key or card access control except the nonrevenue hours personnel entrance which will be separately keyed. The nonrevenue hours emergency egress door shall be equipped with panic hardware.

F. Fare gates and vending machines shall be protected from tampering by an alarm signal system connected to the Rail Control Center.

18.10 SECURITY AREAS

A. Station areas have been classified by level of security as a basis for requirements for protection:

1. Level A = Open to the public during system operating hours

2. Level B = Open to system employees at all times, and to the public under emergency, or special circumstances

3. Level C = Controlled access for system employees only.

B. Security provisions for station areas and appropriate levels of security are as shown on Table III-18-1.

C. The station platforms shall have boarding or safety zone for off/peak hours or times of very light patronage. This boarding zone shall be within the maximum coverage of the CCTV and may be designated by signage.

TABLE III-18-1

SECURITY LEVELS AND PROVISIONS

STATION AREA	SECURITY LEVEL	CCTV SURVEILLANCE	SENSING DEVICES	2-WAY AUDIO	SECURITY LATCHING	REMOTE LATCHING
1. Station Closure At Mezzanine Level	A		o		o	
2. Entrance Elevator	A		o	o	o	
3. Mezzanine Approaches	A					
4. Mezzanine Free Area	A					
5. Station Staff/ Security Room	C		o		o	
6. Fare Vending Equipment	A/C	o	o			o
7. Toilets	B				o	
8. Fare Gates	A/C	o				
9. Service/Emergency Gates	A					o
10. Mezzanine Paid Area	A			o		
11. Mezzanine Elevator	A			o		
12. Ancillary Space Main Entrance	B				o	o
13. Ancillary Space Doors	C		o		o	
14. Ancillary Space	C		o	o		
15. Openable Mezzanine Wall Panels	C				o	
16. Platform Edge	A	o		o		
17. End-of-Platform Gates	C			o		
18. Station Trackway	C	o				
19. Parking and Bus Area	A					

For specific hardware requirements, see Section 13, Table III-13-1 Door, Hardware and Security Schedule.

TABLE III-18-1

SECURITY LEVELS AND PROVISIONS

STATION AREA	SECURITY LEVEL	CCTV SURVEILLANCE	SENSING DEVICES	2-WAY AUDIO	SECURITY LATCHING	REMOTE LATCHING
1. Station Closure At Mezzanine Level	A		●		●	
2. Entrance Elevator	A		●	●	●	
3. Mezzanine Approaches	A					
4. Mezzanine Free Area	A					
5. Station Staff/ Security Room	C		●		●	
6. Fare Vending Equipment	A/C	●	●			●
7. Toilets	B				●	
8. Fare Gates	A/C	●				
9. Service/Emergency Gates	A					●
10. Mezzanine Paid Area	A			●		
11. Mezzanine Elevator	A			●		
12. Ancillary Space Main Entrance	B				●	●
13. Ancillary Space Doors	C		●		●	
14. Ancillary Space	C		●	●		
15. Openable Mezzanine Wall Panels	C				●	
16. Platform Edge	A	●		●		
17. End-of-Platform Gates	C			●		
18. Station Trackway	C	●				
19. Parking and Bus Area	A					

For specific hardware requirements, see Section 13, Table III-13-1 Door, Hardware and Security Schedule.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 19

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 19

STREETS, PARKING FACILITIES, AND SITEWORK

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA & STANDARDS

VOLUME III, SECTION 19, STREETS, PARKING FACILITIES, AND SITEWORK

CONTENTS

VOLUME III, SECTION 19

STREETS, PARKING FACILITIES, AND SITEWORK

19.1 INTRODUCTION

The location and boundaries of station sites, adjacent street improvements, and station location has been established by the G.C. and is set forth on the General Plans for each station. The site layout relates to the surrounding area and its traffic patterns. Provisions for handling the pedestrian and traffic flow have been based on projections made by the G.C. and are reflected on the General Plans. (For additional information, see Volume II, Section 1, Civil.)

19.2 BASIC GOALS

To insure that site design at each station should satisfy its operational demands and integrate satisfactorily into the surrounding urban fabric. Site design adheres to the architectural concept of a systemwide cost effective approach to design. By adapting to the unique climate of Southern California, conceptually consistent design will fulfill the functional, as well as aesthetic requirements.

19.3 MODE OF ACCESS PRIORITIES

19.3.1 General

Since all modes of access to a station cannot be given equal priorities, a hierarchy has been established, measured by the convenience of access and proximity to the station entrance(s) from the various modes.

19.3.2 Pedestrians

All patrons accessing the stations become pedestrians before entry and for reasons of safety, the pedestrian mode shall be given first priority.

19.3.3 Buses

The total public transportation network includes not only rail, but buses, and since feeder buses will play a crucial role in determining the ultimate success of rail rapid transit, buses will be given first priority of the vehicular modes of access.

Bus access to and from the site shall not be compromised by other modes of transportation.

19.3.4 Kiss-and-Ride

Kiss-and-ride spaces allow high volumes of patrons to access stations in short period of time with relatively little special facilities provided. Kiss-and-ride and drop off spaces convenient to the station entrance will provide incentive not to stop on adjacent public streets. Therefore, second vehicular priority shall be given to the kiss-and-ride facility and kiss-and-ride spaces should be as close to the station entrance as possible without interfering with the bus facilities.

Waiting time in the p.m. is considerably greater since the person driving will usually arrive at the station before the transit patron. A six-minute wait (two train arrivals at three-minute headways) is average.

19.3.5 Park-and-Ride

Park-and-ride, or long term parking, although the least efficient in terms of the physical facilities required, has proven by past experience to be a necessary facility for the success of transit systems. This facility, whether at grade or structure, shall be located at a greater distance from the station entrance than other modes where site conditions allow. Whenever possible, the walking distance from the station entrance to the most remote parking space should not exceed 1,320 feet.

19.3.6 Summary

Summary of Mode of Access Priority:

A. Pedestrian (including bicycles)

B. Buses

C. Kiss-and-ride (including taxis)

D. Park-and-ride (including motorcycles).

19.4 PEDESTRIAN ACCESS

19.4.1 General

The relative importance of pedestrian access will vary from one site to another depending on location and function of the station. In all cases, however, the pedestrian access to the station should be as direct and safe as possible.

19.4.2 Approaches

A. Pedestrian crossings at streets wider than four lanes should have a refuge area at least four feet wide between opposing lanes, and shall allow easy use by all patrons, including the elderly and handicapped.

B. Pedestrian crosswalks should be emphasized with a strongly contrasting change in paving material, surface texture, or color. The width of the crossing should be at least equal to the width of the adjacent pedestrian walk, but not less than seven feet.

C. Pedestrian crosswalks shall have good visibility for both pedestrians and drivers.

D. No pedestrian ramp should have a slope greater than five percent.

E. Parking areas should be arranged to minimize the number of pedestrian crossings of streets and access roads which carry vehicular traffic.

19.4.3 Walkways

A. Isolated and remote or hidden pedestrian walkways should be avoided. Where avoidance is not feasible, they should be as open as possible and well lighted.

B. Effective width of exterior walks equals total width minus obstacles such as parking meters, poles, fire hydrants, trash cans, etc. An additional one and one-half feet fringe area per side should be subtracted due to the tendency of people to avoid walking close to walls or barriers.

C. Minimum walkway width is eight feet.

D. Walks should have a continuing common surface, not interrupted by steps or abrupt changes in level. Wherever walks cross other walks, driveways, or parking lots, they should blend to a common level.

19.5 VEHICULAR ACCESS - GENERAL

19.5.1 Entrances to Site

A. Entrances shall be from secondary roads where possible, with provision for queuing space provided at their intersections with arterial roads.

B. Separate access points into the site from the same street shall be at least 150 feet apart.

19.5.2 Separation of Modes of Access

Separation of vehicular modes of access shall be provided whenever possible due to the differing circulation needs and priorities assigned to buses, kiss-and-ride, and park-and-ride.

19.6 BUS FACILITIES

19.6.1 General

As stated in Section 19.3, buses shall be given priority in terms of vehicular access.

19.6.2 Bus Lanes

A. Bus lanes shall be one-way only through the station site.

B. Bus lanes shall be 20 feet wide minimum to allow buses in motion to pass stalled buses.

19.6.3 Bus Bays

A. Sawtooth bus bays shall not be used.

B. Bus bays shall be designed to allow loading and unloading of passengers from the right side of the bus to pedestrian paths.

C. Bus bays will be oriented so that bus patrons do not need to cross traffic to reach the station entrance.

19.6.4 Free Body Transfer

A. Free body transfer is the term used for separate and unrestricted access to and from stations to the bus areas.

B. If the District decides to implement free body transfer, since fares are not collected at these points, some form of barrier outside of the station entrance must be provided to separate the bus passengers from other transit patrons who will be paying fares or using transfers.

19.7 KISS-AND-RIDE FACILITIES

19.7.1 General

A. Convenience and safety are prime design objectives.

B. Kiss-and-ride facilities shall have second priority in vehicular access and where possible should have separate access points.

19.7.2 Access Roads

A. Access roads shall be single lane, yet allow space to maneuver around a stopped vehicle.

B. When possible, the kiss-and-ride vehicle should be able to recirculate on-site in the event a space is not available.

C. Kiss-and-ride traffic shall not be routed through the park-and-ride areas.

19.7.3 Configuration

A. When possible, kiss-and-ride spaces shall be oriented so that the waiting driver can watch the station exit.

B. Although drive-through spaces promote better circulation, the fact that many people will exchange seats with the initial driver and that kiss-and-ride spaces will be used for short-term parking (probably metered) during the nonpeak hours, site constraints will dictate whether drive-through or dead-end spaces are provided.

C. Drop off zones should be incorporated into the kiss-and-ride areas to promote better a.m. services and for taxis when they cannot use kiss-and-ride spaces in the nonpeak hours.

19.8 PARK-AND-RIDE FACILITIES

19.8.1 General

A. Park-and-ride facilities shall be provided at stations outside of the CBD. The amount of parking space at a particular station will depend upon the traffic potential, the ability of the street system to feed the station, and availability of land. (See General Plans for specific station requirements.)

B. Parking facilities may be at grade, at grade initially with provision for structured parking in the future, or structured parking with expansion capability. Refer to station specific General Plans for park-and-ride requirements.

C. If paid parking is incorporated in the park-and-ride areas, payment for parking should be made when the vehicle exits the area or by some metering method. Though installation of control devices may not be made initially, the ability to have paid parking at or near the parking stalls or upon exit must be designed into all park-and-ride facilities.

D. The facilities for park-and-ride should be designed for self-parking.

19.8.2 At-Grade Parking

A. Large parking lots should be subdivided into sections to reduce the scale. Walkways and landscaping may be used for this purpose. However, vehicular movement from each section to the next shall not be restricted.

B. Although landscaped, the parking areas should be open enough to maintain good surveillance.

19.8.3 Parking Structures

A. Parking garages shall be concrete structures and conform to the criteria set forth in Section 19.8.1.

B. Space shall be provided for elevators in the event the parking structures exceed 3 levels (2 levels above-grade).

C. Elevator locations shall be as close as practical to the station entrance. (Refer to Section 23, Vertical Circulation, and General Plans for these and other site-specific considerations.)

D. Parking structures shall conform to the following:

1. Minimum vehicular clearance height 7'0".

2. Ramp Grades:

a. Parking on ramp - 5 percent maximum.

b. No parking on ramp - 5 percent desirable, 12 percent maximum.

3. Width of entrance/exit lanes 12 feet.

4. Aisle turning radii 16 feet inside, 30 feet outside.

5. Curb height 6 inches.

19.9 FACILITIES FOR THE ELDERLY AND HANDICAPPED

19.9.1 General

A. These provisions are intended to make all station sites and facilities used by the public accessible to and functional for the physically handicapped and elderly.

B. Parking spaces as close as practical to the station entrance should be set aside and identified in the park-and-ride area for use by individuals with physical disabilities.

C. See Section 1.6.8 for additional requirements.

19.9.2 Parking Spaces

A. Parking spaces open on one side should allow room for individuals in wheelchairs or individuals on braces and crutches to get in and out of an automobile onto a level surface, suitable for wheeling and walking.

B. Care in planning of walkways should be exercised so that individuals in wheelchairs or on braces and crutches are not compelled to wheel or walk behind parked cars.

C. See Section 1.6.8.B.1 for number of accessible spaces.

19.9.3 Walkways

A. Ramps and curb cuts shall be provided as required to provide safe convenient circulation by the physically disabled to and from the station.

B. For details of curb cuts, refer to Section 2-7103, Title 24, CAC.

19.10 BICYCLE FACILITIES

19.10.1 General

A. Provisions will be made for access to and from stations by bicycle, including their storage at station sites.

B. Bicycle racks shall be placed near the station entrance.

19.10.2 Bicycle Paths

A. Bicycle paths shall be provided as an integral part of the site work.

B. Where bicycle paths meet with station areas where pedestrians are encountered, they shall remain separate from pedestrian walks. Where separation is not possible, bikers are expected to walk their bicycles and no special provisions shall be made, such as wide turning radii, in these areas.

VOLUME III, SECTION 19 STREETS, PARKING, AND SITEWORK (Cont'd.)

C. Bicycle paths shall be a minimum of eight feet wide.

D. Turning radii shall be 15 feet minimum with 30 feet desirable.

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 20

REVISION RECORD

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 20

TRAIN CONTROL

VOLUME III, SECTION 20, TRAIN CONTROL

CONTENTS

VOLUME III, SECTION 20

TRAIN CONTROL

20.1 INTRODUCTION

This section identifies the general requirements to be met by the Designer to provide for the installation of train control equipment in stations. (For further information, refer to Volume V, Section 2, Automatic Train Control.)

20.2 BASIC GOALS

To alert the Station Designer to systems which must be accommodated in the station to ensure:

A. Proper allocation of space to house and maintain equipment.

B. Proper arrangement of the spaces in relation to one another to provide for efficient servicing.

C. Location of areas and equipment to provide security for this sensitive equipment, and limit access thereto.

D. Provision of environmental controls as required for train control equipment.

20.3 TRAIN CONTROL SYSTEMS

The train control system will comprise train control equipment located on trains, along the wayside (tracks), at the Central Control facility, and at local station train control rooms and battery rooms. All train control equipment in stations will be installed by the train control contractor.

20.4 STATION TRAIN CONTROL ROOM

The train control equipment at each station will be housed in the combined Train Control and Communications Room. Train control room requirements are as follows:

VOLUME III, SECTION 20 TRAIN CONTROL (Cont'd.)

20.4.1 Location

Location should be as shown on the Directive drawings and/or General Plans. No access to or through the room shall be permitted to service or transport any equipment not installed in the train control room. Train control rooms shall be enclosed completely and provided with restricted access hardware and intrusion alarms (see Volume V, Section 3, Communications). Traction power and auxiliary power feeders shall not pass through nor be closely adjacent to the train control room.

20.4.2 Sizes and Configurations

Minimum sizes are indicated in Table III-1-2, General Criteria. Additional information regarding configuration is provided in the Directive drawings.

20.4.3 Headroom

Provide a minimum headroom in train control rooms of 12'-0".

The minimum overhead clearance shall not be encroached upon by HVAC ducts, room lighting and/or station structure that would interfere with cable trays and equipment racks.

20.4.4 Access

A pair of 3' x 7' high outswinging doors, with a 3-foot high removable transom panel, are to be provided for access.

20.4.5 Separation

To prevent electromagnetic interference with train control and communications equipment, train control rooms must be physically separated from other electrical facilities as follows:

A. Traction Power Substations:

25 linear feet and two walls of separation.

B. These walls shall be of masonry or concrete and shall have a two hour fire rating (see Volume I, Section 2 Fire/Life Safety).

20.4.6 Miscellaneous

A. Provision shall be made to hang exposed cable trays, raceways, etc., from the ceiling. Troughs or boxes in the floor will not normally be required. Generally, conduit access from outside areas will terminate at a wall inside the train control.

B. Temperature and cleanliness of the room air must be maintained within established limits. (See Chapter 11, Heating, Ventilating and Air Conditioning, and Volume IV, Section 1.)

C. All walls and ceilings shall have an applied sealer. The floors shall be covered with vinyl asbestos tile.

D. Devices will be provided to monitor the room for abnormal conditions such as smoke, fire or intrusion.

E. Provisions will be made for the grounding of equipment.

F. The room shall be waterproof.

20.5 TRAIN CONTROL CONDUIT ROUTING

For requirements of conduit routing from train control rooms to trainway duct banks and other facilities see Volume V, Section 2, and pertinent Directive drawings.

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 21

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 21

UTILITIES

VOLUME III, SECTION 21, UTILITIES

CONTENTS

VOLUME III, SECTION 21

UTILITIES

21.1 GENERAL

These criteria govern the design of rearrangements to achieve maintenance, support, or relocation of existing utility facilities that will be affected by the construction of the SCRTD Metro Rail Project. (See Volume II, Section 1, Civil for more specific requirements.)

A. Utility facilities are defined as facilities belonging to governmental agencies, public utility corporations, railroads, privately owned companies, and private parties for the provision of storm drainage, sewer, water, gas, electrical, steam, telephone, telegraph, cable television service, street lighting, traffic control, petroleum products pipelines, city communications, and other communications systems. Included are transmission and distribution lines and the service connections to adjacent properties.

B. In the performance of utilities rearrangements, due consideration shall be given to the needs of the project, the requirements and obligations of the facility owner, traffic requirements, the service needs of adjoining properties, and policies established, or to be established, by the District. Such consideration shall include ensuring that:

1. Utilities do not generate electromagnetic interference (EMI) or any other interference which would compromise either operations or safety of any element of the SCRTD System.

2. All metallic pipe and casing are protected against corrosion by the use of corrosion-resistant materials, protective coatings, or cathodic protection.

21.2 REARRANGEMENT ALTERNATIVES

A. The necessary rearrangement of utility facilities shall be performed by using one of the following alternative procedures:

1. Support and maintenance complete-in-place during construction, and continuation of service following completion of the Project facilities.

2. Temporary rearrangement and maintenance, then, upon completion of the Project facilities, and restoration to permanent service.

3. Temporary rearrangement and maintenance, then, upon completion of the Project facilities, replacement with a new facility or

4. Permanent relocation beyond the Project construction limits, preferably clear of the right-of-way.

5. Permanent relocation within the project construction limits, support in place during construction, and continuation of service following completion of the project facilities.

B. Utilities service to adjoining properties shall not be interrupted without permission of the facility owner and, if temporarily rearranged, shall be restored upon completion of Project construction.

21.3 REARRANGEMENTS DESIGN

A. Design of replacement facilities shall be performed generally on a replacement-in-kind basis. However, the minimum replacement standards and design procedures agreed to by the District and each owner shall govern. If betterments are to be included, they shall be approved by the District in accordance with the cooperative agreement and detailed agreements with the applicable agency, utility, or railroad.

B. All design involving rearrangement, maintenance of service, support in place, and other utilities work shall be in accordance with facility owner's design criteria, standard drawings, and specifications. The Section Designer shall coordinate his work and submit utilities rearrangement designs for review and approval by the District in accordance with his

contract and the terms and conditions of the cooperative agreements. The Section Designer shall arrange through the G.C. to coordinate his work with the Section Designers of adjacent sections, agencies, utility owners, and private developers to ensure compatibility of the respective rearrangements. Specifications and design standards provided by the facility owners known to be affected have been assembled and will be made available to Section Designers by the G.C. and the District.

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 22

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 22

VEHICLE DATA AND CLEARANCES

VOLUME III, SECTION 22, VEHICLE DATA AND CLEARANCES

CONTENTS

VOLUME III, SECTION 22 VEHICLE DATA AND CLEARANCES (Cont'd.)

LIST OF TABLES

VOLUME III, SECTION 22

VEHICLE DATA AND CLEARANCES

22.1 INTRODUCTION

Rail vehicle clearance requirements, and track data are given as guides in determining station configuration.

22.2 TRACKWAY CHARACTERISTICS

A. Minimum track spacing is 14'-0" center to center.

B. At stations, maximum allowable grade will be 1.0%. (For horizontal and vertical alignment restrictions refer to Volume II, Section 1.)

C. Clearance Diagram shall be as shown on the Directive drawings.

22.3 RAIL VEHICLE DESCRIPTION

A. Cars will be approximately 10'-6" wide, 12'-0" high, and 75'-0" long, coupler face to coupler face, with a 44-3/4" floor height above top of rail.

B. Vehicles will be air conditioned, with fixed safety glass windows. Three bi-parting sliding doors will be provided on each side of each car. The doors will be opened and closed at stations by the train operator. Clear width of doors will be 4'-0" min.

22.4 TRAIN OPERATIONS

A. Trains will consist of up to 6 cars.

B. Automatic operation of the train will be supervised by attendants who will be capable of monitoring performance of the train and the track ahead, and will be available for emergency operation, announcements, and general supervision.

C. Platform edge and vehicle clearance shall be as shown on Directive drawings.

22.5 BUS DESCRIPTION

TABLE III-22-1

BUS DESCRIPTION

Dimensions	Minimum	Maximum
Length	31 feet 8 inches	60 feet
Width	96 inches	102 inches
Height	114 inches	dbl deck - 170 inches sgl deck - 124 inches
Wheelbase	180 inches	299 inches
Track: Front/rear	79.5/71.75 inches	86.8/76.5 inches
Overhang: Front/rear	82.25/77.3 inches	103/112 inches
Ground clearance	8 inches	12.34 inches
Angle of approach	9°	10.39°
Angle of departure	8°	9.8°
Turning radius (body corner)	32 feet	44.3 feet
Floor height	30 inches	55.8 inches
Weights		
Curb weight (unladen)	20,000 pounds	37,200 pounds
Front axle weight rating	11,000 pounds	16,535 pounds
Drive axle weight rating	20,503 pounds	26,455 pounds
Third axle weight rating	5,500 pounds	16,535 pounds
Gross vehicle weight	34,000 pounds	59,525 pounds

Note: The above descriptions are subject to confirmation by the District.

SYSTEM DESIGN CRITERIA AND STANDARDS

VOLUME: III SECTION: 23

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SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 23

VERTICAL CIRCULATION

VOLUME III, SECTION 23, VERTICAL CIRCULATION

CONTENTS

VOLUME III, SECTION 23

VERTICAL CIRCULATION

23.1 INTRODUCTION

This section lists the main principles and standards relevant to the design of vertical circulation including escalators, elevators, stairs, and pedestrian ramps. (For further information, refer to Volume IV, Section 6, Elevators and Escalators.)

A. In the stations, the basic means of vertical transportation will be by escalators and stairs.

B. Escalators and stairs must be so situated that they carry passengers directly to the platform at a location convenient for boarding their particular train. Changes of direction should be avoided when possible. These vertical elements must be carefully located at all levels to make this direct route possible.

C. Ultimate quantity of stairs and escalators required in the foreseeable future has been determined. Even though only some of these escalators will be installed when the system opens to accommodate Design Year loading, the station design must be such that it will permit the ultimate quantity to be installed.

D. Elevators from street level to mezzanine level, and from mezzanine level to platform level, or levels, will be provided as required to make the System accessible to the handicapped, and for use by Metro Rail personnel.

23.2 BASIC GOALS

A. Safety, achieved through proper relationship of basic vertical circulation elements and the details of construction.

B. Maximum convenience for patrons, achieved through the establishment of uniform circulation patterns throughout the System.

C. Comfort, achieved through proper sizing and layout of the vertical circulation elements.

D. Facilities designed to provide for the physically handicapped.

E. Standard design to facilitate maintenance.

23.3 LAYOUT REQUIREMENTS

A. All stations must have a least one main entrance/exit to the street level plus either one additional entrance/exit for regular use or one emergency exit.

B. Where changes in level occur (rise) escalators and stairs shall be provided in accordance with the following minimum criteria: Two (2) stairs and two (2) escalators.

C. Additional stairs and escalators shall be provided between the platform and mezzanine and between the mezzanine and street to clear the platform of detraining passengers prior to the arrival of the next train.

D. The capacities of vertical circulation elements shall be assumed as follows:

1. Escalators: 48" nominal width, 120 fpm, 133 ppm; 90 fpm, 100 ppm.

2. Stairs and Ramps Over 4 Percent Slope: 22 ppm (per 22" wide exit lane).

3. Horizontal Corridors and Ramps under 4 Percent Slope: 30 ppm (per 22" wide exit lane).

Note: For ramps and horizontal corridors, a 1'-0" buffer space shall be provided at side walls, and may not be considered as exit lane space.

E. An unobstructed run-off or queue space shall be provided at each end of all stairs and escalators. The space shall be as outlined in Section 1, General Criteria. Where stairs and/or escalators oppose one another at the same level, the total unobstructed run-off/queue space may be reduced by 25 percent.

F. All vertical circulation elements shall comply with the requirement as referenced under Section 5, Codes; and Volume I, Section 2, Fire/Life Safety.

G. Elevators or ramps will be required in all stations from the street level to mezzanine and from mezzanine to each platform to provide access for maintenance equipment and those patrons who would have difficulty using stairs or escalators.

23.4 STAIRS

23.4.1 General Requirements

A. Noncombustible materials shall be used for stair construction.

B. All treads, landings, and nosings shall have slip-resistant surfaces.

C. At least one shallow sloping trough, 3" wide, shall be provided at the side of each surface to mezzanine stair to facilitate cleaning. Bottom of trough shall be a minimum of 1-1/2" clear below the tread. Treads of stairs exposed to the weather shall have a one-half (0.5) percent slope sideward toward the trough.

23.4.2 Standard Stair Widths (Minimum)

A. For Public Use: 5'-6".

B. For Service Stairs (staff use only): 3'-8".

C. Emergency Stairs: 3'-8".

23.4.3 Stair Landings

A. For straight run stair, minimum and recommended length of landing: 4'-0".

B. For return stair, minimum width of landing must be at least equal to width of stair.

C. Concealed reverse landings will be avoided in public stairs.

23.4.4 Treads and Risers

A. Public stairs running parallel to and adjoining escalators shall have a tread and riser relationship with a component of 30 degrees.

B. All other public stairs shall have a tread and riser relationship with a component within the comfort range of from 30 degrees to 35 degrees.

C. The maximum height of riser at public stairs shall be 6½". Minimum tread shall be 11".

D. Number of risers in any one run of public stairs shall not exceed 22.

E. Solid treads and risers shall be used.

F. Tread and riser dimensions shall be uniform in any one stair.

G. Minimum allowable number or risers: three. Where a change in elevation is less than 18", a ramp shall be used.

H. Minimum headroom at public stairs measured vertically from the line of nosings: 8'-6". Continuous soffits, without obstructions, should be held to 10'-0".

I. Emergency and staff stairs shall have a maximum 7-1/2" riser and a minimum 10" tread. The number of risers in any one run of stairs shall not exceed 20. The minimum headroom shall be not less than 7'-6" measured perpendicular to the tread at nosing.

J. Tread riser formula: The ratio of risers to treads shall fall within the following limits: 2R + T = 24 to 25.

23.4.5 Handrails

A. Height of railing: 2'-8" measured vertically from the top of the tread, at the nosing, to the top of the handrail. (2'-10" at landings and 3'-6" around well openings.)

B. Handrails may extend a maximum of 3-1/2" into required stair width.

C. Handrails, except center handrails, shall be continuous through landings for the full length of the stair.

D. Handrails should extend a minimum of 12" beyond the top riser and 12" + 1 tread beyond the bottom riser.

E. Handrails must be provided on both sides of all stairs.

F. Maximum allowable stair width without a center handrail: 7'-4". Center handrails should be provided on narrower stairs where needed or required to aid circulation. All stairs (except monumental stairs) in excess of 7'-4" wide must have center handrails spaced no more than 7'-4" apart.

G. Where a balustrade is not solid, the distance between vertical balusters must not exceed eight (8) inches.

H. Handrail ends shall be returned to wall, or curved down 90 degrees where free standing.

I. Handrail material shall be brushed stainless steel.

23.5 PEDESTRIAN RAMPS

A. Slope of Ramp: not to exceed 1'-0" in 20'-0" (5%) preferred; not to exceed 1'-0" in 12'-6" (8%) maximum.

B. Run of ramp between landings not to exceed 30'-0".

C. General requirements for ramp widths, landings, and handrails are as noted for stairs. See also Title 24, CAC, Section 2-3306, for provisions for the handicapped.

D. Surface of ramps shall be slip-resistant.

E. Cleaning trough not required for ramps.

23.6 ESCALATORS

23.6.1 General Requirements

A. Direction

All escalators will be furnished and installed under a separate systemwide contract.

B. Width

All escalators shall be 48" nominal width.

C. Speed and Capacity

All escalators shall be dual speed, 90 and 120 feet per minute (fpm) in both "up" and "down" directions. They shall be capable of operating 24 hours each day.

D. Rise and Slope

Rise (H) is the true vertical distance between working points (W.P.). All escalators shall be installed with the line of stop nosings 30 degrees from the true horizontal.

E. Structure Considerations

A slip connection at the head of escalators in above ground stations, and at the foot of escalators in below ground stations, will be provided by the escalator manufacturer to allow for movement (deflection, torsion, etc.) due to the load on the station structure caused by the train as it moves in and out

of the station. Escalator trusswork and other structural members are not to receive loads other than those imposed by the escalator itself.

F. Floor Slope

Landing plates must be level. Adjacent floors shall be sloped away from the escalator. The texture of the floor in proximity to the landings shall contrast with the finish of the surrounding area for detection by the visually impaired.

G. Space and Safety Requirements for Escalator Machine Space:

1. Within the machine space there will be no obstruction, such as supporting posts for the upper support beam, partitions, etc. This area will be reserved for the installation of motors, drivers, and controllers of various sizes and placements.

2. Machine space shall be provided with natural or mechanical ventilation to avoid overheating of electrical equipment and to ensure safe and normal operation of the escalator.

3. Any floor-mounted equipment other than escalators and their drive machines will be placed on reinforced concrete housekeeping pads. Minimum pad height shall be 4".

4. All machine pits shall be provided with removable covers over the full area of the machine pit. Covers shall be removable by one man without use of special equipment.

5. Escalator finish materials shall be brushed stainless steel. Moving handrail is to be black rubber. (See Standard Drawings for further information.)

H. Noise Attenuation Requirements

Noise produced by escalators operating individually in either direction under no load and under maximum load in the station environment shall not exceed 55 dBA 5 ft above the tread at the entrance combs at both ends of the escalator.

23.7 ELEVATORS

23.7.1 Planning Requirements

A. Elevators shall be installed in all stations where there are differences in level, one between each platform and the paid area of the mezzanine, and one between the free area of the mezzanine and the street. Depending on the configuration of the station, the minimum number of elevators shall be used to serve the above mentioned areas and levels.

B. Travel between elevators at their overlap (mezzanine) level will require passing from the paid area to the free area or vice versa through the elderly/ handicapped gate. Elevators should be located to keep the travel distance through the elderly/ handicapped gate to a minimum.

C. The elevator at street level should be located so that it is near a loading zone. In stations with parking facilities, parking for the handicapped shall be located near the elevator.

D. Elevator finish materials shall be brushed stainless steel on all opaque wall surfaces, doors, frames, sills, and trim. Floor and ceiling materials are to be as directed by the G.C. Transparent surfaces shall be laminated glass. (See Architectural Standard and Directive Drawings for further information.)

E. Elevator Enclosures:

1. Street level to mezzanine - opaque walls with finish as selected by the Section Designer. The hoistway doors will be safety glazed and are a Standard condition.

SCRTD METRO RAIL SYSTEM DESIGN CRITERIA

Volume III, Section 24

INTERCHANGE STATIONS

VOLUME III, SECTION 24, INTERCHANGE STATIONS

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VOLUME III, SECTION 24

INTERCHANGE STATIONS

24.1 Introduction

This chapter identifies functional criteria for Interchange Stations. An Interchange Station is defined as a Metro Rail Station that connects two rail transit lines. These operational requirements apply to all post MOS-1 interchange stations. Functional criteria primarily focus on trackway configuration, maintenance facilities and support requirements. Design criteria relating to station passenger circulation, security, Fire/Life Safety, elderly and handicapped facilities, and bus and auto access are contained elsewhere in the Metro Rail System Design Criteria and Standards.

24.2 Basic Goal - To ensure that Interchange Station designs provide the following

A. Adequate passenger-carrying capacity.

B. Convenient and timely passenger transfers between rail lines.

C. Required train movements through provision of pocket tracks and cross-overs.

D. Optimized temporary train storage capability.

24.3 Station Design Considerations

Design of the track configuration of an Interchange Station shall be based on the Operating Plan prepared by SCRTD of each connecting rail line. The Plan shall include as a minimum:

A. Determination of where short turn operations are appropriate.

B. Determination of where midday train storage is desirable, including the number of trains to be stored, the number of cars per train, and the specific storage locations.

C. Determination of overnight train storage requirements at terminals.

D. Determination of any design impacts to Interchange Stations which result from labor contract requirements.

The operational requirements included in the plans shall be considered as part of the overall station design. They influence the functional requirements of trackway configuration discussed in Section 24.4.

24.4 Functional Criteria

Functional criteria stated in this section apply primarily to trackway configuration and its impact on train operations. These criteria are categorized three ways according to the type of train operation at the Metro Rail station: those applicable to a terminal station (T) , to a mid-line station with a turnback function (MT), and to a mid-line station with through operation (M).

24.4.1 Operations

A. Designers shall incorporate features to provide for use of across-platform transfers whenever possible, and particularly where required by the Operating Plan due to large rail to rail transfer volumes. (T, MT, M)

B. Station design shall be adequate to handle the train movements required by The Operating Plan in and through the station, considering:

1. The number of trains which must be in the station at one time and the time required to clear routes in and out of the stations. At design minimum headways, track configuration shall allow for the reversing of trains without occupying the station platforms. (T, MT)

2. Crossover capability requirements between tracks in both directions and at both ends of the station platform(s). (T, MT)

3. Turnback requirements. (T, MT)

4. Gap train storage requirements. (T, MT)

5. Midday storage requirements. (T)

6. Overnight storage requirements. (T)

7. Requirements for storage of maximum length failed trains. (T, MT)

C. Station design shall provide the ability to construct future extensions while minimizing the impact to normal operations. (T, MT, M)

24.4.2 Maintenance

A. When a non-revenue track connection between lines is specified as a requirement, the station designer shall provide a track design to move equipment of one line across another to reach maintenance or operating facilities. The track's clearances and traction power shall accommodate vehicles from both lines, thus providing an overlap zone to couple dissimilar cars for towing or to permit change over from one type of current collection to another. (T, MT, M)

B. Station design shall provide personal access to stored cars for car cleaning and maintenance. (T)

C. Facility design shall provide space for storing supplies and equipment and shall have appropriate utilities. (T, MT)

24.4.3 Support Requirements

A. Station design shall provide appropriate facilities for bus operating personnel in accordance with Operating Plan requirements if the rail interchange is a major bus stop/layover point. (T, MT, M)

B. Station design shall provide washrooms and supervisor's booth for rail personnel in accordance with Operating Plan requirements. (T, MT)

C. Station design shall provide lunchrooms, lockers, and report facilities for rail personnel in accordance with Operating Plan requirements. (T)

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D. Station design shall provide a station transfer booth if required to process fare transfers. (T, MT, M)