



**METROPOLITAN TRANSIT AUTHORITY
OF HARRIS COUNTY, TEXAS
DESIGN CRITERIA FOR
METRO PARK & RIDE AND
TRANSIT CENTER FACILITIES**

**CCN: PAR-DC-001
Baseline Document**

September 14, 2012

**Revision 2
Addendum 2**

METROPOLITAN TRANSIT AUTHORITY OF HARRIS COUNTY, TEXAS

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

ORIGINATED BY: Buckette Towns DATE: 9/14/12
Program Manager

REVIEWED AND APPROVED BY: J. Cawthell DATE: 9/14/12
Program Management Support/Configuration Management

REVIEWED AND APPROVED BY: Rick Brown DATE: 9/14/12
Sr. Director/Chief Engineer

REVIEWED AND APPROVED BY: V. Donegan DATE: 9/14/12
AVP of Engineering & Major Capital Projects

REVIEWED AND APPROVED BY: Allen Smith III DATE: 9/14/12
Sr. Director State of Good Repair

REVIEWED AND APPROVED BY: VP of Facility Maintenance DATE: 9/14/12

REVIEWED AND APPROVED BY: VP of Safety DATE: 9.14.12

REVIEWED AND APPROVED BY: Sr. VP of Service Delivery DATE: 9/14/12

REVIEWED AND APPROVED BY: Sr. VP Capital Programs DATE: 9/14/12

September 2012
Revision 2

This document, once printed is an uncontrolled copy and may be outdated. To ensure you are using the correct version of this document, please refer to the Oracle Primavera Contract Management "Metro Solutions Phase 2" being hosted at <http://ridemetro.ihosting.com:7008/exponline/logon.jsp> after login: click on "Projects, 2009/2010 Metro Solution Phase 2, Library and Reference Documents" or contact Document Control via email at documentcontrol@ridemetro.org.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

October 2012
Revision 2, Addendum 1

REVIEWED AND APPROVED BY:

Chief of Police



DATE:

1/2/13

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Document History

Title	Revisions	Revision #	Revision Date
Design Criteria for METRO Park & Ride & Transit Centers	Initial Release	0	Nov 1998
Design Criteria for METRO Park & Ride & Transit Centers	Revisions to All Sections	1	Nov 2000
Design Criteria for METRO Park & Ride & Transit Centers CCN: PAR-DC-001	Revisions to All Sections	2	Sept 14, 2012
Design Criteria for METRO Park & Ride & Transit Centers CCN: PAR-DC-001	Added Chief of Police Signature and Section 10	2 Addendum 1	Nov 9, 2012
Design Criteria for METRO Park & Ride & Transit Centers CCN: PAR-DC-001	Removed conflicts between Section 10 and other Sections; removed telephone requirements and added PA/PIS system	2 Addendum 2	March 1, 2013

Configuration Control:

This is a baseline document for METRO's Capital Programs – Park & Ride and Transit Centers. The baseline document configuration control number (CCN) is **PAR-DC-001**.

Record Retention:

State Record Number: 1000-38

State Retention Period: Until superseded + 5 years

Sensitive Security Information (SSI):

“WARNING: This record contains Sensitive Security Information that is controlled under 49 CFR parts 15 and 1520. No part of this record may be disclosed to persons without a "need to know", as defined in 49 CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration or the Secretary of Transportation. Unauthorized release may result in civil penalty or other action. For U.S. government agencies, public disclosure is governed by 5 U.S.C. 552 and 49 CFR parts 15 and 1520.”

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

TABLE OF CONTENTS

1.0	GENERAL	1-1
1.1.	DESCRIPTION	1-1
1.2.	CONFIGURATION MANAGEMENT AND CONTROL	1-1
1.3.	DOCUMENT CONTROL REQUIREMENTS.....	1-2
1.3.1.	METRO Deliverables to Consultant.....	1-2
1.4.	QUALITY CONTROL/ASSURANCE	1-2
1.5.	VALUE ENGINEERING (VE).....	1-4
1.6.	CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED).....	1-4
1.7.	AMERICANS WITH DISABILITIES (ADA) CODE REQUIREMENTS.....	1-5
1.8.	SUSTAINABILITY CONSIDERATIONS	1-5
1.9.	SCHEDULE AND PROGRESS REPORTING	1-6
1.9.1.	Schedule.....	1-6
1.9.2.	Bi-Weekly Progress Review Meetings	1-6
1.10.	SUBMITTALS	1-6
1.10.1.	Design Services.....	1-7
1.10.2.	Submittals Level of Completion	1-8
1.10.3.	Preliminary Design Report.....	1-9
1.10.4.	Preliminary Submittal.....	1-9
1.10.5.	In-Progress Design Submittal (Start of Detail Design).....	1-10
1.10.6.	Pre-Final Design Submittal	1-11
1.10.7.	Final Design Submittal.....	1-11
1.10.8.	Final Submittal.....	1-12
1.11.	METRO REVIEW PROCEDURE.....	1-13
1.11.1.	Status Reviews.....	1-13
1.11.2.	Formal Design Reviews.....	1-13
1.12.	APPROVALS AND PERMITTING	1-13
2.0	SURVEYING	2-1
2.1	GEODETIC COORDINATE SYSTEM	2-1
2.2	HORIZONTAL CONTROL	2-1
2.3	VERTICAL CONTROL	2-1
2.4	TOPOGRAPHIC SURVEY	2-2
2.5	LAND TITLE SURVEYS, PLATS, RIGHT-OF-WAY MAPS AND DRAWINGS	2-3
2.6	CADD STANDARDS AND DELIVERABLES FOR SURVEY MAPS AND DRAWINGS	2-4

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

2.7	SURVEY DELIVERABLES	2-5
2.8	PROJECT DESIGN	2-5
2.9	MOCK-UP LAYOUT	2-6
3.0	CIVIL	3-1
3.1	GEOMETRIC DESIGN	3-1
3.1.1	Facility Components	3-1
3.1.2	Site Features	3-1
3.1.3	General Site Design Consideration	3-2
3.1.4	Bus Loading/Unloading Platform	3-2
3.1.5	Busways	3-3
3.1.6	Pedestrian Traffic	3-3
3.1.7	Passenger Vehicle Access Routes and Roadways	3-4
3.1.8	Passenger Drop-Off/Pickup Area	3-5
3.1.9	Parking and Accessibility for the Handicapped	3-5
3.1.10	Passenger Vehicle Parking.....	3-5
3.2	SITE GRADING	3-6
3.3	SITE DRAINAGE	3-7
3.4	DETENTION POND	3-8
3.4.1	Natural Detention Ponds.....	3-9
3.4.2	Concrete-Lined Detention Ponds.....	3-9
3.5	PAVEMENT	3-10
3.6	TRAFFIC ENGINEERING	3-10
3.6.1	Traffic Analysis	3-10
3.6.2	Traffic Signing.....	3-11
3.6.3	Pavement Markings.....	3-12
3.7	UTILITIES.....	3-12
3.7.1	Proposed Utilities.....	3-12
3.7.2	Existing Utilities	3-12
3.8	AUTO-TURN	3-13
4.0	STRUCTURAL	4-1
4.1	BASIS OF STRUCTURAL DESIGN	4-1
4.2	DESIGN LOADS.....	4-1
4.3	FOUNDATION DESIGN	4-1
4.4	STRUCTURAL STEEL BUILDING DESIGN.....	4-1
4.5	STRUCTURAL STEEL BRIDGE DESIGN.....	4-1

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

4.6	CONCRETE BRIDGE DESIGN	4-2
4.7	CONCRETE BUILDING DESIGN.....	4-2
4.8	MINIMUM REQUIREMENTS.....	4-2
4.8.1	Steel	4-2
4.8.2	Concrete	4-2
4.9	VERTICAL CLEARANCES.....	4-3
4.10	LOCATION OF SUBSTRUCTURE UNITS	4-3
4.11	WINDSCREENS.....	4-3
5.0	ARCHITECTURAL	5-1
5.1	GENERAL	5-1
5.2	FACILITY FUNCTIONAL REQUIREMENTS	5-1
5.3	SITE DEVELOPMENT	5-2
5.4	PLATFORM SHELTER	5-3
5.5	PLATFORM AMENITIES.....	5-3
5.5.1	Emergency Assistance Station Phones (EAS)	5-3
5.5.2	Public Address and Passenger Information Signs (PA/PIS).....	5-3
5.5.3	Newspaper Vending Machines	5-4
5.5.4	Waste Containers	5-4
5.5.5	Windscreens.....	5-4
5.5.6	Benches.....	5-4
5.5.7	Supervisor Booth (if required).....	5-5
5.5.8	Observation Mezzanine (if required).....	5-5
5.7	OTHER AMENITIES.....	5-5
5.7.1	Bike Racks.....	5-5
5.8	UTILITY BUILDING	5-5
5.8.1	Restroom	5-6
5.8.2	Electrical Room	5-6
5.8.3	Surveillance, Communication & Control (SC&C) Room.....	5-6
5.8.4	Concessions	5-6
5.9	ARCHITECTURAL SIGNING (See Section 3.6.2 for Traffic Signing).....	5-6
5.10	MATERIALS AND FINISHES	5-6
5.10.1	General.....	5-6
5.10.2	Basic Goals	5-7
5.10.3	Finish Qualities	5-8
5.10.4	Finish Materials for Bus Loading/Unloading Platform Area.....	5-10

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

5.10.5	Finish Materials for Utility Building	5-12
6.0	LANDSCAPING	6-1
6.1	INTRODUCTION	6-1
6.2	GOALS AND OBJECTIVES	6-1
6.3	SITE ANALYSIS	6-2
6.4	TREE PRESERVATION	6-3
6.5	LANDSCAPE CONCEPTS	6-4
6.6	LANDSCAPE GRADING AND DRAINAGE	6-5
6.7	PLANT MATERIAL	6-7
6.8	PLANT DETAILS AND SPECIFICATIONS	6-9
6.9	IRRIGATION	6-10
6.10	MAINTENANCE	6-11
7.0	MECHANICAL	7-1
7.1	GENERAL	7-1
7.2	ENVIRONMENTAL REQUIREMENTS	7-1
7.2.1	Design Parameters - Ambient Conditions	7-1
7.2.2	Ancillary Space Design Conditions (See Table 7.1)	7-1
7.2.3	HVAC Calculations	7-2
7.3	PLUMBING SYSTEMS	7-2
7.3.1	Cold Water System	7-2
7.3.2	Hot Water Systems	7-2
7.3.3	Soil, Waste and Vent Systems	7-2
7.3.4	Roof/Canopy Drainage Systems	7-3
7.3.5	Plumbing Calculations	7-4
7.4	FIRE AND LIFE PROTECTION SYSTEMS	7-4
8.0	ELECTRICAL	8-1
8.1	GENERAL	8-1
8.2	ELECTRICAL SERVICE	8-1
8.2.1	Voltage	8-1
8.2.2	Spare Capacity	8-1
8.2.3	Load Analysis	8-1
8.3	ELECTRICAL SYSTEMS	8-2
8.3.1	Conductors	8-2
8.3.2	Panelboards	8-2
8.3.3	Conduits	8-2
8.3.4	Underfloor Duct System	8-3

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

8.3.5	Corrosion Prevention	8-3
8.3.6	Grounding	8-3
8.4	ELECTRICAL DISTRIBUTION	8-3
8.4.1	Observation Mezzanine	8-3
8.4.2	Supervisor Booth	8-4
8.4.3	Utility Building	8-4
8.4.4	Bus Canopy/Platform	8-4
8.4.5	Parking Lot and Perimeter	8-5
8.5	LIGHTING	8-5
8.5.1	Objective	8-5
8.5.2	Calculations	8-5
8.5.3	Printouts	8-6
8.5.4	Luminaries	8-6
8.5.5	Lighting Poles	8-6
8.5.6	Illuminance	8-7
8.5.7	Controls	8-7
8.5.8	Circuiting	8-8
8.6	LIGHTING PROTECTION	8-8
8.7	TELEPHONE SYSTEM	8-8
8.7.1	Requirements	8-8
8.7.2	Service	8-9
8.7.3	Utilization	8-9
8.8	SURVEILLANCE, COMMUNICATIONS AND CONTROL (SC&C)	8-9
8.8.1	General	8-10
8.8.2	Electronic Information System (EIS)	8-10
8.8.3	Closed Circuit Television (CCTV) Cameras	8-11
8.8.4	Fiber Optics Interface	8-11
8.8.5	Automated Barrier Gate Controls (ABGC)	8-12
8.8.6	Pedestrian Barrier Gate Controls	8-12
8.8.7	Call Boxes	8-12
8.8.8	Observation Mezzanine	8-12
9.0	FARE COLLECTION	9-1
9.1	BACKGROUND	9-1
9.2	SITE PREPARATION DESIGN	9-1
9.2.1	Power	9-1
9.2.2	Communications	9-1

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

9.3	Design Considerations.....	9-1
10.0	SECURITY	10-1
10.1	INTRODUCTION	10-1
10.2	ACRONYMS AND DEFINITIONS.....	10-1
10.3	GENERAL REQUIREMENTS.....	10-1
10.4	ADDITIONAL GENERAL SECURITY DESIGN REQUIREMENTS	10-2
10.5	SITE REQUIREMENTS.....	10-3
10.5.1	Site	10-3
10.5.2	Architectural Features.....	10-4
10.6	COMMUNICATIONS AND SECURITY	10-5
10.6.1	Security Cameras	10-5
10.6.2	Intrusion Detection System.....	10-6
10.6.3	Emergency Assistance Stations (EAS).....	10-6
10.6.4	Public Address and Passenger Information Signs (PA/PIS).....	10-7
APPENDIX A.....		Appendix A-1
APPENDIX B.....		Appendix B-1

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

1.0 GENERAL

1.1. DESCRIPTION

- A. The design criteria specify the minimum requirements for the performance of professional design and engineering services.
- B. Project design and engineering services shall include but not be limited to; refinement of the conceptual geometric design, grading, drainage, utilities, pavement, structures, architectural landscaping, irrigation, fencing, security, communications & control (SC&C), and soil borings for stabilization & foundation design.
- C. This design criteria is provided as a technical resource to guide the design of Park & Ride and Transit Centers by engineers and architectural consultants under contract by METRO. The professionals contracted by METRO shall verify and validate the information presented contained in this design criteria during the various phases of the project/contract and in particular during final design. Any deficiencies encountered here, shall be reported to METRO immediately.
- D. METRO accepts no liability for the use of this design criteria manual. Any person making use of the information presented here shall be solely responsible for its use. The information here is not intended as substitute for professional judgment of a design professional.
- E. Design Package: The design package shall include all drawings, specifications, calculations, submittals, reports, construction estimates and schedules, approvals needed for the successful implementation of the project through the various phases.
- F. Engineer of Record (EOR): A Texas Professional Engineer who is in responsible charge for the preparation of the design package and has the overall quality assurance and control of the project. The EOR shall certify that all the design elements have been properly interfaced and there are no conflicts among the different disciplines and the design package is ready for bids and construction and that all legal and contractual obligations have been met.

1.2. CONFIGURATION MANAGEMENT AND CONTROL

- A. METRO has established a formal configuration management process that requires the evaluation, coordination, and approval of changes in the configuration of a project component after establishment of a technical baseline. This baseline is required to be in compliance with the appropriate regulatory compliance, code requirements, design criteria and standards and any approved deviations. The baseline consists of all approved technical project documentation.
- B. If changes are needed to this design criteria for METRO, the EOR shall secure first approval of METRO by means of a variance or a change request and shall follow the procedures established by METRO. The Configuration Control Board (CCB) or equivalent organization shall evaluate the request for approval or other corrective actions.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

1.3. DOCUMENT CONTROL REQUIREMENTS

- A. All official documentation shall be uploaded by the Consultant as required in Section 01312 – Document Control Requirements. These shall include correspondence, specifications, calculations, reports, design plans and all other submittals required or prepared by the Consultant.

1.3.1. METRO Deliverables to Consultant

- A. METRO deliverables to the Consultant vary for each facility. METRO generally provides the Consultant with the following items:
- Conceptual layout of the proposed facility (hard copy and CADD file)
 - Construction budget and schedule for the site, serving as a basis for design
 - METRO Guide Technical Specifications
 - Design Criteria Manual for Park & Ride and Transit Center Facilities
 - METRO's Standard Drawings
 - METRO's Directive Drawings
 - METRO's CADD Manual
 - METRO's Document Control Requirements
 - Acquisition boundary survey of the site
 - Environmental report(s) on the site
 - CADD files of METRO's "Title Sheet" and 22"x34" standard sheet border
 - METRO Urban Design Guidelines
 - METRO's Review Comments form

METRO will deliver the above items using METRO's Project Management Information System (PMIS) based in Oracle Primavera Contract Management.

1.4. QUALITY CONTROL/ASSURANCE

- A. Project design shall comply with the latest edition of the documents listed in this Design Criteria, Appendix A - Reference Standards, all applicable laws, rules, codes, regulations and ordinances of Federal, State and Local governmental agencies.
- B. Project design shall comply with all conditions contained in Categorical Exclusion, Environmental Assessment/Finding of No Significant Impact or Final Environmental Impact Statement/Record of Decision issued for the subject project by the Federal Transit Administration or Federal Highway Administration. Along with any METRO agreements with other Local, State, or Federal agencies, or other entities except as provided for and written by METRO. The design shall also incorporate ADA requirements and considerations for sustainability features.
- C. The Consultant shall be responsible for the technical and professional quality, accuracy, adequacy, and comprehensiveness of construction documents for the Project, including all documents produced by his/her subcontractors, and shall provide all necessary supporting calculations and backup as requested by METRO.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. The Consultant shall take appropriate corrective action upon receipt of all evaluations and when appropriate, respond to the evaluations. The Consultant's written response shall be submitted to METRO's Project Manager with a copy to the Contracting Officer.
- E. The Consultant shall establish or have in place a quality control system for reviewing and checking all elements of the work, including that of its lower-tier subcontractors, to ensure conformance to terms and conditions of the Contract. Consultant shall submit a copy of their QA/QC Manual to METRO for review.
- F. The Consultant shall document his/her established quality control system in a QA/QC Plan. This Plan shall include, as a minimum, the Consultant's proposed quality control organization, and shall indicate the responsibility and authority for each individual to be used in a quality control function.
- G. The Consultant's QA/QC Plan shall include, but not be limited to:
 - 1. Assurances that all plot drawings, construction drawings, standard drawings and specifications are consistent within themselves and with other drawings.
 - 2. Identification of specific points in the Project where QA/QC activities occur.
 - 3. Identification of specific individuals engaged in QA/QC activities.
 - 4. Specific procedures for ensuring continuity of work between the different organizations of the Project team, including all subcontractors and partners.
 - 5. Method of reviewing, checking, approving construction documents and design changes.
- H. Forms used to document the results of reviews and checking shall be included in the QA/QC Plan. The type of forms used shall adequately cover the type of review being performed. If, during performance of the Contract, METRO deems QA/QC Plan revisions necessary, the Consultant shall revise the QA/QC Plan accordingly and resubmit it within five (5) calendar days after notification.
- I. Prior to submitting the drawings to METRO for formal program design reviews, an interdisciplinary coordination checklist and overlay checking process should be conducted by the Consultant.
- J. This coordination checking process should not replace the single discipline, technical reviews that are essential for quality assurance.
- K. Adherence to the following production guidelines will avoid the most common coordination errors, and will expedite the reviewing-approval process.
 - 1. Comply with the Design Criteria Manual furnished by METRO.
 - 2. Comply with the CADD Manual furnished by METRO.
 - 3. Match lines for all discipline design drawings should be consistent.
 - 4. Terminology used on drawings should be consistent with the one used in the Technical Specifications and Standard Drawings.
 - 5. The term "by others" shall be avoided. When applicable, use N.I.C. (Not Included in Contract).
 - 6. Duplication of information and details should be avoided.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

7. All details and sections should be cross-referenced to a specific detail and drawing number. The use of notes as “See Architectural” or “See Structural” should be avoided.
8. The word “new” shall be avoided. All information provided in the plan set reflects proposed work. Only call out existing items as “existing ...” with all proposed items being implied.
9. Architectural floor plans shall be the base plan which other discipline floor plans must match.
10. The column location system and any other grid lines used in the project should be consistent for all disciplines.

1.5. VALUE ENGINEERING (VE)

- A. METRO shall conduct a VE study, generally at the 30% design level, on all projects with construction cost over \$1 million. The following is the minimum work the Consultant must perform unless otherwise directed in writing by METRO:
 1. Provide electronic files and three (3) full-size sets of drawings, one (1) half-size set of drawings, construction cost estimate, soils report and any other pertinent design information requested by METRO.
 2. Key personnel shall attend the VE kick-off meeting and the findings presentation held on the last day of the VE study.
 3. Assist METRO’s Project Manager in reviewing the validity of the VE proposals and prepare responses for each VE proposal.
 4. METRO accepted VE changes should be implemented at no additional cost to METRO.

1.6. CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED)

- A. METRO requires that A/E firms under contract with METRO shall be trained in, and apply CPTED design strategies. Consultant shall identify CPTED trained personnel.
- B. The basic premise that characterizes CPTED is that the proper design and effective use of the built environment is conducive to enhance safety and security, while reducing risk to people, operations and assets at public transit facilities. The term environment includes the people and their physical environment and social surroundings. The environment is that which has recognizable territorial and/or system limits. The term Design includes physical, social management and law enforcement directives that seek to positively affect human behavior as people interact with their environment.
- C. CPTED design strategies seek to prevent certain specified crimes (and the fear attendant on them) within a specifically defined environment by applying variables that are closely related to the environment itself. CPTED does not purport to develop crime prevention solutions in a broader universe of human behavior, but rather solutions limited to variables that can be manipulated and evaluated in the specified man/environment relationship.
- D. CPTED strategies utilize natural surveillance, natural access control, and territorial behavior.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- E. The primary thrust of access control strategies is to deny access to a crime target and to create the perception of risk to the perpetrators of a crime. Surveillance is a design concept directed primarily at keeping intruders under observation either through police patrol (organized), lighting (mechanical), or through the use of windows or structural design and landscaping (natural). The concept of territoriality suggests that physical design can contribute to a sense of territoriality. Physical design can create or extend a sense of influence so that, users develop a sense of "proprietorship"--sense of territorial influence and the potential for offenders to perceive that influence.
- F. There are numerous examples of CPTED techniques in practice today. In each, there is a mixture of the CPTED strategies that are appropriate to the setting and to the security or crime problem. The most basic common thread is the primary emphasis on naturalness--simply doing things that you already do, a little better. Some examples of CPTED techniques are:
 - 1. Provide clear border definition of controlled space and clearly marked transitional zones, which indicate movement from public to semi-public to private space.
 - 2. Relocate gathering areas to locations with natural surveillance and access control.
 - 3. Place safe activities in unsafe locations to bring along the natural surveillance of these activities (to increase the perception of safety for normal users and risk for offenders.)
 - 4. Place safe activities in unsafe spots to overcome the vulnerability of these activities with the natural surveillance and access control of the safe area.
 - 5. Designate the use of space to provide natural barriers to conflicting activities.
 - 6. Improve scheduling of space to allow for effective use and appropriate "critical intensity".
 - 7. Redesign or revamp space to increase the perception of reality of natural surveillance.
 - 8. Overcome distance and isolation through improved communications.

1.7. AMERICANS WITH DISABILITIES (ADA) CODE REQUIREMENTS

- A. Design must fully comply with all ADA code requirements and Texas Accessibility Standards of the Architectural Barriers Act, Article 9102, Texas Civil Statutes, whichever is more stringent.
- B. Consultant shall submit plans and specifications to the Architectural Barriers Department in Austin, Texas. Filing fee shall be incidental to the overall design fee.
- C. Upon receipt of comments from the Architectural Barriers Department, bring design into compliance and resubmit until final approval is received. Provide copies of all correspondence to METRO's Project Manager.

1.8. SUSTAINABILITY CONSIDERATIONS

- A. Sustainability considerations consistent with Leadership in Energy and Environmental Design (LEED) principles shall be applied to the design of METRO facilities.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- B. Consultant shall evaluate applicable design features which would preserve energy consumptions, reduce water use, and conserve environmental qualities, while within the constraints of project budget and schedule.
- C. Consultant shall present sustainability options and advise METRO of the ramifications of each in short-term and long-term impacts to the project, and to the operations and maintenance of the facility.

1.9. SCHEDULE AND PROGRESS REPORTING

1.9.1. Schedule

- A. Milestones for submittals have been established and are outlined in Section 1.9.2. Consultant shall provide a breakdown of time between review submittals, outlining; A/E design time; QA/QC; revisions; printing and submittal to METRO. Consultant shall also show other agencies review time along with permitting process. Consultant shall provide METRO's Project Manager with an updated schedule on a monthly basis.

1.9.2. Bi-Weekly Progress Review Meetings

- A. Bi-Weekly Progress Review meetings shall be conducted with the participation of the respective Project Managers and other members of the designer's team, as necessary. The time, day, and place for the meeting shall be mutually agreed to. Meetings shall start within five (5) minutes of the designated time. The agenda of the meeting will pertain to relative subjects. Consultant shall maintain minutes of all project related meetings. A copy of all meeting minutes shall be sent to METRO's Project Manager within five (5) working days after the meeting takes place. Meeting minutes shall be uploaded in METRO's PMIS System.

1.10. SUBMITTALS

- A. Documents to be reviewed shall be submitted by the Consultant to the Project Manager. The submittal shall be accompanied by a transmittal letter from the Consultant tabulating the contents of the design review package. It shall specify the purpose of the submittal, the design review point, and shall outline any items within the submittal that are known to the Consultant to represent variances from the previous baseline or review point. The transmittal shall also be signed by the QA/QC manager and state that the plans comply with the contract according to the QA/QC process. The Consultant is required to upload and deliver submittal utilizing METRO's Oracle Primavera Contract Management.
- B. Construction Drawings shall be submitted to all agencies having jurisdiction over the site for approval in order to obtain necessary permits. Consultant shall coordinate with the agencies as to when the plans should be submitted for review. Copies of correspondence shall be provided to METRO's Project Manager via METRO's PMIS System.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

1.10.1. Design Services

- A. The Consultant shall, within fourteen (14) calendar days after the Notice-To-Proceed (NTP), furnish to the Contracting Officer for approval, five (5) copies of a Program Outline of Design Services that the Consultant will provide including a detailed schedule of activities. Sufficient detail shall be provided outlining manpower to perform each of the tasks. Also, provide a Schedule of Values (SOV). The Consultant shall also provide a list of deliverables along with the submittal schedule. Unless otherwise directed, the breakdown shall be in sufficient detail to permit an analysis of the direct manpower and cost requirements, as required to conduct:
 - 1. The Preliminary Design Report (15% level of completion)
 - 2. Preliminary Design (30% level of completion)
 - 3. VE Workshop
 - 4. In-Progress Design (60% level of completion)
 - 5. Pre-Final Design (95% level of completion)
 - 6. Final Design (100% level of completion), and
 - 7. Final Submittal.
- B. Consultant shall provide an overview of all software used in the design process. CADD software must be consistent between all sub-contractors. All CADD files shall be uploaded to METRO's PMIS.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

1.10.2. Submittals Level of Completion

Unless otherwise directed in writing by METRO, the Consultant shall adhere to the following level of completion for reports, design drawings, and technical specifications to be reviewed by METRO:

SHEET	15% Preliminary Report	30% Preliminary Submittal	60% In-Progress Submittal	95% Pre-Final Submittal	100% Final Submittal
Cover					
Index of Drawings					
Plat					
Topographic Survey					
Elevation and Contour					
Boring Location Plan					
Boring Logs					
Storm Water Poll. Plan					
Project Layout					
Site Demolition					
Construction Sequence					
Horizontal Control					
Drainage Analysis					
Site Drainage					
Water Line					
Sanitary Line					
Site Grading					
Pavement Joint Layout					
Fence and Gate					
Traffic Plan, Signing & Traffic Analysis					
Stripping Layout					
Traffic Signal and Details					
Platform and Canopy					
Utility Building					
Mechanical					
Electrical					
CPTED, Security and SC&C					
Irrigation					
Landscape					
METRO Standards					
Technical and Special Provision Specifications					

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

1.10.3. Preliminary Design Report

- A. The Consultant, within 30 calendar days after NTP, shall submit for METRO's review and comments, fifteen (15) sets of the Preliminary Design Report. This submittal shall include information at approximately the 15% level of completion. The documentation included in this submittal shall consist of:
1. Three (3) conceptual alternatives for the bus shelter canopy (all must stay within METRO's budget constraints).
 2. Provide evaluation report for each conceptual alternative.
 3. A review of the Project budget and information furnished by METRO to ascertain the requirements of the Project.
 4. Preliminary Traffic Analysis Report.
 5. Copy of survey field notes with computer ASCII data file containing the survey information. The ASCII data file will include the Point Number, Northing Coordinate, Easting Coordinate, Elevation and Descriptive Comments for all points tied in the field survey. The point numbers will correspond with the CADD file and field notes.
 6. Preliminary plans of the Project.
 7. Provide two (2) Topographic Survey and two (2) Planimetric Survey layout check prints, signed and sealed by a Texas Registered Professional Land Surveyor.
 8. Preliminary re-plat document for the Project (if required).
 9. Availability of utilities: potable/irrigation water, telephone, electrical and sanitary services (if required).
 10. Preliminary construction cost estimate for the Project.
 11. Storm Water Management Report including site drainage calculations and recommendations.
 12. CPTED and Security recommendations.
 13. Preliminary list of Technical Specifications.
 14. Preliminary list of Standard Drawings to be used.
 15. CADD files for all drawings at the 15% level of completion (Include Surveyors ASCII file) Design layouts shall be prepared based on a coordinate system.
 16. In addition to the native files of the above documents, searchable pdf files shall be provided to METRO.

Quantities and types for the above requirements shall be outlined in other Contract documents.

All of the above submittals shall be uploaded on METRO's PMIS.

1.10.4. Preliminary Submittal

- A. The Consultant, within 60 calendar days after receipt of METRO comments on the Preliminary Design Report, shall submit for METRO's review and comments the Preliminary Design. This submittal shall include information at approximately the 30% level of completion. The documentation included in this submittal shall consist of:
1. Design Package including standards at the 30% level. Full size sets of

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- bounded design drawings and standards. Drawing package shall be uploaded on METRO's PMIS.
2. Final Traffic Analysis Report
 3. CADD files for all design drawings including ancillary files such as Geopak and Descartes files.
 4. Two (2) marked up outlines of the Technical and Special Provisions Specifications to be used, along with preliminary specifications for new materials or items.
 5. Two (2) sets of each Manufacturers' Specifications and Cut-Sheets for proposed lighting fixtures and other items, along with a list of materials to be used and samples when available.
 6. Computer printouts and drawings indicating maintained illumination levels in foot-candles, including maximum, minimum, average to minimum ratio, and maximum to minimum ratio.
 7. Two (2) copies of all pertinent design calculations, including but not limited to: storm drainage, Storm water Pollution Prevention Plan, canopy structure, utility building, platform slab, parking lot & bus way pavement, sanitary sewer, potable water, COH landscape ordinance (if applicable) and irrigation water requirements and others as required.
 8. Update of necessary utilities.
 9. Two (2) copies of the updated construction cost estimate and preliminary construction schedule.
 10. List of all permits required and time needed to obtain them.
 11. Provide two (2) Topographic Survey and two (2) Planimetric Survey layouts, signed and sealed by a Texas Registered Professional Land Surveyor.
 12. Final sealed and signed Plat or Re-Plat (if required).
 13. Preliminary report on crime analysis and security issues including; problems addressed alternatives considered and final selection with rationale. Also provide cost, feasibility and other recommendations as needed.
 14. Provide responses to METRO Preliminary Design Report review comments.
 15. In addition to native files of the above documents, searchable pdf files should be provided to METRO.

All of the above submittals shall be uploaded on METRO's PMIS.

1.10.5. In-Progress Design Submittal (Start of Detail Design)

- A. The Consultant, within 45 calendar days after receipt of METRO's review comments for the Preliminary Design submittal, shall submit for METRO's review and comments, the In-Progress Design. This submittal shall include information at approximately the 60% level of completion. The documentation included in this submittal shall consist of:
 1. Design Package including standards at the 60% level. Full size sets of bounded design drawings and standards. Drawing package shall be uploaded on METRO's PMIS.
 2. One marked up copy of the Technical and Special Provisions Specifications to be used indicating additions or deletions.
 3. One (1) set of electronic CADD files for all design drawings (on flash drive or portable hard disk).

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

4. Updated design calculations.
5. One (1) copy of the updated construction cost estimate.
6. Finalize all utility requirements, both public and private.
7. Provide responses to METRO Preliminary Design review comments.
8. Final CPTED and Security report.
9. In addition to native files of the above documents, searchable pdf files should be provided to METRO.

All of the above submittals shall be uploaded on METRO's PMIS.

1.10.6. Pre-Final Design Submittal

- A. The Consultant, within 45 calendar days after receipt of METRO's review comments for the In-Progress Design submittal, shall submit for METRO's review and comments, the Pre-Final Design. This submittal shall include information at approximately the 95% level of completion. The documentation included in this submittal shall consist of:
 1. Design package including standards at the 95% level. Full size sets of bounded design drawings and standards. Drawing package shall be uploaded on METRO's PMIS
 2. Design calculations including but not limited to civil, structural, architectural/landscaping, mechanical, electrical, and system. Design calculations shall be sealed by a licensed professional in the State of Texas. Design calculations shall have been properly reviewed including by and independent quality assurance professional and by the Engineer of Record for the project.
 3. Technical and Special Provisions Specifications proof read and marked up. The consultant shall submit a report outlining the changes needed for the project.
 4. Electronic CADD files of all design drawings, standard drawings, and ancillary files such as Geopak and Auto-turn files (on flash drive or portable hard disk including associated path structures).
 5. One (1) copy of updated Construction cost estimate and schedule.
 6. Provide responses to METRO In-Progress Design review comments.
 7. In addition to Native files of the above documents, searchable pdf files should be provided to METRO.

All of the above submittals shall be uploaded on METRO's PMIS.

- B. The Consultant shall submit drawings to Texas Department of Licensing and Regulations, Architectural Barriers Department, along with all other agencies and utilities having jurisdiction over this project.

1.10.7. Final Design Submittal

- A. The Consultant, within 30 calendar days after receipt of METRO's review comments for the Pre-Final Design submittal, shall submit, for METRO's review and comments, the Final Design. This submittal shall include information at

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

approximately the 100% level of completion. The documentation included in this submittal shall consist of:

1. Design Package including standards at the 100% level. Full size sets of bounded design drawings and standards. Drawing package shall be uploaded on METRO's PMIS.
2. Design calculations including but not limited to civil, structural, architectural/landscaping, mechanical, electrical, and system. Design calculations shall be sealed by a licensed professional in the State of Texas. Design calculations shall have been properly reviewed including by and independent quality assurance professional and by the Engineer of Record for the project.
3. Electronic CADD files for all design drawings, including ancillary files such as Geopak and Descartes files.
4. One (1) master set of Technical and Special Provisions Specifications ready for printing and One (1) electronic copy of the master Technical and Special Provisions Specifications on a flash drive.
5. Two (2) sets of each Manufacturers' Specifications and Cut-Sheets.
6. Two (2) copies of all pertinent design calculations, (checked and sealed by a Professional Engineer or Architect licensed to practice in the State of Texas, indexed and bound).
7. Provide comments from all agencies and utilities having jurisdiction over this project and incorporate comments into plans, and
8. Provide responses to METRO Pre-Final Design review comments.

All of the above submittals shall be uploaded on METRO's PMIS.

1.10.8. Final Submittal

- A. The Consultant, within 14 calendar days after receipt of METRO review comments for the Final Design submittal, shall submit:
 1. Original signed and sealed by a Texas Professional Engineer and "Issue for Construction (IFC)" full size Construction and Standard Drawing mylars.
 2. Design calculations including but not limited to civil, structural, architectural/landscaping, mechanical, electrical, and system. Design calculations shall be sealed by a licensed professional in the State of Texas. Design calculations shall have been properly reviewed including by and independent quality assurance professional and by the Engineer of Record for the project.
 3. Signed and sealed by a Texas Professional Engineer Master set of Technical and Special Provisions Specifications. The consultant shall submit one electronic Microsoft Word file(s), one pdf and one hard copy set.
 4. One (1) half size set of vellums of Construction and Standard Drawings.
 5. Design Package including standards at the 100% level. Full size sets of bounded design drawings and standards. Drawing package shall be uploaded on METRO's PMIS.
 6. Electronic CADD files for all design drawings, including ancillary files such as Geopak and Descartes files.
 7. Five (5) copies of the construction cost estimate and schedule.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

8. Plans should reflect all comments from METRO, other agencies and utilities.
9. In addition to Native files of the above documents, searchable pdf files should be provided to METRO.

All of the above submittals shall be uploaded on METRO's PMIS.

1.11. METRO REVIEW PROCEDURE

- A. METRO's Project Manager will first check the submittal for completeness, according to the requirements in this manual for each submittal.
- B. After METRO's Project Manager has determined that the submittal is complete, the submittal will be distributed to various engineering disciplines within METRO for technical review.
- C. METRO will return the formal submittal with comments, additions or corrections required no later than 21 days after receipt of the complete submittal from the Consultant.
- D. All action taken/responses to METRO's comments shall be incorporated prior to the next submittal being accepted.

1.11.1. Status Reviews

- A. Status reviews shall be on an as-needed basis as determined by METRO's Project Manager. These reviews are mainly informal and for information regarding the timeliness of the progress in accordance with the Consultant's proposed schedule. These reviews will generally not require formal transmittals or responses.

1.11.2. Formal Design Reviews

- A. Formal Design Reviews shall take place at METRO's offices at the designated milestones of the design process. Formal transmittals of the design materials submitted for review shall be required.

1.12. APPROVALS AND PERMITTING

- A. The Consultant shall have the construction drawings reviewed and approved for construction by all governmental, municipal and private utilities having jurisdiction over the project. The Consultant shall also obtain the following (as applicable) along with others listed within the Scope of Services:
 1. Provide a Notice of Intent (NOI) for Storm Water Discharges associated with construction activity under the National Pollutant Discharge Elimination System (NPDES) General Permit to be submitted to the EPA.
 2. Obtain sanitary and potable/irrigation water rights.
 3. Obtain storm water discharge permit from HCFCD.
 4. Assist METRO in securing all Inter-Agency agreements required to complete the Project (i.e.; TXDOT Multi-Use Agreement, Transportation Improvement Agreement (TIA), Subdivision Plat, etc).

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

5. Perform all work necessary to obtain a building permit from the governmental agency having jurisdiction over the area. The Construction Contractor will be responsible for paying the building permit fee.
- B. The Consultant shall pay all filing, permit and impact fee's (less the building permit fee) and shall be incidental to the overall design cost.

END OF SECTION 1.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

2.0 SURVEYING

2.1 GEODETIC COORDINATE SYSTEM

Park & Ride and Transit Center projects shall be referenced to the Texas State Plane Coordinate System (South Central Zone) NAD 83 Adjustment. Horizontal and vertical datums shall be as provided by METRO per the scope of the project. System of computation for coordinates shall be Surface Coordinates, and will be so identified on all drawings produced. The conversion factor and conversion formula from surface to grid coordinates will also be provided. All standards and specifications of accuracy referenced hereon are based on the accuracy prescribed and required by METRO.

2.2 HORIZONTAL CONTROL

Horizontal Control is the controlling monumented network for the positioning of any data gathered for the project.

- A. The horizontal control survey shall be tied to the Coast and Geodetic Survey / N.G.S. control system or other METRO approved monumentation recovered by previous recovery survey specified by METRO and based on the Texas State Plane Coordinate System, South Central Zone (NAD-83). Horizontal control traverse shall be tied to two (2) GPS observations. The Texas Department of Transportation (TxDOT) control system may also be utilized as directed on various projects of overlapping areas by utilizing TxDOT data.
- B. Error of closure for the Horizontal Control shall meet the requirements for a Category 7 Condition II, per Manual of Practice for Land Surveying in the State of Texas.
- C. The traverse of the horizontal control survey should be laid out to provide accessible reference observations to points along the perimeter of the Park and Ride and Transit Center Facility and connecting drives, access ramps and structures. All angle points set in the main traverse line of the horizontal control survey shall be set by the surveyor as follows. All permanent survey control monuments shall be marked by an aluminum, brass cap or other material as directed on the ground and shall be set in place in concrete prior to commencing actual turning angles of traverse. A 5/8 inch iron rod with a minimum length of 12 inches shall be set under the aluminum or brass cap to enable the cap to be recoverable by use of a metal locator.

2.3 VERTICAL CONTROL

- A. Vertical Control primary benchmarks monuments to be based on the latest USC&GS or National Geological Survey Benchmark most recent adjustment by N.G.S. or other approved monumentation as directed by METRO. Temporary benchmarks (TBM's) shall be set for any secondary level work not to exceed third (3rd) order accuracy from the base vertical control network.
- B. Error of closure for the Vertical Control shall meet the requirements for a Category 8 Condition II, per Manual of Practice for Land Surveying in the State of Texas.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- C. Points used for vertical control shall have elevation values determined from a closed level loop and shall have been used as a turning point in the loop. Foresights and backsights shall be balanced as near as practical.
- D. Vertical control shall be determined by direct differential leveling. Trigonometric leveling will not be accepted. All equipment used shall be calibrated and adjusted prior to the commencement of the project and thereafter shall be checked regularly to maintain correct adjustment.
- E. The surveyor shall set a secondary control traverse from the METRO monumentation system and shall maintain at least a 3rd order accuracy. A minimum of two (2) semi-permanent control points and TBM's shall be set on the project site for future use for construction. Set iron rods, "X" inscribed in concrete or any semi-permanent mark in a safe location where it will not be disturbed during construction. Provide sketches in field notes with three (3) swing ties for recovery for control points.
- F. All primary and secondary control traverse points shall have surface coordinates based on METRO monumentation system and shall include the conversion factor to convert to grid coordinates.
- G. All data shall be acquired in 2D or 3D as required per the scope of work.

2.4 TOPOGRAPHIC SURVEY

- A. Provide a Topographic Survey of the proposed Site along with a minimum of 20-feet outside of METRO's property line in accordance with the requirements for a Category 6, Condition II, Topographic Survey per the Manual of Practice for Land Surveying in the State of Texas. The Topographic Survey shall be signed and sealed by a Texas Registered Professional Land Surveyor. The Topographic Survey shall include the following as a minimum:
 - 1. Recovery and verification of all boundary corners for the proposed Park and Ride/Transit Center Facility. Reset all boundary corners found disturbed or missing with minimum 5/8-inch diameter by 3-foot long iron rods, set flush with natural ground. Call out bearings and distances of all boundary lines, including points of curvature and points of tangency. Call out surface coordinates of all boundary corners based on the coordinate system specified in Section 2.1.
 - 2. Show all existing surface features and utilities. Include nearest sanitary sewer manhole, fire hydrant and potable water service. Provide rim and flowline elevations of manholes and inlets. The Designer is responsible for obtaining all utility drawings and shall provide copies to METRO.
 - 3. Set and identify a minimum of two (2) benchmarks on site with surface coordinates and elevations and provide ties to the horizontal and vertical control system described in Sections 2.2 and 2.3. Benchmarks shall be brass caps set in a minimum of 8 inches of concrete or drilled and epoxied into existing concrete. Call out bearings and distances of all boundary lines, including points of curvature and points of tangency. Call out surface coordinates of all boundary corners based on the coordinate system specified in Section 2.1.
 - 4. The Topographic Survey should determine the position and configuration of natural and/or man-made objects such as buildings, roadways, railroads, fences, utility

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

housing (manholes), power poles, natural and/ or man made waterways, etc. All observed points will have an X and Y value and a Z value, if requested in the project scope.

5. Use a grid system to survey topography on 50- foot centers where possible, delineating grade breaks of entire proposed facility site. Cross sections shall be taken at 50-foot intervals along adjacent roadways and streets, if determined necessary by METRO. Decimal point of spot elevation shall represent location of shot taken. If shots are too close together, provide an "x" to denote location of shot. Show contour lines at 0.50 foot intervals. All elevations and information on drawing shall be legible and shall not overlap. Obtain elevations along the property line, 10 feet and 20 feet outside of the property line, to determine the natural storm water drainage courses.
6. Vertical ties shall be made to METRO, City of Houston, TxDOT, Harris County Flood Control District (HCFCD), and any other agency having jurisdiction over the project area. Provide a comparison chart on the drawing, showing the project elevation as related to each agency's published elevation.
7. Provide grid marks on 5-inch grid. Scale of drawing will determine actual distance of grid marks. At the outer edge of the drawing show northing and easting coordinates. Coordinates shall conform to requirements of Section 2.1.
8. Utility surveys are to be performed for any public and private utility services that exist on the site, within 20 feet from the perimeter of the site, or along and connecting drives, roadways, ramps, or structures included as part of the project. Subsurface Utility Engineering (SUE) will be performed as requested by METRO per the American Society of Civil Engineers (ASCE) criteria. The topographic map shall show the configuration and location of the existing above ground and underground utilities. All above ground and marked below ground utilities should be located as necessary. Utility features such as manholes for sanitary sewers, storm sewers, water meters, gas valves shall be opened, documented and measured to the extent possible. No power utility manholes or vaults shall be opened without the consent and supervision of the utility agency representative. All utility lines shall be connected to their respective consecutive facility, inlets, valves identifying type of structure, direction of flow by noting invert elevations at all manholes or vaults.

2.5 LAND TITLE SURVEYS, PLATS, RIGHT-OF-WAY MAPS AND DRAWINGS

Property surveys shall be represented by a plat, map or drawing to depict the results of the survey, be it a planimetric, topographic, or land title plat. Drawing shall show dimensions, bearings, distances, curve data information, coordinates, elevations and any improvements or other data necessary for the use of such property map. Drawings may be developed at a scale suitable for the use of such map. For Park & Ride and Transit Facilities accessing TxDOT roadways, right-of-way maps shall be prepared which conform to TxDOT requirements (i.e., the TxDOT Survey Manual, Chapter 5, for Boundary Surveys, Mapping Requirements and ROW Components). Right-of-way maps for Park & Ride and Transit Facilities connecting with non-TxDOT roadways shall meet the requirements of the appropriate jurisdictional government agency. Development of the land title plat for property to be retained under METRO ownership shall be coordinated with the METRO Real Estate Department. Verification of right of entry is the responsibility of the surveyor. Upon completion of the title plat, the surveyor is responsible for completing the Land Surveyor's Certification, for each parcel per METRO Real Estate Department requirements.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

2.6 CADD STANDARDS AND DELIVERABLES FOR SURVEY MAPS AND DRAWINGS

Survey data shall be compiled into MicroStation DGN file format as specified in the project scope of work. All survey data shall be input in to the CADD file in State Plane Coordinates and drawings will be plotted in Surface coordinates and noting the conversion factor based on the METRO Primary Control provided. Consultant shall use the special level structure provided for this project as provided with the scope of services.

The Survey Consultants shall submit all drawing files in MicroStation (.dgn) v.8 or later. All 3d and 2d files developed must be submitted, etc. METRO's CADD Manual.

METRO requires each Consultant who is performing survey-related work to deliver their complete suite of files which have been created during a Geopak session. This suite of files includes, but is not limited to, the following:

job###.gpk

This is created when the user starts a Coordinate Geometry (COGO) session for the first time, or uses Store Graphics for the first time. All coordinate geometry data is stored in this data base file. The ### is the only variable in this name. It represents a job number unique to a project and is defined by the user upon creation. Example: job123.gpk

name###.ioc

This is an input file used for loading data into the GPK file during a COGO session. The ### represents the job number (gpk file to receive the data for storage) and the "ioc" represents the "operator code", usually the user's initials. The only variable is the "name" that the user assigns. Example: HA1123.ioc

j###ooc.inp

This is a special COGO input file that is created the first time that either Store Graphics or Create Existing Ground Profile is used. This file is appended automatically as each of these tools are used during the design process. Example:123ooc.inp

name###.ooc

This is an output file created by GEOPAK during a COGO session. The file can be created by using the COGO pulldowns File > Output or simply typing Out [name], in the COGO command window. The only variable is the "name" that the user assigns. Example: HA1123.ooc would result from typing OUT HA1

name.inp

This is the simple naming convention for any input file used in conjunction with the Geopak Process Cross Sections tool. These would include input files for creating "auto shapes", proposed cross sections, earthwork, etc... The only variable is the "name". It is user defined and can support 1-8 characters. Example: PRXS_09.inp

name.dat

This is an input file for generating topographical surfaces, (DTM input file). The only variable is the "name". It is user defined and can support 1-8 characters. Example: site_1.dat

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

name.tin

Binary DTM file created from processing the .dat file used for all surface computations and creating things such as contours. The only variable is the "name". It is user defined and can support 1-8 characters. Example: site_1.tin

name.dgn

This is the file extension of all MicroStation design files created by Geopak, both 2d and 3d. All MicroStation drawings are to be delivered in the V7 file format. The consultant shall follow the file name convention adopted by METRO.

For clarification for the above requested submittals contact:

Jose Castellanos, P.E.
Director, Program Management Support
Capital Programs
Phone: (713)739-3727
E-mail: jose.castellanos@ridemetro.org

Electronic DGN files and ASCII files shall be submitted to METRO on Flash Drives or as directed by METRO. Horizontal and vertical control point key map shall be delivered in separate files. All CADD files shall contain a note that all coordinates are (Grid/Surface) Texas State Plane Coordinates South Central Zone NAD 83 and Surface to Grid Coordinates Conversion Factor.

2.7 SURVEY DELIVERABLES

The deliverables from the surveyor should consist of a coordinate listing of all points, computer generated sketch, or annotated plat as required by METRO CAD Standards. The deliverables must fully comply with the requirements set forth in the drafting standards and per the contract scope.

The deliverables should also meet the standards of the Texas Society of Professional Surveyors (TSPS), the American Land Title Association (ALTA) or any other applicable authority or agency. Additionally, the Texas Board of Professional Land Surveyors (TBPLS) has minimum standards that should be adhered to for survey projects. It shall also be the responsibility of the surveyor to maintain, and submit as required by the project scope of services, legible field notes, sketches and any other material useful to the recovery and/or identification of field information by others. Surveyor shall also provide a "Point No. Key Map" of plotted data from field notes for reference. All this information shall be provided to METRO at the conclusion of the project.

2.8 PROJECT DESIGN

Consultant shall be responsible for any additional survey work required in completing the Project.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

2.9 MOCK-UP LAYOUT

During the Preliminary Design Review, the Consultant is required to lay out the geometric design of the busways, at METRO's Field Services Center. All critical points shall be flagged or coned to simulate curb lines. This work shall be coordinated through METRO's Project Manager.

END OF SECTION 2.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

3.0 CIVIL

3.1 GEOMETRIC DESIGN

3.1.1 Facility Components

- A. The geometric design shall establish the location and configuration of each component with respect to the physical features of the Site.
- B. The geometric design of the Project shall provide for the following as a minimum:
 - 1. Existing Site features (e.g., geometric shape, easements, adjacent traffic arteries, open drainage courses)
 - 2. Storm water drainage system with or without a detention pond
 - 3. Bus loading/unloading platform and passenger shelter
 - 4. Busways, bus bays, and layover locations
 - 5. Sidewalks for internal and external pedestrian traffic
 - 6. Passenger drop-off/pickup area
 - 7. Parking and accessibility for the handicapped
 - 8. Conformance to ADA requirements
 - 9. Passenger vehicles access routes and parking
 - 10. Utility Building location and access route
 - 11. Surveillance, Communications and Control (SC&C)
 - 12. Perimeter fencing and access gates.

3.1.2 Site Features

- A. Existing site improvements that cannot be relocated or removed (e.g., underground well, pumping station) shall be isolated by security fencing to mitigate potential safety problems with paved access for maintenance and service. These physical features at the Site shall be identified in the Preliminary Design Report.
- B. Existing open storm water drainage courses shall be enclosed by means of pipe or a box culvert wherever the flow requirements of the drainage course can be met by such construction. If the flow requirements of the drainage course cannot be met in this manner, coordinate with METRO and jurisdictional agency the next course of action. All storm pipes 18 inches and larger shall have safety end treatments.
- C. The perimeter of the bus loading/unloading platform and passenger shelter shall be horizontally isolated from the clearance envelope of all hazardous transmission lines (e.g., high voltage lines, natural gas lines) by a minimum of 100 feet of separation in Park and Ride facilities and whatever is possible in Transit Center facilities.
- D. Passenger vehicle parking, raised pedestrian walkways, vehicle access lanes and other improvements will be acceptable within the bounds of an easement inside the Site when written permission is obtained for METRO by the Consultant, from the easement holder.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- E. Sufficient access roads for passenger vehicles shall be provided to and from adjacent primary and secondary traffic arteries consistent with the vehicle parking capacity.

3.1.3 General Site Design Consideration

- A. All points of access from public right-of-way shall have unobstructed cross-visibility for both vehicle and pedestrian movement. The visual envelope that shall remain unobstructed is between heights of 2 feet 6 inches and 7 feet 0 inches above the centerline of the street and 15 feet back from the curb with a 45 degree lateral visibility envelope or AASHTO sight distance standards, whichever is more stringent.
- B. Entrances and exits shall be located so that patron traffic is evenly distributed along the public street serving the Site as determined by the traffic analysis.
- C. The circulation systems shall permit easy recirculation of vehicles back onto the local streets with minimal or no mixing with other traffic.
- D. Crosswalks shall have a minimum width of 8 feet.
- E. Sidewalks shall be provided along the adjacent public streets. The width of the sidewalk shall conform to the applicable governmental or relevant community standards, but shall not be less than 5 feet wide.
- F. In order to maximize safety, care shall be exercised in the determination of grades and profiles and in the specification of clearances. Single steps shall be eliminated in all public areas with the exception of 6 inch high curbs.
- G. In order to develop continuity, a system of coordinated elements and interrelated areas and spaces shall be provided, which by size, shape, texture, color, and symbolism best express and accommodate their intended function.
- H. Clarity of directional movement shall be designed into the site plan through the use of contrasting color, textures and forms, and through incorporation of definitive lighting and signing.
- I. The perimeter of the Site shall be fenced. Vehicle access points shall be controlled with cantilever sliding gates. Pedestrian access points shall be controlled with swing gates. Fence shall consist of 6 foot high chain link fence with black polyvinyl coating. Fence shall be centered on 1 foot wide concrete mow strip.

3.1.4 Bus Loading/Unloading Platform

- A. The bus loading/unloading platform is the focal point of activity, and as such shall be centrally located to minimize walking distances.
- B. The top of the bus loading/unloading platform concrete slab shall be 6 inches above the adjacent busway pavements and the adjacent parking pavements.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

3.1.5 Busways

- A. Except as otherwise specified in the Contract Documents; the geometric design of the busways shall be in accordance with the geometric design criteria of AASHTO and METRO governing vehicle criteria. (See Tables 3.1.1 through 3.1.3 and Figures 3.1.1 through Figure 3.1.12)
- B. A roadway with separate entry and exit access shall be provided for the exclusive use of bus traffic between a primary traffic artery and the busway. This busway shall be arranged so that there is no intermingling of bus traffic with passenger vehicle traffic within the Site. Horizontal separation between bus roadway and passenger access roadway shall be a minimum of 8 foot, back of curb to back of curb.
- C. The overall Site layout shall be arranged such that pedestrian traffic crossing the busway from the passenger vehicle areas will only occur at controlled locations.
- D. The busway shall be designed so that one bus can pass another bus in the event of out-of-sequence arrivals or if there are multiple loading bays employed.
- E. A minimum tangent length of 120 feet shall be provided along the busway for bus lay over parking.
- F. The busway concrete pavement surface at the bus loading/unloading platform shall be given a transverse metal-tine finish. The metal-tine device shall be operated so as to obtain randomly spaced grooves approximately 3/16-inch deep, with minimum depth of 1/8-inch and approximately 1/16-inch wide. Successive passes of the tines shall not overlap a previous pass.
- G. The busway concrete pavement around the loading/unloading platform shall be sealed with waterproofing agent to disperse oils and other fluids that may leak from idle buses.
- H. During the Preliminary Design Review process, the Consultant shall coordinate with METRO and layout the busways, at METRO's Field Service Center. With the mock setup, METRO shall drive buses through the busways to verify geometric design of the layout.
- I. Light poles shall not be located in the median of busways.

3.1.6 Pedestrian Traffic

- A. Dedicated raised pedestrian walkways shall be provided at every third parking aisle. Walkways shall be a minimum of 11 feet wide (face of curb to face of curb).
- B. Pedestrian movements from parking areas to the bus loading/unloading platform shall be arranged to minimize the crossing of vehicle lanes. This shall be accomplished with the use of low (3 foot high maximum) fences and landscaping. Pedestrian walkways shall be given priority over vehicular routes.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- C. Pedestrian walkway layout should be as direct as possible to avoid “shortcut” routes.
- D. The majority of pedestrians shall be provided a comfortable on-site walking distance, preferably within a distance of 600 feet from the bus loading/unloading platform.
- E. Walkways shall have a minimum unobstructed width of 5 feet.
- F. Walkways shall comply with most current and stringent ADA and State of Texas accessibility requirements.

3.1.7 Passenger Vehicle Access Routes and Roadways

- A. A minimum of two (2), two-way traffic access routes separated by a minimum of 300 feet shall be provided into the passenger vehicle parking area. A third access route shall be provided when the capacity of the Site exceeds 750 total parking spaces.
- B. In high volume lots, as determined by the traffic analysis and as otherwise indicated, a traffic signal with a left turn lane for exiting traffic shall be reviewed and considered. METRO and governing agency shall have final decision on placement of traffic signal.
- C. An access route may serve the drop-off/pickup area, handicapped parking area, and the passenger vehicle area if the access route is arranged to avoid traffic conflicts. If possible, access to the drop-off/pickup area and handicapped parking area should be separated from the access to the parking areas.
- D. Access routes with a major road shall have a minimum of 120 feet of auto queuing lane to avoid possible blocking of intersections. The actual queuing length shall be determined by the traffic analysis. A minimum of 75 feet, from other street access points, shall be provided to the first parking area.
- E. Major feeder access into the passenger vehicle parking area shall be arranged to divide the area into a number of smaller parking areas or, if several feeder access routes are available, shall be routed around the perimeter of the subdivided parking areas.
- F. Vehicle access routes from a traffic artery and servicing subdivided parking areas shall be 24 feet wide.
- G. The minimum horizontal clearance (the minimum distance between any structure and the face of a curb or roadway shoulder) shall be 2 feet 6 inches.
- H. Traffic islands defined by curbing shall be provided to control traffic movements, protect pedestrians and to highlight parking aisles. Island surface shall be a different color than the surrounding pavement by means of colored concrete or concrete stain.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

3.1.8 Passenger Drop-Off/Pickup Area

- A. Passenger vehicles shall not interfere with, or be routed through, the bus areas.
- B. A curb side drop-off lane having a minimum width of 12 feet shall be provided in front of the bus loading/unloading platform.
- C. Only one way, counter-clockwise circulation through the drop-off area shall be provided.
- D. Access roadways to the drop-off area shall be a minimum of 18 feet wide.
- E. The drop-off area shall be arranged to serve as a transfer location for pickup and drop-off of bus passengers by drivers of private vehicles and taxis. The drop-off area shall be located in proximity to the bus loading/unloading platform.
- F. The drop-off area shall be arranged for easy access and short-term, high turnover parking. Parking spaces shall consist primarily of side-by-side, pull-in/pull-out, angle type parking spaces in single depth parking bays.
- G. The number of parking spaces in the drop-off area should be approximately 1 percent of the total regular parking spaces available but not to exceed 15 total spaces.

3.1.9 Parking and Accessibility for the Handicapped

- A. Specially designed and identified parking spaces for handicapped persons shall be provided in proximity to the bus loading/unloading platform in order to minimize the crossing of traffic lanes by the users of these spaces.
- B. The design of parking for the handicapped shall comply with all relevant codes. The number of typical handicapped parking spaces and "van accessible" spaces shall be provided in accordance with the ADA requirements.

3.1.10 Passenger Vehicle Parking

- A. Parking spaces for passenger vehicles shall be arranged in parallel rows for double bay, front-to-front parking. The length of a parking aisle from the centerlines of the adjacent traffic aisles shall be 360 feet to 540 feet.
- B. Parking aisles should be oriented perpendicular to the loading/unloading platform and parking spaces should be oriented perpendicular to the parking aisles for maximum space efficiency.
- C. Parking spaces shall be 19 feet long by 9 feet wide, except for parking spaces along the outer perimeter and dedicated raised walkways, which shall be 16 feet long by 9 feet wide. Traffic routes between parking aisles shall be 24 feet wide. Therefore, centerline of parking aisle to centerline of parking aisle shall be 62 feet.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. No compact vehicle parking spaces shall be allowed.
- E. Motorcycle parking shall be in normal parking spaces.

3.2 SITE GRADING

- A. The finished grade of all pavements in METRO's Facility shall be above the floodplain created by a 100-year, 24-hr rainfall event frequency storm unless otherwise directed by METRO in writing.
- B. The finished floor elevation of the bus platform and utility building shall be a minimum of 1 foot above the 100-year, 24-hr rainfall event frequency storm unless approved by METRO in writing.
- C. The site shall be brought up to the required grade by the use of approved fill material where necessary after removal of all the topsoil and waste material on the site. Removal from the site of all spoil shall comply with all applicable Local, State and Federal requirements.
- D. Fill material placed in the 100 year flood plain shall be offset by detention pond area that is equal to the volume of fill within said 100 year flood plain. Coordinate this effort with HCFCD and any other governmental agency having jurisdiction over the Site.
- E. The Geotechnical Consultant shall provide compaction and stabilization and design recommendations data for earthwork, pavement base courses, lime or cement stabilized areas and detention pond bottoms when concrete lined detention ponds are provided.
- F. The majority of the concrete pavements cross slopes should be around 1.0 percent. The maximum cross slope shall be 2.0 per cent and the minimum shall be 0.5 percent. The surface flow of storm water shall be directed away from pedestrian traffic routes and as directed in Section 3.3 of this manual. Dedicated raised pedestrian walkways shall always be located at highpoints. For landscaping grades see Section 6.6.
- G. Changes in grade along the busway and along access routes that exceed 1 percent shall be accomplished by means of vertical curves. The vertical curve shall be based on a design velocity of 30 miles-per-hour and a safe sight distance for this velocity in accordance with AASHTO's "A Policy On Geometric Design of Highways and Streets" and METRO's critical vehicle criteria. (See Figure 3.1.6.)
- H. Site grading shall consider the visual clearances and views to the site from adjacent roadways and from the platform to the parking areas.
- I. METRO property shall be internally drained and where possible, sheet flow from property line to parking area. Due to extreme cases area inlets may be used, but must be approved by METRO in writing. Grading design shall not obstruct natural storm water drainage courses.
- J. Grading shall be designed to direct water away from building structures.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- K. Apply sustainability principles, per LEED, in site design.

3.3 SITE DRAINAGE

- A. The Consultant shall prepare a drainage analysis report. Such report shall be approved by the agency having jurisdiction.
- B. The Consultant shall develop Storm Water Pollution Plans (SWPPP) in accordance with NPDES.
- C. Storm water drainage system shall be designed for the site and its environs, in accordance with the criteria of the agency into whose jurisdiction the site and its environs drain into.
- D. The volume of storm water discharge from the Project Site to Off-Site drainage shall be calculated on the basis of the required design storm. The calculations shall be submitted to the agency having jurisdiction for approval. A storm water flow study and an analysis of flooding potential for the surrounding and downstream areas shall be made whenever required by the agency having jurisdiction. The study and analysis shall be performed as required by the agency and shall be subject to the approval of the agency, following review by METRO.
- E. The hydraulic grade line of the closest major storm water collector, flowing full, shall be calculated and compared to the elevation of METRO's facility. If it is higher, measures shall be taken to prevent backflow into METRO's facility. The hydraulic grade line shall be shown on all storm water and sanitary sewer profiles.
- F. The flow calculations for storm water in closed conduits shall be based on the Manning Formula and a value of "n" equal to 0.013 for reinforced concrete pipe, 0.009 for internally smooth-walled PVC, SDR or HDPE plastic pipe and 0.025 for corrugated metal pipe. The minimum and maximum flow velocities shall be 3 and 10 feet per second, respectively, inside METRO facilities.
- G. Subsurface storm water pipe shall be PVC, SDR or HDPE for pipe diameters of eight (8) inches to 15 inches and reinforced concrete pipe for pipe diameters equal to or greater than 18 inches unless agreed upon in writing by METRO's Project Manager.
- H. A drainage structure consisting of an inlet or manhole shall be provided at each change of grade, alignment, or both and at each intersection of two (2) or more storm sewers. The drainage structures provided should be the standard drainage structures of the agency having jurisdiction over the site.
- I. A storm water inlet shall be provided for each 0.5 to 0.8 acres of paved area within the site. Where possible, sheet flow unpaved area from the property line to the parking area. Inlets shall be provided for drainage at low points in unpaved areas that will not otherwise drain by surface flow, but must be approved by METRO in writing.
- J. Only curb inlets shall be used in the busways. Inlets shall be located opposite the bus loading/unloading platform and away from the utility building crossing.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- K. Inlets located in the passenger drop-off/pick up area shall be located opposite the bus loading/unloading platform, away from where the cars will be parked.
- L. Direction and location of sheet flows shall be indicated on the drawings in accordance with HCFCD requirements or the agency having jurisdiction.
- M. The roof drainage system of the shelter shall be designed for a storm having an intensity of 9.36 inches per hour. Manifold piping for the roof drainage system shall be sized accordingly and shall drain into the storm system designed for the Site.
- N. All open-ended storm pipe (18 inches and larger) shall have safety end treatments.

3.4 DETENTION POND

- A. When required, a storm water detention pond and other flood control measures shall be provided and designed in accordance with the HCFCD and governing agency having jurisdiction over the Site.
- B. The Consultant shall recommend the type of detention pond(s) to be provided, appropriate to the site and in accordance with such agreements as may exist between METRO and the jurisdictional agencies.
- C. All detention ponds having a design depth greater than three (3) feet shall be completely enclosed with a six- (6) foot high, one (1) inch mesh chain link fence. An eight- (8) foot wide gate shall be provided for getting maintenance equipment into the pond area. The fence shall have a one- (1) foot wide mow strip similar to the perimeter fence.
- D. Wherever possible, detention ponds shall drain naturally to the local storm sewer system. Where the local storm water system flow line is above the bottom of the detention pond, ponded water below the local system shall be pumped out of the pond. Pumps shall only operate when the pond surface is below the flow line of the detention pond outflow pipe. The pumps shall draw storm water from a concrete lined sump sized to provide an extended period between cleanings of silt from the sump area. Pumps shall be located with their intakes a minimum of two (2) feet above the sump floor. A minimum of two (2) pumps shall be provided having a duplex control panel with a hand/off/automatic switch for each pump and level sensors to control on/off and lag/lead pump operation. Pumps shall be securely mounted with a quick disconnect design for easy removal. A frame or jib crane shall be provided along with a suitably sized electrically operated hoist to remove the pumps from the sump and set them on level ground for maintenance and repair. The hoist shall be removable with removable weatherproof electrical connector along with a NEMA 4X enclosed electrical disconnect switch.
- E. Detention ponds shall be designed to provide a minimum of 18 inches of freeboard from the top of the detention pond side slope to the surface of the designated contained storm water. In addition, 12 inches of freeboard from the top of the emergency overflow channel to the surface of the designated contained storm water.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- F. Overflow channel shall be concrete lined for at least five (5) feet on both sides of the top of the detention pond side slope. The emergency overflow channel flow line shall be at least six (6) inches below the top of the detention pond side slope. The width of the overflow channel shall be at least one-eighth (1/8) the detention pond's circumference at the top of the side slope.
- G. If detention ponds are bounded by planting areas; metal edging shall be used to prevent mulch from washing into the detention ponds.
- H. Culverts entering and exiting the detention pond shall have safety end treatments.

3.4.1 Natural Detention Ponds

- A. Natural detention ponds shall be solid sod grass lined with side slopes not greater than one (1) vertical to three (3) horizontal.
- B. Natural detention ponds shall have a centerline pilot channel running from the main storm pipe feed to the outfall pipe. The centerline pilot channel shall be "V" shaped, 10 foot wide, 6-inch reinforced concrete, with side slopes of 1 vertical to 12 horizontal. All secondary storm pipes shall have "V" shaped, 6-inch reinforced concrete pilot channels that connect to the centerline pilot channel. These secondary pilot channels shall be two (2) feet wider than the storm pipe feed with the same side slopes as the centerline pilot channel.
- C. The pond bottom shall have a minimum two (2) percent slope towards the pond's outflow pipe. Transverse slopes of the bottom from the toe of the side slopes to the centerline pilot channel shall be a minimum of three (3) percent.
- D. The subgrade preparation and the paving of pilot channels shall be the same as the parking area pavement.

3.4.2 Concrete-Lined Detention Ponds

- A. Detention ponds which require side slopes steeper than 3:1 shall be concrete lined.
- B. Subgrade preparation, concrete and concrete reinforcing shall be the same as the parking area. Geotextile fabrics shall be used as a filter medium and as a bond breaker between the concrete paving and the subgrade.
- C. Side slopes shall be paved with four (4) inches of reinforced concrete and have adequate top and bottom beams to hold the slope paving in place. The base slab shall be six (6) inches of reinforced concrete.
- D. Weep holes shall be provided in the side slopes and bottom slab as recommended by the Geotechnical Consultant to relieve any hydrostatic pressure, but not greater than 40 foot centers each way nor through any expansion joints. Weep holes shall contain filter materials to prevent subgrade materials from passing through the weep holes.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- E. If the detention pond(s) have either side slopes greater than 2: 1 or are vertical, stairs or ladders shall be provided at spacing not greater than 100 feet along the wall. Vertical walls shall have a minimum thickness of eight (8) inches.
- F. All concrete lined detention ponds shall be provided with concrete roadways down to the bottom of the detention pond. The roadway shall be 10 feet wide and six (6) inches thick, with subgrade treatment and reinforcing the same as the parking area. The roadway slope into the detention ponds shall not be greater than 6:1.

3.5 PAVEMENT

- A. All paving for vehicular traffic shall be jointed reinforced portland cement concrete. Geotechnical Consultant shall recommend stabilization of subgrade and determine if geotextile fabric is required under the pavement. Pavement thickness recommendations shall be based on the soils investigation, but in no case shall the thickness be less than nine (9) inches in area exposed to bus traffic nor six (6) inches in all other traffic lanes nor five (5) inches in all parking areas.
- B. The minimum amount of reinforcing shall be number 4 bars at 18 inches each way for 6-inch or 5-inch pavement and number 4 bars at 12 inches each way for 9-inch pavement. The reinforcing bars shall be Grade 60.
- C. Pavement concrete shall be Class 3,000.
- D. Hot-mix asphaltic concrete may be used only in unique cases (e.g., the repair of a cut in an existing asphalt pavement or over underground gas or petroleum pipeline easements where the pipelines are not in casings and as temporary pavement where final paving by others is not already in place). Cold mix asphaltic concrete shall not be used.
- E. Pavement joints shall be in accordance with METRO standard drawings CES-1003-1A and CES-1003-1B.

3.6 TRAFFIC ENGINEERING

3.6.1 Traffic Analysis

- A. The Consultant shall prepare a traffic analysis report. Such report shall be approved by the agency having jurisdiction.
- B. The intersection of public streets and access driveways for the facility as well as other specified intersections within the study area shall be analyzed to obtain level-of-service operation and signal warrants. All traffic analysis shall conform to the guidelines established by the governing entities within the proposed site e.g., City of Houston Department of Public Works & Engineering – Design Manual Traffic and Signal Design Requirements. METRO will define the study area. The Consultant shall perform the following tasks for the analysis:
 - 1. Collect available traffic data of the study area from METRO, City of Houston, TxDOT, HGAC and other available sources as needed for the analysis. Identify 24-hour approach volumes and AM & PM peak-hour turning

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- movements at the intersections. In the event traffic counts do not exist for locations to be analyzed, the Consultant shall perform traffic counts needed for evaluation purposes. Develop AM & PM peak-hour site ingress and egress traffic volumes to add to the existing traffic in the study area.
2. Using appropriate traffic analysis procedures based on the 2010 Highway Capacity Manual or latest revision. Existing, No-Build, and Build Conditions, intersection delays and levels-of-service for the AM & PM peak hours.
 3. Eliminate deficiencies by recommending improvements, such as intersection improvements, signalization/signal optimization, roadway widening, signing, and pavement marking within the study area.
- C. Traffic circulation inside the facility shall be designed to minimize conflict points and confusion among the drivers. Driveways shall be designed with proper turning radii and travel lanes (widths and number) to correspond to the traffic demand and vehicle type usage.
- D. The maximum speed inside any METRO facility shall be 15 miles per hour.

3.6.2 Traffic Signing

- A. As the individual facility design is developed; a signing layout shall be prepared by the Consultant in cooperation with METRO. Supports for all signs and provision of electrical power, where required, shall be the responsibility of the Consultant.
- B. Basic Signage Goals
1. To guide patrons and bus operators through the facility in the most efficient and least complicated manner.
 2. To provide safety by keeping the visual envelope open as defined in Section 3.1.3-A.
- C. Signage Requirements
1. All informational signs shall be in accordance with the latest editions of METRO standards and all regulatory signs shall be in accordance with TMUTCD guidelines.
 2. Proper signing shall be provided for directional information, including regulatory and warning requirements at all entrances and exits of the facility, and at appropriate locations within the facility.
 3. Signs shall be kept to the minimum necessary for patron and bus operator guidance. Signs shall reinforce architectural elements and landscaping in identifying entrances, exits, and circulation routes.
 4. Signing shall identify situations such as pedestrian crosswalks, parking for the handicapped, bicycle access routes and storage racks, bus circulation, passenger pick-up/drop-off area circulation, no-parking areas and any potential hazards.
 5. The message on each sign shall be concise, clear and simple for easy understanding.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

6. Signs shall be located at key points of separation and at intervals frequent enough to allow unsure patrons to find their way confidently.
7. Sign design and placement shall be uniform system wide to aid in immediate recognition by the patron.
8. Due to the importance of their messages, certain signs shall have priority over others to achieve the prime goal of efficient movement of patrons. These include signs directing the patron and bus operator to exits, and direction-oriented signs. This priority may be achieved by differences in size of copy, color, or location of signs, with the result being signs of optimum visibility and dominance over lesser signs, which may occur, in the same field of view.
9. All signage shall have reflective backing, size and shape shall follow METRO's Standards.

3.6.3 Pavement Markings

- A. All pavement markings shall comply with TMUTCD requirements.
- B. Individual parking spaces shall be defined by standard painted lines. Traffic lanes shall be clearly delineated by appropriate reflectorized marking.
- C. Crosswalks for pedestrians shall be defined by pavement markings or contrasting pavement treatment at all points where pedestrians will cross vehicular traffic routes.
- D. Pavement markings shall be used to clearly delineate handicapped parking areas.

3.7 UTILITIES

3.7.1 Proposed Utilities

- A. The Consultant shall be responsible for determining the manner in which the METRO facility will be supplied with the utility services that it requires.
 1. Coordinate with the agency having jurisdiction over the site for water & sanitary services, see Section 7.0 MECHANICAL.
 2. For electrical and telephone services, see Section 8.2 ELECTRICAL SERVICE and Section 8.7 TELEPHONE SYSTEM.

3.7.2 Existing Utilities

- A. The Consultant shall be responsible for determining the number, location and kinds of Utilities that will be impacted by the construction of the METRO facility.
- B. At each review submittal, the Consultant in coordination with METRO shall forward applicable drawings to the utility companies for their review. Comments shall be returned to the Consultant and the Consultant shall forward a copy to METRO. If a conflict arises, the Consultant shall meet with METRO and the utility company to discuss the most cost-effective manner of resolving the conflict.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- C. If a utility adjustment is required, METRO will coordinate this effort with the utility company. Relocation of any utility, owned by others, is subject to reimbursement and such reimbursement shall be included in the construction cost estimate.
- D. Utility service to adjoining properties shall not be interrupted without permission of the Utility owner and, if temporarily rearranged, shall be restored to original condition upon completion of METRO construction.
- E. If there is a potential underground Utility conflict; the Consultant shall eliminate the potential conflict by specifying sufficient elevations and horizontal dimensions to ensure that the design is effectively prosecuted in the construction. Provide elevations along with horizontal clearances for the following: footings; sanitary sewers; storm sewers; water, gas, and oil lines; conduits for communications; electric service and distribution lines; under drains; retaining wall stems and counterforts; manholes, inlets and pull boxes; and structure walls.
- F. Utilities may exist in public right-of-way and on private property that will become part of the right-of-way for the METRO facility. When such Utilities are encountered, they will be allowed to remain in place if the following conditions are met:
 - 1. The Utility can withstand the construction loading and the permanent facility loading.
 - 2. The depth of cover over the Utility will not be less than the minimum cover allowed by the Utility owner or greater than the maximum depth utilized by the Utility owner in its own construction.
 - 3. The Utility is not located beneath bus stalls or longitudinally beneath the major access roads to the METRO facility.
 - 4. The Utility does not compromise METRO reliability, maintainability, or safety.
 - 5. Cables are installed in conduit.
 - 6. The utility shall be no closer than 100 feet from the bus loading/unloading area in Park & Ride facilities. In Transit Centers, no utilities shall be located in the bus loading area.

3.8 AUTO-TURN

The Consultant shall verify all turning paths for all METRO operating bus fleet, and operating speeds included on these design criteria using Auto-Turn software by Transoft Solutions, Inc and meeting the criteria established on ASSHTO – Geometric Design of Highways and Streets. The Consultant shall submit “Turning Paths” schematics at the submission of the conceptual phase and 30% milestone. The Consultant shall submit CADD drawings along with this submission. The information shall be shown on Auto-Turn layers within the CADD drawings. Turning path envelop shall show as minimum the following:

- Path of the Front Overhead
- Path of Front wheel (outer)
- Center Line Geometrics including radii and dimensions (Centerline Turning)
- Path of Back wheel (inner)
- Path of right rear overhead
- Clearance – Min. Clearance

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

The Consultant shall design for a minimum clearance of 2 feet from any object. In the case of two way traffic, the consultant shall show and design for this movement with a minimum of 5 feet clearance. All geometric design prepared by the consultant shall be validated using Auto-Turn software Release 8.0 or as directed by METRO.

On parking lots, the Consultant may be required to show car parking movements (paths) to demonstrate safe operation. The Consultant shall also design for safety with drawal of WB-20 vehicles that accidentally can get in to the Park & Ride and Transit Center lots.

TABLE 3.1.1

METRO BUSES IN OPERATION

	60 FOOT ARTICULATED BUS	45 FOOT REGULAR BUS	40 FOOT REGULAR BUS	29 FOOT REGULAR BUS
Length	727"	540"	480" – 504"	348"
Width	102"	102"	102"	102"
Height	132"	150" *	110" – 135"	120"
Wheel Base	504"	295" – 366"	245" - 293"	108"
Curb Weight	42,860–44,800 lbs	35,100 - 36,377 lbs	26,400 - 30,840 lbs	23,340 lbs
Gross Weight	66,600 lbs	46,000 - 51,800 lbs	39,930 - 42,540 lbs	39,920 lbs
Seating	63 - 65	55 – 57	37 – 41	25
Standee	32 – 33	28 – 29	19 – 21	13

* **Governing** Design Clearance (Measurement up to the top of air conditioning)

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

TABLE 3.1.2a
METRO OPERATIONAL PAVEMENT WIDTH AT TURNING CURVES
(SINGLE LANE)

RADIUS INSIDE CURB FT.	RADIUS OUTSIDE CURB FT.	MINIMUM LANE WIDTH FT.	RECOMMENDED LANE WIDTH FT.	MAX SPEED MPH	FOR TURNS OVER 90° ONLY FOR TURNS 90° OR LESS USE FIG. 3.1.9
30	55-57	25	27	5	
35	59-61	24	26	7	
40	63-65	23	25	9	
45	67-69	22	24	10	
50	71-74	21	24	12	
55	76-78	21	23	14	
60	80-82	20	22	15	
65	85-87	20	22	16	FOR BUS TURNS AT ANY ANGLE
70	89-91	19	21	17	
75	94-96	19	21	17	
80	99-101	19	21	18	
85	103-106	18	21	19	
90	108-110	18	20	20	
95	113-115	18	20	20	
100	118-119	18	19	21	
110	127-129	17	19	22	
120	137-138	17	18	23	
140	156-157	16	17	24	
150	166-167	16	17	25	
230	265	15	15	30	
310	324	14	14	35	
400	412	12	12	MAX	

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

**TABLE 3.1.2b
METRO OPERATIONAL PAVEMENT WIDTH AT TURNING CURVES
(TWO LANES)**

MAX. SPEED	R INSIDE	PAVING WIDTH	ISLAND/ STRIPE	R OUTSIDE	PAVING WIDTH	REMARKS
5 MPH	30'	25'	1'	56'	21'	Table 3.1.2 (Single Lane)
7 MPH	35'	24'	1'	60'	20'	Table 3.1.2 (Single Lane)
10 MPH	45'	22'	1'	68'	19'	Table 3.1.2 (Single Lane)
15 MPH	60'	20'	1' 81'		19'	Table 3.1.2(Single Lane)
	53.5'	23'	3'	71.5'	22'	Fig. 3.1.10 Over 90
	53.5'	21'	3'	64.5'	20.4'	Fig. 3.1.11 Less 90 (15' Normal Lane)
	54'	19.5'	3'	52'	19.1'	Fig. 3.1.12 Less 90 (12' Normal Lane)
20 MPH	90'	18'	1'	109'	18'	Table 3.1.2 (Single Lane)
25 MPH	150'	16'	1'	167'	16'	Table 3.1.2 (Single Lane)
30 MPH	230'	15'	1'	246'	15'	Table 3.1.2 (Single Lane)

**TABLE 3.1.3
RECOMMENDED DESIGN CRITERIA FOR USE OF THE BUS TURNING CURVES
INSIDE ALL METRO PARK & RIDE AND TRANSIT CENTER FACILITIES**

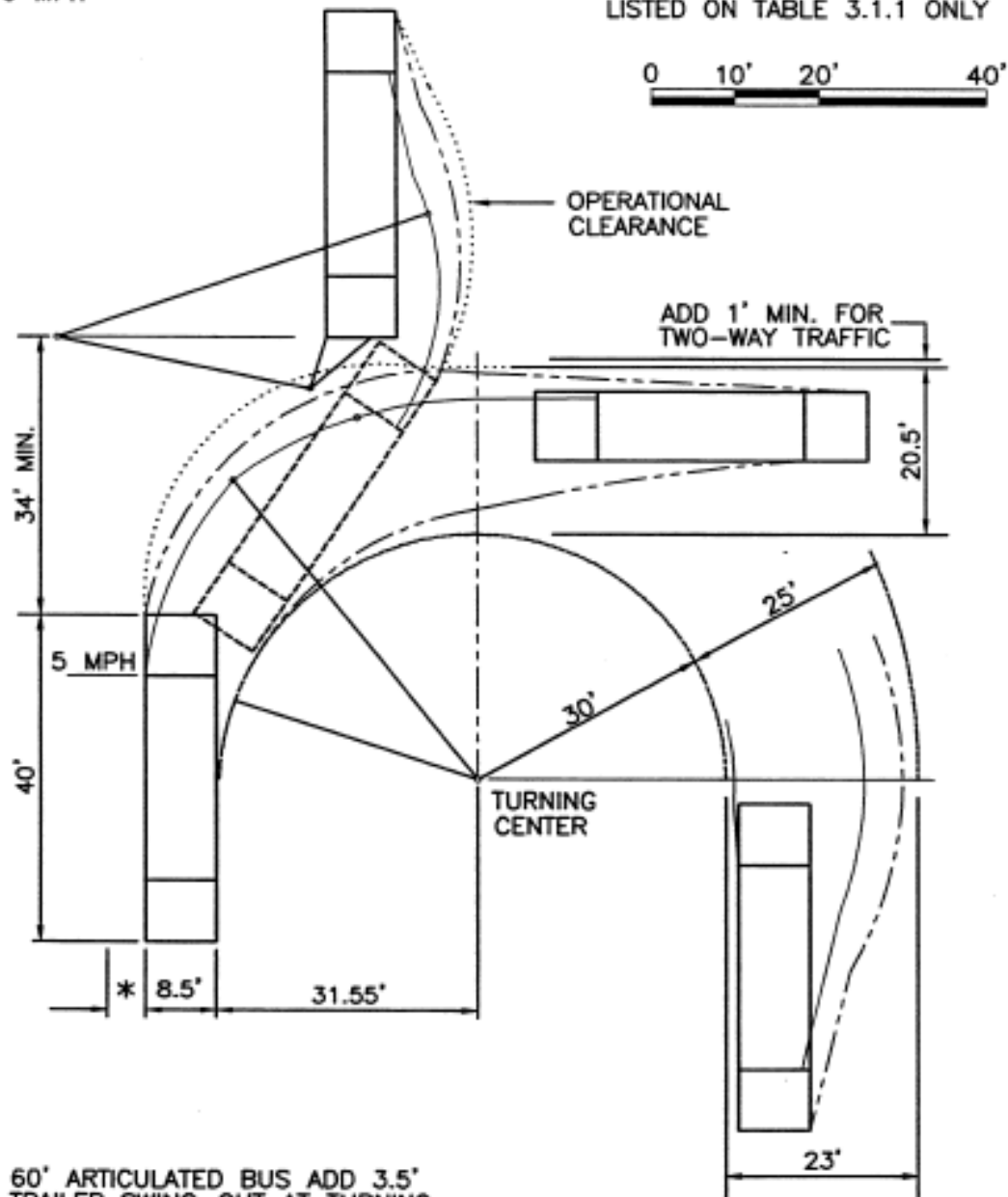
MIN. SPEED	MOVEMENT CONDITION	LOCATION	CURVE NO.
5 MPH	Turning after stop or turning to stop	At bus stop or bus bay	Fig. 3.1.1 or equivalent Auto-turn template
7 MPH	Turning after slowing down from 10 MPH. Turning during acceleration	At bus loop at Park & Ride or Transit Center	Fig. 3.1.2 or equivalent Auto-turn template
10 MPH	Turning after slowing down from 15 MPH. Turning after acceleration	At bus loop at Park & Ride and Transit Center	Fig. 3.1.3 or equivalent Auto-turn template
15 MPH	Turning after slowing down from 30 MPH. Turning after acceleration	Entering or exiting HOV Ramp	Fig. 3.1.4 or equivalent Auto-turn template

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

MINIMUM DESIGN SPEED 5 MPH
MAXIMUM ALLOWABLE SPEED INSIDE P&R AND T.C. IS 15 MPH

FIGURE 3.1.1
TURNING TEMPLATE
SCALE: 1"=20'
RADIUS: $r=30'$
SPEED 5 MPH

THIS TEMPLATE IS BASED ON THE
CLEARANCES REQUIRED FOR THE
OPERATION OF THE METRO BUSES
LISTED ON TABLE 3.1.1 ONLY

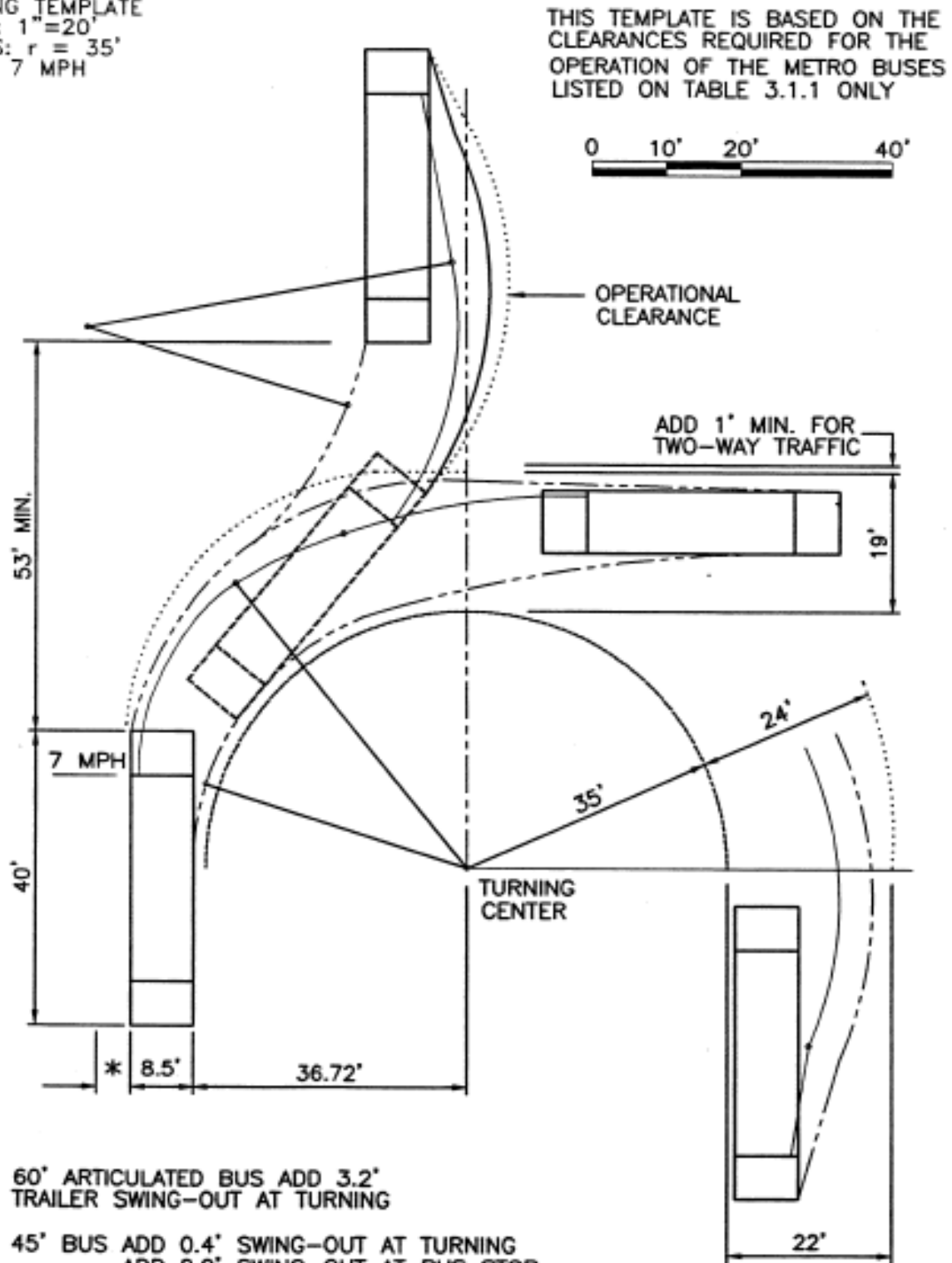


* FOR 60' ARTICULATED BUS ADD 3.5'
FOR TRAILER SWING-OUT AT TURNING

FOR 45' BUS ADD 1.8' SWING-OUT AT TURNING
ADD 2.3' SWING-OUT AT BUS STOP

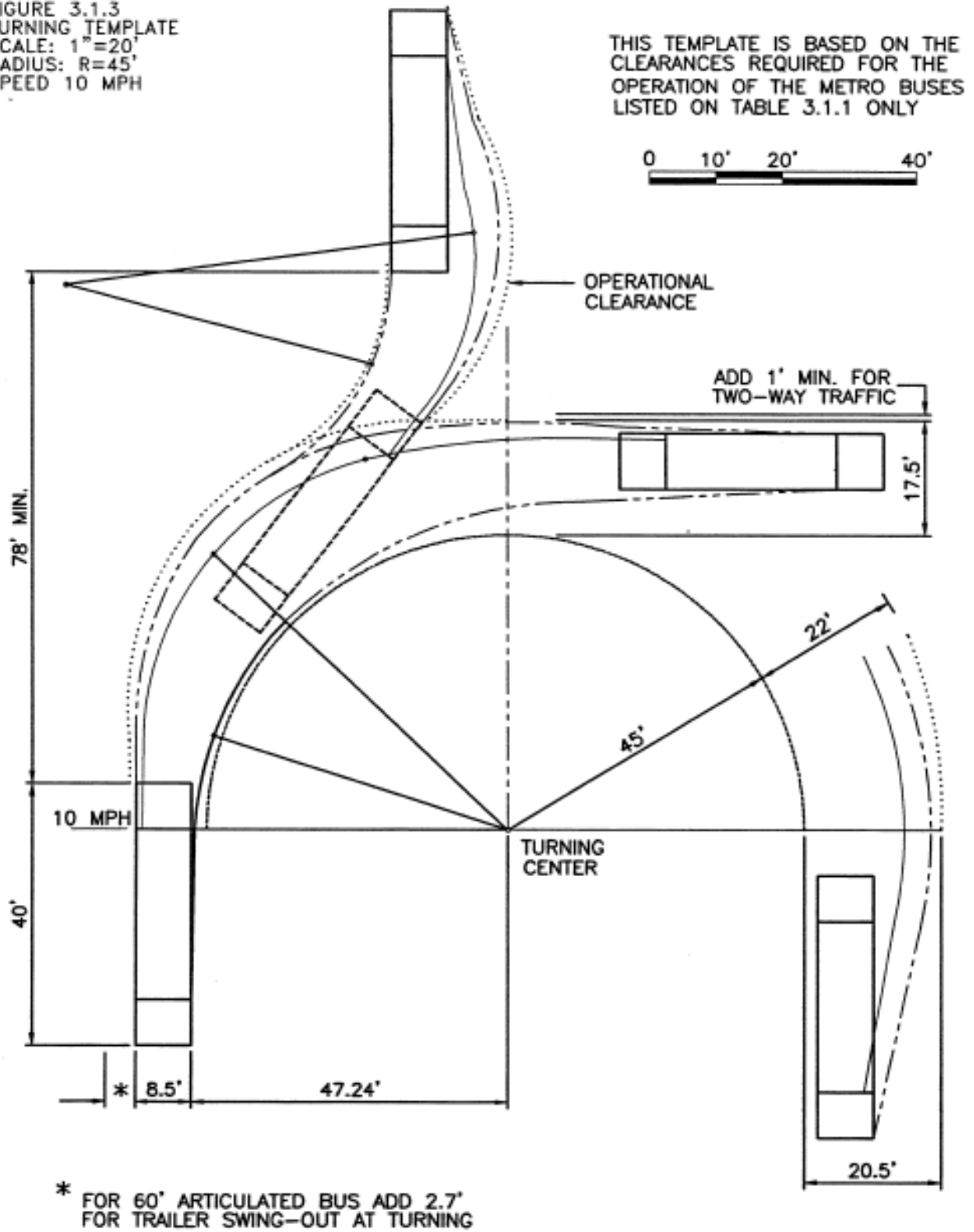
DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

FIGURE 3.1.2
TURNING TEMPLATE
SCALE: 1"=20'
RADIUS: $r = 35'$
SPEED 7 MPH

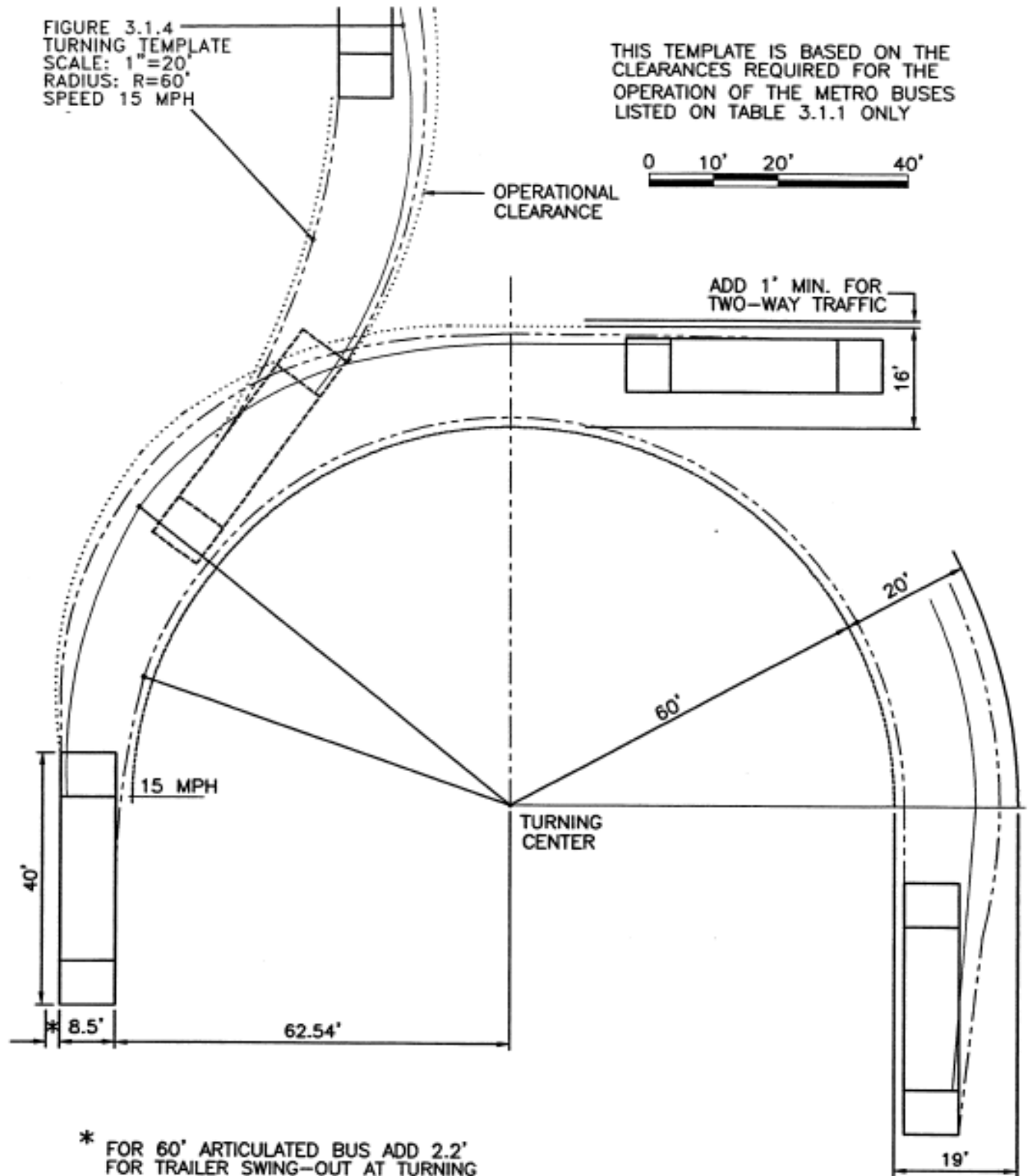


DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

FIGURE 3.1.3
TURNING TEMPLATE
SCALE: 1"=20'
RADIUS: R=45'
SPEED 10 MPH

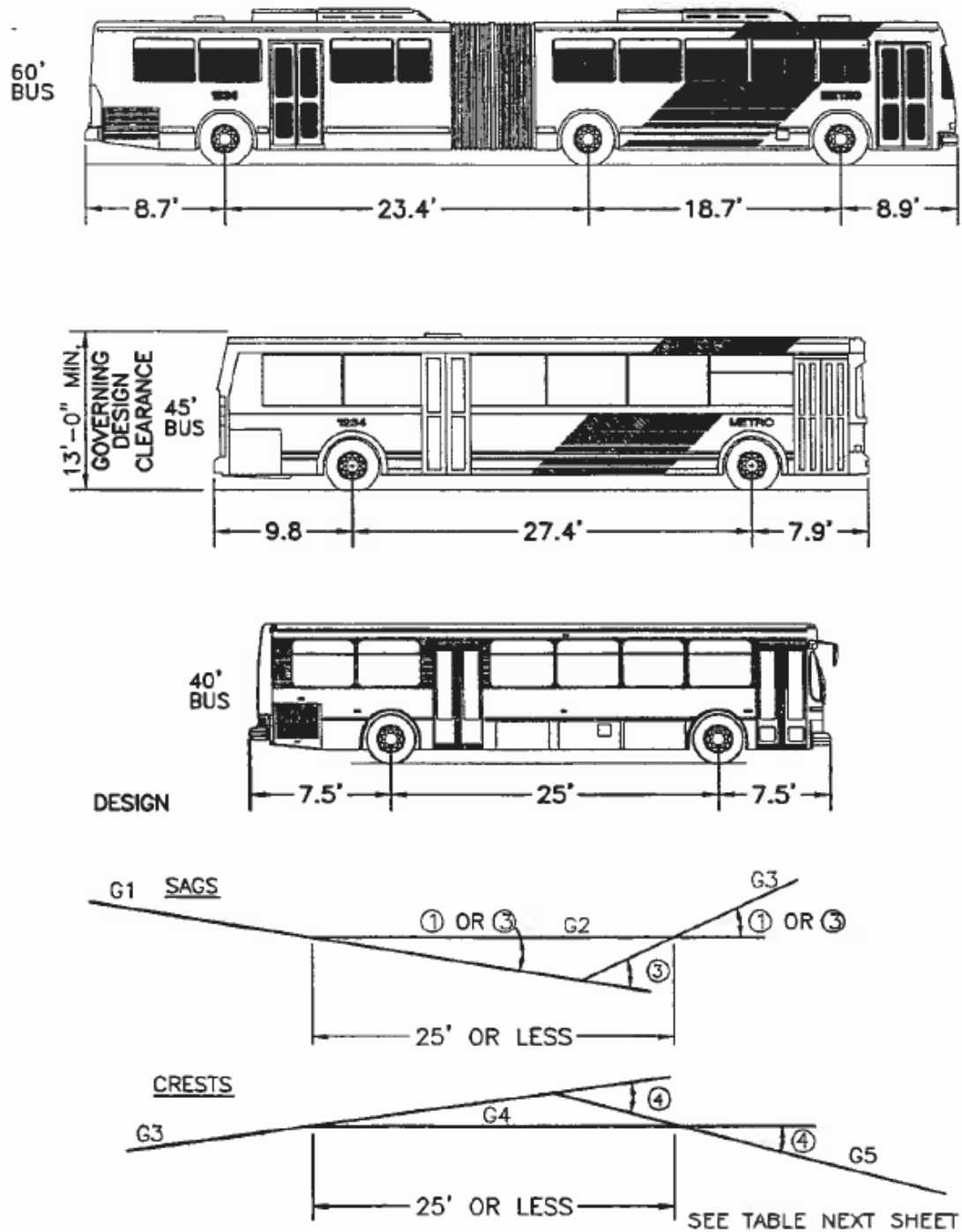


DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES



DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Figure 3.1.5
Vertical Control - 1



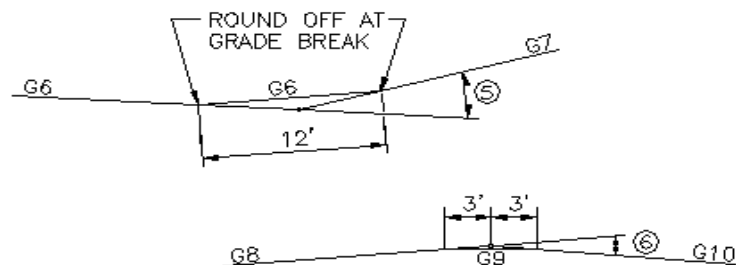
DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Figure 3.1.6
Vertical Control - 2

	BUS	ACTUAL						DESIGN	
		ANGLE °			SLOPE %			ANGLE °	SLOPE %
① APPROACH ANGLE		60°	45°	40°	60°	45°	40°	ALL	ALL
② UNDER BODY CLEARANCE		8"	11.5"	9"					
③ DEPARTURE ANGLE		8°	9°	9°	14%	16%	16%	5.7°	10%
④ ROLLOVER ANGLE		8°	9°	9°	14%	16%	16%	5.7°	10%

NOTE: DESIGN SLOPES ARE BASED ON MAXIMUM SPEED OF 15 MPH

GRADE TRANSITION (SAG OR CREST)

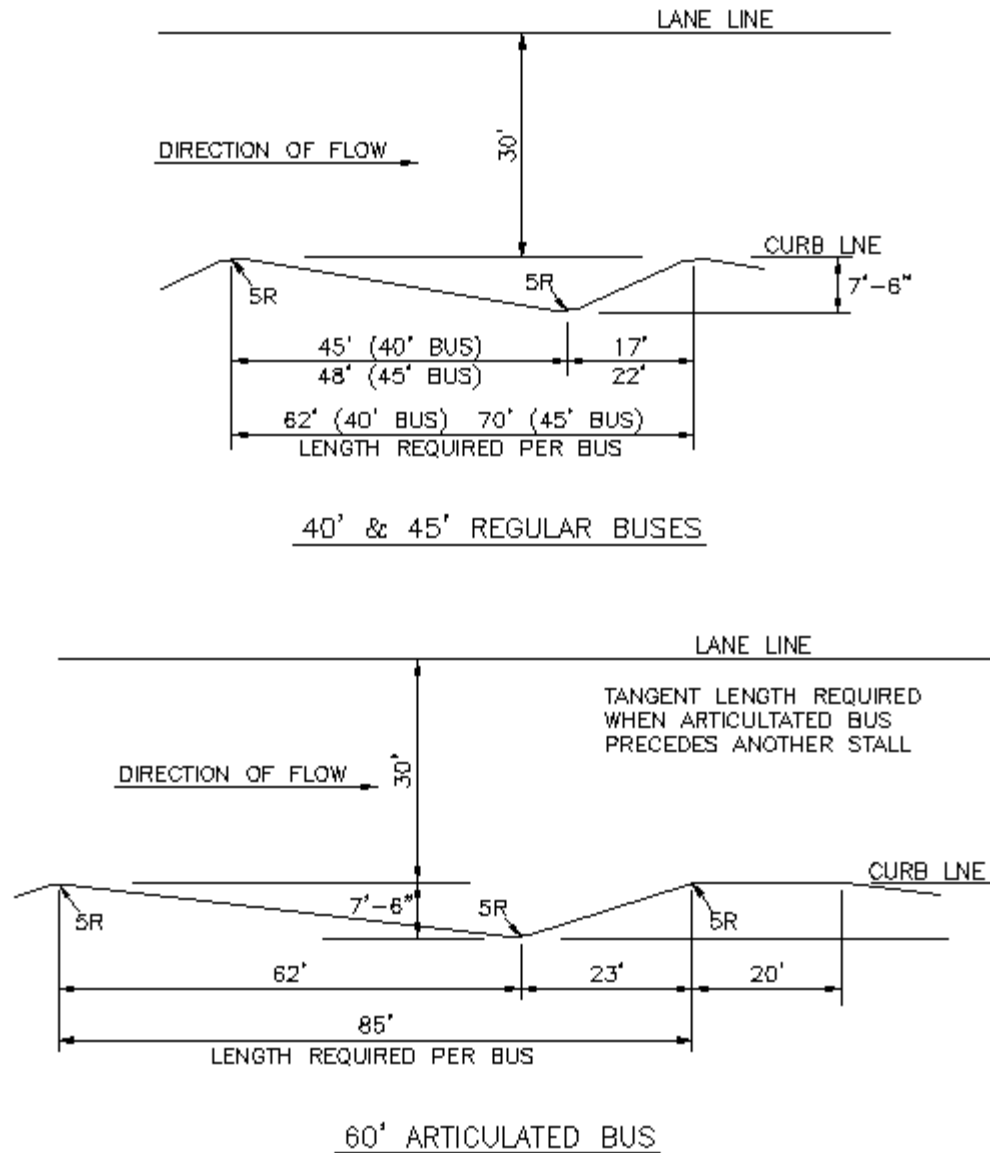


ROUND OFF AT GRADE BREAK (SAG OR CREST)

SAG OR CREST ANGLE (SLOPE)	GRADE CHANGE
2.5° (4.5%) OR MORE AND SPEED OVER 15 MPH	USE VERTICAL CURVE
⑤ 2° (3.5%) OR MORE SPEED 6 MPH TO 15 MPH 2.5° (4.5%) OR MORE SPEED 5 MPH & LESS	USE GRADE TRANSITION AND ROUND OFF AT GRADE BREAK
⑥ 2° (3.5%) OR MORE SPEED 6 MPH TO 15 MPH 2.5° (4.5%) OR MORE SPEED 5 MPH & LESS	USE ROUND OFF AT GRADE BREAK ONLY
1° (1.8%) OR LESS AND SPEED 15 MPH & LESS	DIRECT CHANGE

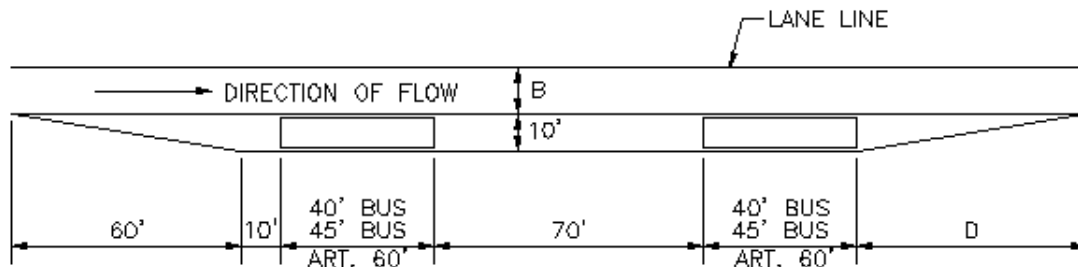
DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Figure 3.1.7
SAWTOOTH BUS BAY



DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Figure 3.1.8
RECESSED BUS BAY



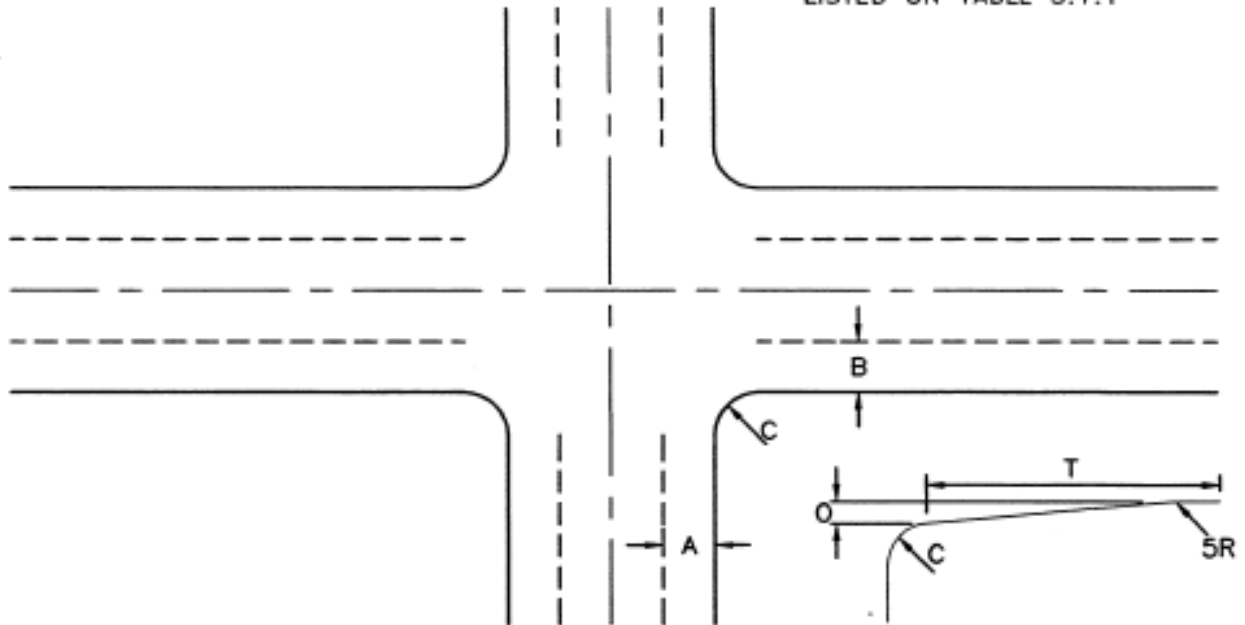
* 35' MAY BE USED IN BUS
LAY OVER AREAS, IF 2 FT.
OVERHANG BEYOND CURB
LINE IS ALLOWED

DIMENSION "D" FOR DIFFERENT LANE WIDTH								
LANE WIDTH	B	27'	24'	22'	20'	14'	13'	12'
REG. BUS	D =	15'	20'	25'	30'	50'	55'	60'
ART. BUS	D =	25'			30'	50'	55'	60'

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

FIGURE 3.1.9
RECOMMENDED CORNER RADII

CLEARANCES REQUIRED FOR THE
OPERATION OF THE METRO BUSES
LISTED ON TABLE 3.1.1



A	B	C	O	T	MAX. SPEED
LEAVING LEG WIDTH	ENTERING LEG WIDTH	RADII	OFFSET	TAPER	M.P.H.
12'	12'	140'	0	0	20
		60'	4'	16'	15
		45'	5.5'	22'	10
		35'	7'	28'	7
		30'	8.5'	34'	5
	14'	85'	0	0	17
		60'	2'	8'	15
		45'	3.5'	14'	10
		35'	5'	20'	7
		30'	6.5'	26'	5
	16'	60'	0	0	10
		35'	3'	12'	7
		30'	4.5'	18'	5
	19'	35'	0	0	7
	21'	30'	0	0	5
	24'	25'	0	0	5
	27'	20'	0	0	5

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

FIGURE 3.1.10
BUS TWO-BAY TURNING
OVER 90°
SCALE: 1"=20'
SPEED 15 MPH

THIS TEMPLAT IS A
MINIMUM DESIGN,
BASED ON THE
CLEARANCES
REQUIRED FOR THE
METRO BUSES
LISTED ON TABLE
3.1.1. FOR MORE
INFORMATION, SEE
TABLE 3.1.2 (CONT'D)

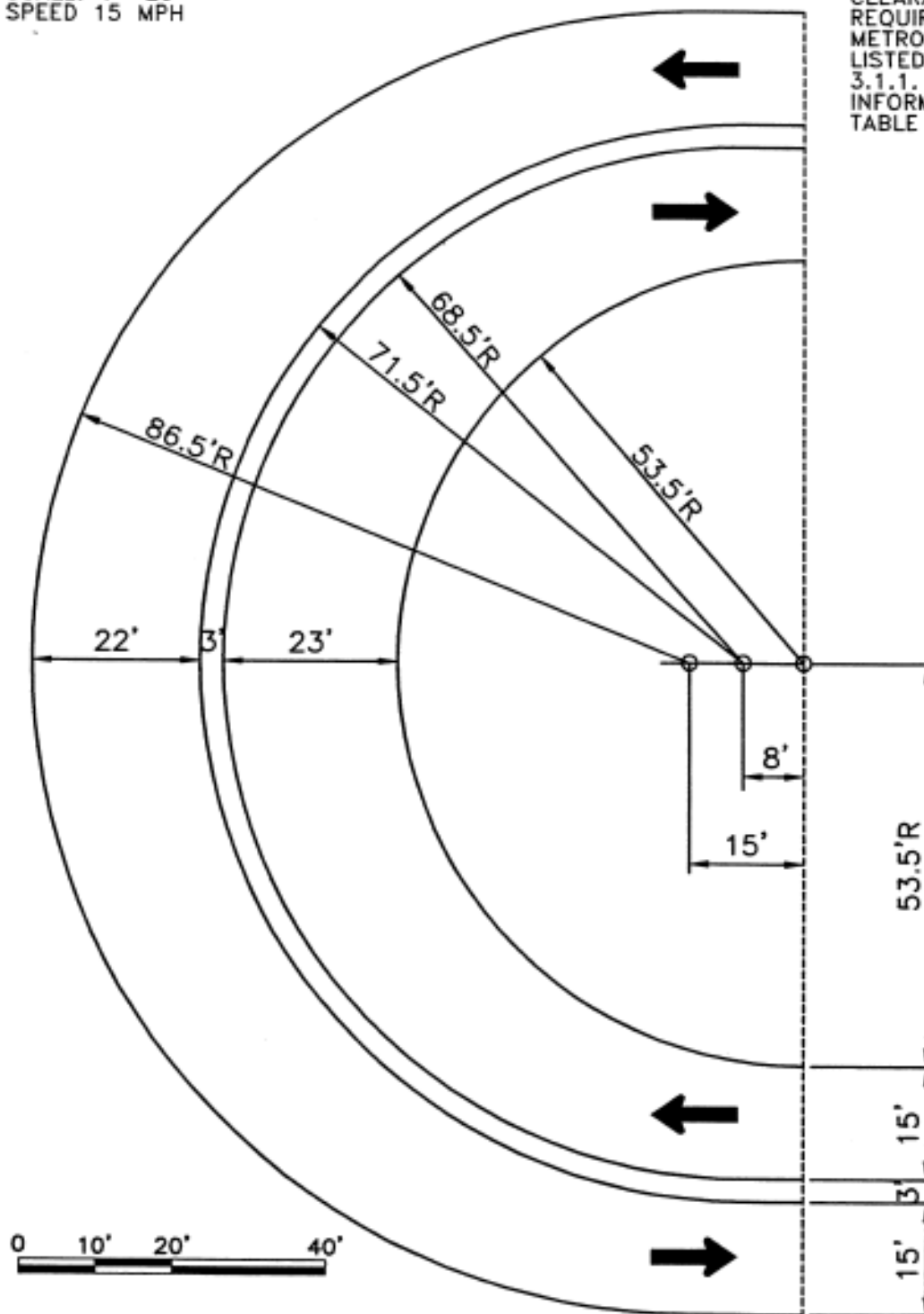
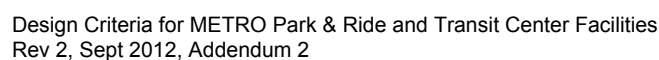


Figure 3.1.11
BUS TWO-BAY TURNING, 90° OR LESS, SPEED 15 MPH
THIS TEMPLAT IS A MINIMUM DESIGN, BASED ON THE CLEARANCES REQUIRED FOR
THE METRO BUSES LISTED ON TABLE 3.1.1. FOR MORE INFORMATION, SEE TABLE
3.1.2.



DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

4.0 STRUCTURAL

4.1 BASIS OF STRUCTURAL DESIGN

- A. The structural design of all footings, foundations, concrete slabs and structures shall be economically designed based on the Uniform Building Code (UBC) or the building code requirements of the agency having jurisdiction in the area of the Site whichever is greater.
- B. Provide sealed design calculations for verification of design.

4.2 DESIGN LOADS

- A. Self weight of the structure
- B. Structure design should be based on a FM-I-90 design rating
- C. Wind loads: 110 MPH, 3 second wind gusts
- D. Pedestrian live load: 150 psf
- E. A 2.0 uplift safety factor should be utilized
- F. Snow loading calculations should use a minimum of 5 PSF at all elevations
- G. A 1.15 building importance factor shall be used
- H. Seismic Loading in accordance with Seismic Design and Construction Requirements of 49 CFR, Part 41, per FTA Regional Notice No. 167 or a statement stating that seismic loading is not critical signed and sealed by a Professional Engineer licensed in the State of Texas.

4.3 FOUNDATION DESIGN

- A. The design of foundations shall be based on the allowable soil bearing pressures determined by the Geotechnical Consultant as outlined in the Geotechnical Report. Light pole foundations shall be designed to resist overturning utilizing the passive resistance of the soil after discounting the top 3 feet. The passive and active pressures shall be those determined by the Geotechnical Consultant. The minimum factor of safety for all types of failures shall be 2.0.

4.4 STRUCTURAL STEEL BUILDING DESIGN

- A. All structural steel design of buildings shall be in accordance with AISC Standard S326 and M011, using the Load and Resistance Factor Design Method.

4.5 STRUCTURAL STEEL BRIDGE DESIGN

- A. All structural steel design of bridges shall be in accordance with TxDOT's Bridge Manual

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

and AASHTO's "Standard Specifications for Highway Bridges" using the TxDOT Bridge Design Manual LRFD, revised December 2011 and AASHTO LRFD Bridge Design Specifications, STD Edition with 2010 Interim Revisions.

4.6 CONCRETE BRIDGE DESIGN

- A. All concrete design of bridges shall be in accordance with TxDOT's Bridge Manual and AASHTO's "Standard Specifications for Highway Bridges" using the TxDOT Bridge Design Manual LRFD.

4.7 CONCRETE BUILDING DESIGN

- A. All concrete design of buildings shall be in accordance with ACI 318, 381R and other applicable ACI Standards using the Ultimate Strength Design Method and in compliance with local governmental building codes.

4.8 MINIMUM REQUIREMENTS

4.8.1 Steel

- A. All structural steel shall be ASTM A-36 or greater.
- B. All reinforcing steel shall be a minimum of Grade 60 with the exception of spiral reinforcing which may be a minimum of Grade 40.
- C. No field welding of structural member splices or connections shall be allowed on any METRO structure, without written approval from METRO.
- D. All holes required for manufacturing of structural members shall be sealed prior to the application of the factory finish over the entire member.

4.8.2 Concrete

- A. Paving Concrete: 3,000 psi, called Class 3000, minimum 28-day strength.
- B. Structural Concrete: 4,000 psi, called Class 4000, minimum 28-day strength.
- C. The minimum size reinforcing bar shall be a number 4 deformed bar.
- D. The maximum size aggregate shall be 1.5 inches.
- E. Minimum cover for any concrete above finished grade shall be 2 inches to the closest reinforcing steel, (e.g. stirrups, ties or spirals) at the smallest cross-sectional area.
- F. All columns with a circular pattern of the main reinforcing having more than 4 vertical bars shall have it enclosed with spiral reinforcing having a pitch not greater than 6 inches. All columns with 4 vertical bars shall have the main reinforcing enclosed with ties with a spacing not to exceed 12 inches. All other

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

shapes of columns shall have the main reinforcing enclosed with ties with a spacing not to exceed 12 inches.

4.9 VERTICAL CLEARANCES

- A. If an entrance to the facility is from a ramp, the minimum clearance over any roadway shall be a minimum of 16 feet 0 inches or the clearance required by the agency over which the ramp passes, whichever is greater.
- B. If an entrance to the facility is from a ramp over a railroad, the minimum clearance shall be that required by the Railroad Company.

4.10 LOCATION OF SUBSTRUCTURE UNITS

- A. If an entrance to the facility is from a ramp over a City of Houston street, no substructure unit shall be located within the City's right-of-way.
- B. If an entrance to the facility is from a ramp over a railroad, no substructure unit shall be located within the railroad's right-of-way.

4.11 WINDSCREENS

- A. Windscreens shall be constructed with a stainless steel frame (unless approved otherwise by METRO's Project Manager), anchored to a reinforced concrete foundation designed to UBC FM-I-90 design rating. See Section 5.5.5 Glass Block Windscreens, for field information.

END OF SECTION 4.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

5.0 ARCHITECTURAL

5.1 GENERAL

- A. This Section establishes general guidelines and specific standards for the design of METRO facilities. It includes space requirements, approved materials and finishes, standards for planning, and other pertinent information. The METRO Urban Design Guidelines, furnished under separate cover, are intended to provide direction and standardization in Project Design.
- B. METRO's Urban Design Guidelines incorporate the necessary design strategies that are sensitive to developing CPTED applications.
- C. Working within the framework of the Design Criteria for METRO facilities, Consultants shall be expected to use imagination and skill to design the facility, yet meet all established requirements to produce functional, aesthetic and safe structures that address particular site conditions.
- D. The Consultant shall be familiar with the general aspects of the entire facility, in order to see how individual elements relate and integrate. It is essential, for example, that the natural relationships between pedestrian flow, space design, and equipment layout is maintained throughout the facility for the convenience of passengers. Safety, operational and maintenance requirements shall also be taken into account.
- E. Throughout the design of all facilities, the Consultant shall bear in mind the general objective of METRO is to secure the optimum in patron convenience, safety, and pleasure, within the constraints of the construction budget, ease of maintenance and minimal operational costs.
- F. General design of all facilities shall be such that each will be aesthetically pleasing and immediately identifiable as a METRO facility, yet shall be in harmony with its surrounding environment, inclusive of adjacent permanent structures or planned developments, and neighborhoods. These relationships shall be considered in the selection of colors, textures, and materials. Unique permanent topographical and neighborhood cultural characteristics shall be recognized and utilized in the design, insofar as practicable.
- G. The general design shall address crime, fear, vandalism, safety and security following CPTED principles.
- H. Sustainability considerations, per LEED principles, shall be applied.

5.2 FACILITY FUNCTIONAL REQUIREMENTS

- A. The role of the Consultant for METRO is to develop facilities, which meet standards and requirements, established for METRO facilities.
- B. Much of METRO facilities' success will depend on the attractiveness and efficiency of the individual facilities. The quality of the design is a subtle matter; it must reflect a

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

balanced relationship with the immediate environment, and at the same time provide facilities that will function smoothly from the standpoint of patrons and bus operations.

- C. In the process of developing the facility design, subjective aesthetic considerations and judgments shall be made and agreed upon by METRO. The broad viewpoint of METRO is expressed here for the information of the Consultants:
 - 1. All elements of the facility shall reflect the use of modern techniques to achieve safe, efficient, convenient, and pleasant rapid transit for all patrons, with due regard for operation and maintenance.
 - 2. The design shall take in to consideration the opportunities for crime and vandalism and apply techniques to remove or reduce these opportunities to create a safe secure environment for METRO patrons and staff.
 - 3. The design of all elements shall reflect the best use of the technology available, anticipating an economic life of 25 years.
 - 4. Design novelties, clichés of the moment, and architectural fads shall be avoided. The materials of construction shall be selected with particular attention to durability, availability, sustainability, cost and maintenance.
 - 5. These factors will be considered by METRO in all design reviews and approvals.
- D. Standardization throughout the facilities is desirable in order to establish an identity for the METRO system as a whole. This standardization will enable patrons to find their way easily, even in a facility new to them. Standardization of certain elements throughout all facilities is also necessary from the standpoint of economy and function. These standards, which include use of specific materials, certain standard items and prefabricated units, kinds and sizes of spaces, and relationships between spaces, shall be followed in all facility design.
- E. Standardization of materials and manufactured components will reduce material inventory, simplify and reduce the cost of making repairs.
- F. Circulation throughout METRO facilities shall be planned so that handicapped and elderly patrons can move easily toward their destinations. Consideration shall be given to the use of light, sound, color, and orientation edges to accomplish this objective.
- G. Sustainability considerations, per LEED principles, shall be applied to all facility designs.

5.3 SITE DEVELOPMENT

- A. The location and boundaries of Sites will be established by METRO and will be set forth on the Conceptual Site Plan. The Conceptual Site Plan will outline the location of the loading/unloading platform, bus ingress and egress movements, patron traffic movements, parking areas (regular parking, short-term parking and handicap parking) and landscaped areas.
- B. The site layout and traffic flow shall relate to the surrounding area and its traffic patterns. Provisions for handling patrons arriving and departing by bus, car or motorcycles, on foot, on bicycles, and as drop-off patrons, shall be provided.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- C. Entrances and exits to the facilities shall be located as shown in the Conceptual Site Plan. Design of the entrances and exits shall be such that they are obvious to the approaching patron.

5.4 PLATFORM SHELTER

- A. The platform shelter, shall consist of a column supported, steel structure with flat surface ceiling and standing seam metal roof or similar structural canopy.
- B. The roof of the platform shelter shall extend a minimum of 10 feet over the loading doors and discharging doors of an articulated bus. The shelter roof shall be as long as required to accommodate simultaneous loading and/or discharging of passengers at all designated bus bays.
- C. A minimum vertical clearance of 13 feet 0 inches shall be provided from the top of curb to the lowest member of the canopy.
- D. Shelters shall have solid soffits (ceilings) to ease cleaning of shelter.
- E. Shelter design shall eliminate locations where birds can roost.
- F. Column supports shall not be located in the queuing path of passengers boarding and alighting from buses.
- G. Shelter design and selection shall incorporate LEED principles.
- H. Acoustics: No long distance echoes shall be audible. Flutter echo between parallel surfaces shall be minimized. Consideration shall be given to the effect generated by the buses.

5.5 PLATFORM AMENITIES

5.5.1 Emergency Assistance Station Phones (EAS)

- A. Provide a minimum of one at the platform and one for each 250 parking spaces strategically located throughout the Park & Ride lot, or as directed by METRO Project Manager as a result of the review process and feedback from METRO Police and Safety.
- B. For Transit Centers, there should be a minimum of two, one at the platform and one strategically located.

5.5.2 Public Address and Passenger Information Signs (PA/PIS)

- A. PA/PIS shall be provided at passenger station platform.
- B. Public Address (PA) shall consist of amplifier-driven loudspeaker and double-sided Passenger Information Signs (PIS) installed in compliance with ADA requirements. All PIS shall have an amber strobe light integrated into the display when an emergency message is being displayed.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- C. The PA equipment shall be provided with automatic and manual volume adjustment for local conditions.
- D. Acoustics shall be considered when designing the platform shelter to provide for clarity of announcements from the PA system.

5.5.3 Newspaper Vending Machines

- A. Provide space for a minimum of four (4) newspaper vending machines (vending company provided). Number of machines may vary and should be coordinated with METRO's Project Manager. Locate near central axis of platform, clear of foot traffic patterns.
- B. Provide a means to secure the vending machines to the loading/unloading platform.

5.5.4 Waste Containers

- A. Provide for a minimum number of waste containers to match the number of bus bays at the Site. Additional waste containers may need to be added on a case-by-case study of each facility. The design of waste containers and interior liners shall complement other site furnishings and shall reiterate the overall design concept of the rapid transit system. The waste containers shall be engineered to withstand high levels of abuse and vandalism. Containers style shall be wire mesh or perforated metal and interior liners shall be 80% clear and usable so that explosive devices or other hazardous objects can be readily seen from the exterior. Containers shall not obstruct access to building entrances, METRO stations, or pedestrian circulation. Receptacles shall be a minimum 30 gallon in size to accommodate frequency of trash collection.

5.5.5 Windscreens

- A. Provide windscreens for patrons waiting for buses or waiting to be picked up. The number of windscreens shall be coordinated with METRO's Project Manager.
- B. Basic design should follow previous METRO projects that utilized the solid glass blocks. Windscreens must follow CPTED guidelines by minimizing the sight obstruction.
- C. The framing material shall be stainless steel. The lower section of the windscreen (below the benches) should be brick or concrete block with spectraglazed surface or other type of material approved by METRO. The upper section of the windscreen (above the benches) shall be solid glass blocks. See Section 4.11 Windscreens, for structural information.

5.5.6 Benches

- A. Benches shall be located in areas where patrons are waiting for the buses or waiting to be picked up. Coordinate the number of benches with METRO.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- B. Prefabricated concrete benches should be utilized. Benches shall have a factory seal to prevent penetration of paint and inks from graffiti markings.

5.5.7 Supervisor Booth (if required)

- A. Generally METRO provides a supervisor booth at all Park and Ride and Transit Center facilities, provided there is enough floor space for one. Follow METRO's Standard Drawing for size, shape, etc. Supervisor booth should be centrally located for easy patron access. Supervisor Booth shall be equipped with an A/C roof top unit.
- B. The specifications for the supervisor booth shall include provisions to facilitate the sale of fare media and access slot with speaker.

5.5.8 Observation Mezzanine (if required)

- A. Observation Mezzanines shall be used at all Park and Ride facilities and some Transit Center facilities. The observation mezzanine is a prefabricated fiberglass/glass booth elevated on steel frame, see METRO's standard drawing for observation mezzanine and specifications for details.
- B. Location of the observation mezzanine shall be coordinated with METRO Police through METRO's Project Manager.

5.7 OTHER AMENITIES

5.7.1 Bike Racks

- A. Parking racks specially designed for bicycles shall be provided close to the bus loading/unloading platform or near the observation mezzanine (if provided), to allow for natural surveillance. A minimum of two (2) bike racks that can each accommodate five (5) bikes shall be placed near the observation mezzanine or pedestrian waiting area. No enclosed bike racks shall be used. The bike rack location and type shall be approved by METRO Police Department.

5.8 UTILITY BUILDING

- A. Minimum requirements are shown on METRO's Directive Drawings for the utility building. Utility building shall consist of three rooms; toilet, electrical & SC&C.
- B. Doors shall face the loading/unloading platform and/or observation mezzanine. Doors located on the side of the utility building shall open in such a manner that the person entering the building can be seen at all times.
- C. The restroom door shall have a card swipe type lock on door with single-key deadbolt override. Follow METRO's Specification 08710 for details.
- D. Utility building to have roof top air conditioning, see Section 7.2 ENVIRONMENTAL REQUIREMENTS for details.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- E. The electrical and SC&C doors shall be vandal resistant and equipped with tamper and intrusion detection alarms. These alarms shall be annunciated at Police Dispatch.

5.8.1 Restroom

- A. Shall provide a wall mounted commode, urinal, sink, floor drain, mirror, hand dryer, exhaust fan and heater/air conditioning unit.

5.8.2 Electrical Room

- A. Provide adequate space for all electrical panels, raceways, conduits and transformers.

5.8.3 Surveillance, Communication & Control (SC&C) Room

- A. Provide adequate space for all SC&C equipment including; telephone backboard, patch panel backboard, electrical panels, rack mounted communications and video equipment, access control panel for rest room card reader and electronic information systems (EIS).

5.8.4 Concessions

- A. METRO policy allows manned and unmanned concessions at any of its facilities.
- B. The Consultant shall design the platform area to be able to accommodate, four (4) vending machines, and one (1) manned concession, which occupies approximately 4 foot x 6 foot floor space. These concession areas shall be located near the central axis of the platform, clear of major foot traffic patterns.

5.9 ARCHITECTURAL SIGNING (SEE SECTION 3.6.2 FOR TRAFFIC SIGNING)

- A. Direction and information signing is one of the most important elements in the smooth functioning of a METRO facility. However, whenever possible, the architecture itself shall be used to simplify and direct passenger movement.
- B. For ease of identification, the type and style of signs, graphics, system maps, and other directional instructions shall be uniform throughout METRO facilities.
- C. For facilities with 1000 or more parking spaces, locating signs shall be used throughout the parking lot. Utilize capital letters to identify parking sections (i.e.; A, B, C, etc.).

5.10 MATERIALS AND FINISHES

5.10.1 General

- A. This section specifies the basic requirements and criteria that have been established for the finish of public areas and ancillary areas within METRO facilities. These guidelines will provide the basic goals of safety, convenience, comfort, durability, maintainability, economy, visual appearance, vandal and graffiti resistance.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

5.10.2 Basic Goals

A. Life and Safety

1. Non-combustible insulation is always recommended in place of foam-based products (polyurethane, polystyrene, etc.), and is especially important in unprotected, concealed spaces, such as attics and crawl spaces, or in hollow-core walls that will be penetrated by electrically-rated equipment. For combustible construction in concealed spaces, fire protection is still recommended.
2. Use of exterior-insulation and finishing system (EIFS) is not recommended because of fire, high wind and hail hazards. EIFS is considered a lateral support system and fire-resistive substrate topped by insulation, covered by a reinforced, protective weather coating. This includes decorative trim for architectural detailing, such as columns or cornice moldings.
3. Hazard from fire shall be reduced by using fire-resistant materials.
4. Products shall have minimum fuel contribution and shall generate minimum products of combustion, consistent with code requirements.
5. Floor materials shall have slip-resistant qualities.

B. Durability

1. Materials shall be specified that provide for long and economical service with wear, strength, and weathering qualities consistent with initial and replacement costs and their location.
2. Materials shall be colorfast and maintain their intended appearance throughout their useful life.
3. Materials shall be specified which have a life expectancy of at least 25 years and shall have a factory-installed finish. Materials requiring a field-applied finish shall not be specified.

C. Weatherability

1. The materials employed shall be those which are normally considered suitable for outdoor use. The entire system, for practical purposes, shall be considered outdoor space.

D. Maintainability

1. Materials shall not soil or stain easily, shall have surfaces that are easy to clean in a single operation, and on which minor soiling is not apparent. Materials shall be cleanable with standard equipment and cleaning agents.
2. Materials that become damaged shall be of manufacture or construction such that they can be easily repaired or replaced without undue interference with bus operation.
3. Designer shall include in specifications a requirement for contractor to provide 1% to 5% additional tiles, glass blocks and other Site specific materials to be delivered to METRO for storage as spares for future use. The exact quantity shall be determined by the Consultant in cooperation with METRO's Facility Maintenance Division.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

E. Resistance to Vandalism and Graffiti

1. Materials shall be chosen to discourage vandalism. Finish materials shall be vandal and graffiti resistant. These materials shall be difficult to deface, damage, or remove. All porous materials, such as exposed concrete, with potential for contact by the public shall be finished in such a manner that the results of casual vandalism can be readily removed with normal janitorial maintenance techniques. The Consultant shall describe procedures for the repair of more serious defacement for each finish used in public areas within eight (8) feet of height above the floor surface.

F. Aesthetic Qualities

1. Materials shall be chosen to create a feeling of warmth and quality, to minimize fear and opportunity for crime and to instill civic pride in the facility.

G. Sustainability

1. Where feasible and economically viable, building materials, composed of renewable resources which meet the following criteria, shall be used:
 - a. Recycled Content: Products with identifiable recycled content, including postindustrial content, with a preference for postconsumer content.
 - b. Natural, plentiful or renewable: Materials harvested from sustainably managed sources and preferably having an independent certification (e.g., certified wood) and are certified by an independent third party.
 - c. Resource-efficient manufacturing process: Products manufactured with resource-efficient processes, including reducing energy consumption, minimizing waste (recycled, recyclable and/or source-reduced product packaging) and reducing greenhouse gases.
 - d. Locally available: Building materials, components, and systems found locally or regionally, saving energy and resources in transportation to the project site.
 - e. Salvaged, refurbished, or remanufactured: Includes saving a material from disposal and renovating, repairing, restoring or generally improving the appearance, performance, quality, functionality, or value of a product.
 - f. Reusable or recyclable: Select materials that can be easily dismantled and reused or recycled at the end of their useful life.
 - g. Recycled or recyclable product packaging: Products enclosed in recycled content or recyclable packaging.
 - h. Durable: Materials that are longer-lasting or are comparable to conventional products with long-life expectancies.

5.10.3 Finish Qualities

A. Surface

1. Hard, dense, non-porous, non-staining, acid and alkali-resistant surfaces shall be provided for long life and low maintenance. Surfaces up to eight (8) feet above the finished floor shall be more resistant to damage than that required for surfaces above that point.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

B. Color

1. The use of exterior materials will produce a unifying family of colors throughout the METRO system. Generally, color selection within this concept shall favor materials that are light in tone, in order to maintain desired illumination levels and ease of cleaning, but with sufficient contrasts and accents to provide visual interest and to conceal minor soiling.

C. Texture

1. Rough surfaces shall be provided where a non-slip feature is important, and are acceptable where surfaces may absorb dust without its being apparent, thereby minimizing the need for frequent cleaning.

D. Unit Size

1. Unit sizes shall 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 readily noticeable.

E. Joints

1. Required joints shall be small, flush, limited in number, and of the best possible materials within the cost constraints of the project. Horizontal joints in walls shall not be raked but shall be flush. All materials shall have adequate control and expansion joints at the proper spacing in order to prevent surface cracking.
2. Joints in floor surface materials (such as concrete pavers) shall be made level and joints in continuous floor surfaces (such as patterned concrete) shall be only as deep as needed to define the proposed pattern.

F. Life Cycle Cost

1. Life cycle cost shall be considered in all material selections. Custom or special designs, patterns or colors, available only at a cost premium, shall not be used. These factors, along with overall aesthetic and functional qualities, shall be considered in order to design the facility within its budget.

G. Availability

1. The various elements shall be designed in sufficient quantity and in standard sizes such that their delivery, availability, and installation will not involve cost penalties or delays for either materials or labor.

H. Proprietary Materials

1. In order to obtain competitive bids and comply with federal regulations, proprietary items shall be specified only where it has been established that no other materials exist that would meet the particular design requirements and only then with the prior approval of METRO.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

I. Installation Standards

1. Materials shall be detailed and specified to be installed in accordance with industry standards and manufacturers' printed directions for long-life, low maintenance installations. The Consultant is responsible for the physical and chemical compatibility of the specified materials that are to be placed in contact with each other.

J. Testing

1. Approved materials listed in this criteria, shall be subjected to standardized tests by a qualified testing laboratory, for the purpose of comparing the relative merits of different materials and of similar materials produced by different manufacturers. Testing shall be accomplished prior to the completion of Final Design Drawings. Manufacturers conducting independent tests shall abide by standard methods adopted by METRO.
2. Testing information shall include the following:
 - a. Composition and manufacturing process
 - b. Installation procedure and specification
 - c. Dimensions and tolerances
 - d. Color and texture range (actual samples)
 - e. Maintenance requirements.

5.10.4 Finish Materials for Bus Loading/Unloading Platform Area

A. Platform Materials

1. Concrete as-cast, sealed.
2. Full depth colored concrete, sealed.
3. Stamped pattern, full depth colored concrete, sealed. Utilize around the platform perimeter to meet ADA code requirements.
4. Exposed aggregate concrete, sealed.
5. Concrete paver brick (dense, hard), sealed and shall be placed in a mortar bed to prevent displacement. All edges shall be confined to prevent loosening of paver brick.

B. Canopy Column Materials

1. Formliner textured concrete.
2. Sandblasted concrete.
3. Bush hammered concrete.
4. Saw grooved concrete (sufficient surface texture to conceal minor soiling and damage without complicating maintenance procedures or constituting a hazard to clothing or skin of patrons).
5. Exposed aggregate concrete.
6. Structural steel, painted finish.

C. Canopy Soffit Materials

1. Preformed Metal Interlocking Panels.
2. Concrete (finish-rubbed, sandblasted, and painted).

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. Skylight Materials (limited applications)
 - 1. Frames
 - a. Stainless steel.
 - b. Anodized aluminum.
 - 2. Glazing
 - a. Tempered plate glass, solar-tinted.
 - b. Laminated safety glass, solar-tinted.
 - c. Acrylic, solar-tinted.
 - d. Polycarbonate plastic, solar-tinted.
- E. Canopy Structure Material
 - 1. Painted galvanized structural steel.
 - 2. Space frame systems, painted.
- F. Canopy Roof Material
 - 1. Standing seam metal interlocking panels
 - 2. Architectural fabric (METRO written approval required)
- G. Bench Materials
 - 1. Precast concrete
 - 2. Steel wire frame
- H. Wind Screen Materials
 - 1. Glazed or decorative masonry units.
 - 2. Brick
 - 3. Solid glass block.
 - 4. Stainless Steel frame.
- I. Railing Materials
 - 1. Stainless steel
 - 2. Painted galvanized steel
- J. Supervisor Booth (if required)
 - 1. Prefabricated booth
- K. Observation Mezzanine (if required)
 - 1. Prefabricated booth
- L. The Consultant shall select the finish materials from the list above with due consideration of the location and environment of the application.
- M. The Consultant shall specify anti-graffiti coating on all exposed aggregate concrete.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

5.10.5 Finish Materials for Utility Building

- A. Exterior Wall Materials
 - 1. Glazed concrete masonry units
 - 2. Decorative concrete masonry units. Surface shall be sealed as-is or painted with epoxy paint with epoxy block filler, along with topcoat of polyurethane based paint.
 - 3. Porcelain Enamel Panels
- B. Roof Materials
 - 1. Standing seam metal interlocking panels
 - 2. 4-Ply, built-up roof system
- C. Interior Floor Materials
 - 1. Ceramic or quarry tile in toilet area
 - 2. Monolithic concrete with hardened finish in electrical and SC&C areas
- D. Interior Wall Materials
 - 1. Electrical and SC&C room walls shall be concrete masonry units (CMU). CMU's shall be painted with acrylic latex paint with compatible block filler added to the paint.
 - 2. Restroom walls shall be glazed or ceramic tile.
- E. Ceilings
 - 1. Restroom ceiling shall be water-resistant gypsum backing board with gloss acrylic latex paint.
 - 2. Electrical and SC&C room ceilings shall be gypsum wallboard with acrylic latex paint.
- F. Doors
 - 1. Utility Building doors and frames shall be color-tinted fiberglass
 - 2. Stainless steel flush hollow doors (limited use)
- G. Builders Hardware
 - 1. Builders hardware shall be US32D Stainless Steel, Dull Finish.
- H. Hand Rails
 - 1. Stainless steel.
 - 2. Anodized aluminum
- I. Plumbing
 - 1. High-efficiency/Energy Star fixtures
- J. HVAC
 - 1. High-efficiency/Energy Star equipment

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- K. Electrical
 - 1. High-efficiency/Energy Star fixtures

END OF SECTION 5.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

6.0 LANDSCAPING

6.1 INTRODUCTION

- A. METRO's implementation of a capital improvement program and a regional transit system will have physical as well as visual impacts on the Houston environment. The actual planning and construction of transit facilities shall involve Licensed Landscape Architects. These professionals shall be an integral part of the design team.
- B. Due to the scope of the system to be designed and the involvement of many team players, METRO is providing a set of guidelines for landscape design. These landscape design criteria shall provide a basic philosophy of landscape concepts that comply with the goals set by METRO. These goals are set so that the various landscape professionals involved will ensure METRO of a finished site quality and will produce a consistent landscape system that readily identifies the image METRO desires. Landscape Architects shall comply with these standards, City of Houston Tree and Shrub Ordinance and Americans with Disabilities Act (ADA).
- C. It will be the Consultants responsibility to address the following landscape aspects of design:
 - 1. Thorough understanding of the Site and an understanding of the relationship between landscape design, safety and security.
 - 2. Coordination of design with all project team members
 - 3. Consideration of economy
 - 4. Consideration of maintenance
 - 5. Consideration of environmental sustainability
- D. The Consultant shall follow the City of Houston ordinance on landscaping which includes a formula to determine the minimum requirements for landscaping the Site. The Consultant shall submit these calculations to METRO. The Consultant shall adhere to these requirements as close as possible. Variations will require written permission from METRO's Project Manager.

6.2 GOALS AND OBJECTIVES

- A. Landscape installations and plant spacing shall be designed to minimize maintenance and reduce water use. Limited plant varieties must be used to reduce maintenance requirements. Maintenance cycles must be compatible among plant material to reduce the number of required site visits as well as irrigation requirements.
- B. Trees in lawn areas must not be grouped to impede mowing. Shrub masses must not act as a collector of trash.
- C. Automatic irrigation systems shall be used. The scope of irrigation shall be related to the public exposure of each area of the project as well as the size of the project, whereby irrigation requirements may range from total irrigation to minimal irrigation. Since turf areas require the majority of water usage, designers shall consider native turf

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

species that do not require irrigation. Turf species will need to be selected based up on local jurisdictional requirements.

- D. Irrigation systems should utilize high-efficiency systems.
- E. Landscape areas shall be limited with respect to the desired visibility impact. Areas which have a high exposure to the public such as a main entrance along a busy thoroughfare or a boarding area plaza where people gather and queue shall receive more landscape emphasis than an area in which public contact or public visual exposure is minimal. The public shall be provided with a pleasing, comfortable environment in which they are safe and secure. Safe design recognizes the need for surveillance from one area of the site to another, and to an end from the site. Limit landscaping within street Right-of-Ways to grass sod. Variations must be approved by METRO's Project Manager in writing.
- F. The landscaping design shall be fully coordinated to meet the needs and objectives of METRO's Police Department. Landscaping shall be designed in a way that will not cause sight obstruction or electronic interference to METRO's surveillance system.
- G. Landscape installations shall minimize capital costs. Standard plant sizes shall be used to ensure that the minimum plant size is used to achieve the desired effect upon installation. Plants shall be readily available in sufficient quantities to produce a uniform planting. No special provisions by METRO shall be made to cultivate and/or store plant material prior to installation.
- H. Types of trees, shrubs and ground cover shall be approved by METRO. METRO's approved plant material listed in Section 6.7 may be used as a guide. Selection of plant material shall be based upon hardiness, minimal maintenance, availability, water requirements and design character.

6.3 SITE ANALYSIS

- A. The Landscape Architect shall send soil samples for analysis. Sampling and testing shall be in accordance with the current methods of the Association of Official Agricultural Chemists. If deficiencies in the soil are found as a result of an analysis, they shall be corrected in accordance with Landscape Architect's recommendations.
- B. Due to Houston's high annual rainfall amount, drainage is a main concern to be addressed. Problem slopes and poor landscape surface drainage conditions shall be identified and corrected. Subsurface grading shall be provided in all shrub beds at a minimum of 3% slope. Walkways and plaza areas shall not retain water at any time. Drainage measures shall be coordinated with the other design team members.
- C. The Landscape Architect shall coordinate with other subconsultants the location of proposed utilities to minimize impacts on existing plant material during installation of utilities and proposed plant material for future maintenance of utilities. Limit landscaping in utility easements and properties to those species approved by the utility owner.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. Landmark features of aesthetic and/or historical nature, which are located on-site or in close proximity to the site, shall be identified. Off-site features of architectural significance shall also be noted with respect to views that shall be designated as part of the landscaping.
- E. All existing site vegetation shall be assessed. A determination shall be made as to which plant material will be kept or transported on-site or to another location as approved by METRO. (See Section 6.4 - Tree Preservation)
- F. The Landscape Architect shall consider bus, auto, and especially pedestrian circulation access to the site and circulation patterns within the site. Work shall be coordinated with others so as not to disrupt the efficient circulation of all users of the site. Work shall be coordinated with others so as not to disrupt the efficient circulation of all users of the site.
- G. Land uses surrounding the site shall be identified with respect to impact on the final design. Certain areas will also affect the safety the public perceives and experiences about a site; therefore, the design shall address off-site safety influences. These influences in large part will determine whether screening is appropriate. Opportunities for surveillance are critical for safety.
- H. Industrial areas, retail areas, residential areas, all require their own set of design requirements. Sensitivity to these requirements shall be reflected in the final plan.
- I. Apply LEED principles for site and landscape designs.

6.4 TREE PRESERVATION

- A. The Landscape Architect shall perform a tree survey of the Site and determine which trees and other valued plant types can be saved. Plant material to be saved shall be disease free, require low maintenance and not restrict or impede the use of the Site. All selected trees shall be tagged with a 4" x 6" yellow numbered tag permanently attached to the tree. A drawing showing the saved plant material, location, name and tag number for a tree shall be submitted to METRO's Project Manager for review and approval. In addition to plant material on-site, plant material, mainly trees, located off-site whose branching or root systems protrude onto the site must be shown on the sketch.
- B. METRO desires that whenever a parcel of land be purchased for a project, as much natural vegetation as possible shall be saved. All undisturbed natural areas shall be identified graphically with a description of plant types and sizes in each area.
- C. In some instances, trees of merit will exist in areas that must be developed. On-site trees of desired quality should be relocated if it is economically feasible to do so. All conflicts shall be identified and coordinated between existing and proposed utilities before relocating trees.
- D. Guidelines for the protection of trees during design and construction phases shall be provided. These guidelines shall meet METRO standards:

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

1. The Landscape Architect shall insure that the natural grade for existing vegetation is maintained. In cases where grading requirements require raising or lowering the grade, mitigation measures shall be developed by designer and approved by METRO.
 2. A system of barricades around trees to prevent damage during construction shall be provided. Barricades shall be located on drawings. It must be impressed upon all design/construction team members that no one is to penetrate these barricades for any reason and noted on drawings.
 3. In some cases, the preservation technique standards may not be possible to meet. Many times a specimen plant such as a 36-inch caliper oak tree will exist in an area where development is necessary. If the tree can be saved, tree mitigation methods shall be developed and approved by METRO. Efforts such as root pruning, top pruning, deep watering and feeding must be performed prior to initial site development and construction. Timing must be reflected in the construction contract. In the event the tree does not live, the design must accommodate the planting of a replacement.
 4. Trenching operations shall not impair the health of trees. Trenching which may damage roots shall be accomplished with special provisions to minimize damage. Any damaged roots shall be treated immediately. Mechanical trenching devices for piping installation may be used in landscape areas where no obstructions such as tree roots or utilities exist. Sensitive areas containing roots or buried cables will require other construction methods, such as hand digging or boring. Avoid locating pipe across root systems. Instead, show piping to run radially from at minimum the drip line towards the tree's center and stopping before branching of the tree's roots from trunk to minimize the number of roots cut.
- E. The Landscape Architect shall suggest replacement criteria based upon size and quality of tree removed, with METRO approval. Quality trees shall be those associated with hardwoods such as the oak family. Each tree to be removed shall be judged in regards to aspects of quality, health, size and aesthetics. Tree replacements shall be based on the City of Houston's Tree & Shrub Ordinance.

6.5 LANDSCAPE CONCEPTS

- A. To produce a system of landscaping that is economical and low maintenance oriented.
- B. Design shall be complimentary and compatible with the following on-site features:
 1. The security and operation of gates shall not be impeded by any landscaping. When pedestrian access is separated from the main entrance, a pedestrian gate in the fence must be provided. Maintain 24" between plant material and gate to ease operation.
 2. The landscaping and planting shall be designed in a way that does not obstruct the view from the security cameras. Further consideration shall be given in the selection of plants to minimize the impact of obstruction by growing plants. Additional annual maintenance recommendations shall be included to avoid such situation.
 3. Areas around lights shall not contain tall or columnar plant material, which will obstruct lighting.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

4. If bollards are used, as pre-approved by METRO, for lighting or as a barricade, the Landscaping should reinforce their use, such as shrub masses to block access.
5. If planter walls are used as pre-approved by METRO, they shall be compatible with circulation patterns as well as with the architectural materials used in the site.
6. Security shall be addressed in the arrangement of plant material. Plant materials shall not block security sightlines from the observation mezzanine if used on site. Guard should be able to observe the bus loading/unloading platform, utility building, bicycle racks and main pedestrian walkways.
7. All passenger vehicle and pedestrian sightlines shall be clear of any obstruction to provide safety at intersections and crosswalks. Plant material taller than 30" above the curb shall not be planted inside a triangle with two entry curbsides being 25 feet. Bus driver views shall not be impeded too.
8. Plant material shall not intrude into platform canopy to prevent injury or damage due to falling limbs in windstorms. Maintain sufficient distance between trees and the canopy to prevent interference and damage from movement of the limbs against the canopy.
9. Tree varieties shall be selected that allow them to be maintained to a minimum of 12 feet from running surface to the bottom of the tree's canopy to allow for bus clearance.
10. A landscape buffer of at least 10 feet shall be provided between fences and parking lots, or other features. A concrete maintenance strip of at least one-foot with the fence centered on this must be included in the design in all turf areas.
11. Maintain low planting around all signs and pylons so that the view is not obstructed in any direction. Coordinate with Traffic Engineer.
12. Low public exposure areas shall receive minimal landscaping.
13. Apply sustainability principles per LEED.

C. Plant material to be used shall consist of the following:

1. Trees should provide 6'-0" vertical clearance to branching structure of tree for pedestrians' clearance. Broad leaf trees shall not be used near drains to prevent leaves from clogging the drainage system. Pine trees shall not be used near paving since pine straw is difficult to lift from concrete.
2. Shrubs should be planted in groups within shrub beds and used for groundcover. Provide dimensions of bed widths. Do not show individual shrubs in turf.
3. Grass areas near the bus platform should be solid sod. Large expanses of low public exposure areas should be hydromulched-seeded. All curbs or concrete surfaces that have water draining upon them from hydromulched areas shall be planted with a solid sod strip of at least 3 foot width to prevent sedimentation of pavement. (See Section 6.6 C)

D. The Landscape Architect is responsible for coordinating pedestrian circulation with all project team members. All site circulation shall be integrated with the parking lot and the boarding platform.

6.6 LANDSCAPE GRADING AND DRAINAGE

- A. The Landscape Architect shall coordinate contours in all landscape areas with the design engineer and show all high and low point elevations with arrows indicating

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

grading. Designers are strongly encouraged to show contours to help illustrate proposed landscape grading.

- B. In cases where grading must be done to achieve aesthetics or proper surface drainage, cut and fill shall be kept to a minimum. Cut and fill shall be balanced as closely as possible to minimize the purchase of fill dirt and the removal of excess soil. Soil excavated from on-site parking lot grading or other on-site grading may be utilized for the subgrading of landscape berms. (See Section 6.6 I for berm information.)
- C. In order to maintain a clean image and neat appearance, erosion problems shall be eliminated. Site edges shall be maintained with no sedimentation from runoff accumulating at curbs and sidewalks. Erosion control measures shall be employed during the construction phases as well as in the ongoing operation of the finished site. All slopes shall be contoured to be easily maintained with respect to mowing and mulch retention. Mulch on a steep slope will be a constant maintenance problem due to washout. Turf areas bordering curb line and paved areas shall receive special considerations to prevent wash out after construction.
- D. The use of retaining walls for purely aesthetic purposes shall be discouraged and must receive METRO prior approval if used. Retaining walls shall be avoided if possible grading can be achieved by contouring the land. Any use of retaining walls will require logical justification to METRO. Details and sketches must be provided when retaining walls are required. Construction materials must be compatible with other architectural features on-site. Placement of retaining wall and subsequent grading shall be coordinated with all other design elements of the site.
- E. Gradients in Houston can present big problems in the landscape due to the relative flatness of most sites in Houston. Use cut from other areas of the site to achieve positive drainage through the landscape.
- F. On-site landscape drainage shall be handled by swales instead of subsurface drainage or ditches. Swales are more desirable in the landscape due to the cost involved in constructing a concrete ditch or installing piping to control water runoff. Swales must be designed to be unobtrusive and gentle while allowing for positive drainage. Severely engineered swales are difficult to mow and shall be avoided. Concrete linings for swales shall be avoided. Positive drainage shall be achieved using grass areas or other planted surfaces.
- G. Conditions in which the use of swales is not sufficient to produce adequate drainage require logical justification to METRO. The use of subsurface drainage to correct insufficient surface drainage shall be justified by the Landscape Architect. Coordination with the Civil Engineers shall be the responsibility of the Landscape Architect. Where possible, swales should drain to existing drainage systems.
- H. In order to alleviate problems due to ponding, slopes shall not fall below the minimal standards for the following surfaces:
 - 1. Grass Lawn - 2%
 - 2. Shrub Beds - 3%

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- I. The Landscape Architect is encouraged to use berm like features to create interesting landscape topography where the area is large enough to accommodate them. Small hump like berms are not acceptable. On-site fill should be utilized to minimize the cost of this sitework and trucking in additional soil is not acceptable unless pre-approved by METRO. Berm design must consider both height and relative orientation, and should allow opportunities for surveillance from both sides or along the length of the berm. In no instances can berms impair security with regard to sightlines. Berms shall be designed to be gentle, flowing landscape features. Side slopes of berms shall not exceed 4 to 1. Berms, including plant material, shall not exceed a height above the curb of 3 feet so as not to obstruct security sightlines. Shrub and groundcover shall not be planted on berms if the shrub or groundcover at maturity exceeds a height of 3 feet above the curb line. Planting on berms shall be carefully planned to insure that plants capture water. Planting on steep slopes is discouraged since water tends to runoff of slopes without penetrating the soil.
- J. The existence of detention ponds will be determined by other members of the design team and be coordinated with the landscape design. Detention ponds shall be designed to blend naturally with the landscape. A buffer landscape area of at least 10 feet must be provided between the parking lot and the detention pond. All grass detention ponds shall be solid sodded, the sod shall be staked in place and there shall be a concrete low flow channel. The design of detention ponds shall address the following considerations:
 - 1. Safety
 - 2. Slopes
 - 3. Mud Problems
 - 4. Drainage
 - 5. Aesthetics

6.7 PLANT MATERIAL

- A. Plant material used in METRO projects shall be of the hardiest quality available for use in the Houston area. The success of any project lies not only with the visual impact upon installation, but also with the continuous appearance in the ongoing operation of the site. Utilitarian plants should be utilized to achieve low maintenance as well as pleasing aesthetics. Drought-resistant as well as resistance to climate extremes of heat and cold is a definite requirement. Plant material with a moderate to fast growth rate is preferred since small size plants may be installed for economy. METRO projects shall not be an experimental laboratory for the introduction of new and untested plant material for use in the Houston area. This goal can be accomplished along with creative and appealing use of many plant varieties that thrive in Houston.
- B. Some of the major conditions that plant material must satisfy are:
 - 1. Resistant to disease
 - 2. Pest free
 - 3. Be typical of their species or variety
 - 4. Have a normal well-developed branch structure with a vigorous root system
 - 5. Be indigenous or naturalized to the Texas Gulf Coast Area
 - 6. Be in accordance with CPTED guidelines.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

C. Plant List (Also refer to City of Houston Tree and Shrub Ordinance.)

1. Trees

Bald Cypress	Redbud
Crepe Myrtle	River Birch
Cedar Elm	Shumard Oak Variety
Live Oak	Southern Red Oak
Magnolia	Sweet Gum
Mexican Plum	Sycamore
Pine	Water Oak and other Oak varieties

2. Shrubs

Cleyra	Nandina Varieties
Dwarf Crepemyrtle	Pittosporum Varieties
Glossy Abelia	Texas Mountain Laurel
Hawthorn Varieties	Texas Sage
Holly Varieties	Waxleaf Ligustrum
Juniper Varieties	Yaupon Varieties

3. Groundcover (limited to pre-approved locations)

Liriope Varieties	Juniper Varieties
Asian Jasmine	Native grass varieties – encourage in turf areas to reduce mowing and irrigation

4. Small woody landscape plant acceptable in HL&P Transmission Right-of-Way.

Abelia	Yaupon
Bottlebrush	Ligustrum
Camellia	Privet
Silky Dogwood	Southern Wax Myrtle
Parsley Leaf Hawthorn	Trifoliate Orange
May Haw	Purple Leaf Plum
Texas Hawthorn	Common Cherry Laurel
Loquat	Fragrant Sumac
Deciduous Holly	Shining Sumac

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. Plant sizes and for ms shall comply with standards set by Texas Association of Nurserymen, Grades and Standards, 1976 or latest edition. Selections of plant material must provide for the minimum size plant to achieve the desired effect upon installation. Such selections shall be made to minimize capital costs.
- E. All plant material shall be correctly identified as to quantity, name (common and botanical), size, spacing, and whether or not specimen or standard on the landscape plans in plant list form. Designer shall note on drawings that contractor is responsible for providing the quantity that is largest number between quantity shown on plant list versus those needed to achieve correct spacing.

6.8 PLANT DETAILS AND SPECIFICATIONS

- A. Spacings shall be specified to ensure a fairly established look upon installation.
- B. Due to Houston's soil conditions, the proper construction of tree wells is essential to the survival of new trees. Tree wells shall have proper irrigation and drainage. If the tree well is surrounded by concrete, adjacent concrete shall be designed to support itself above planting soil. A soil separator and gravel aeration piping shall be used between concrete and planting soil.
- C. Minimize landscape areas on the plaza. Tree grates, as a solution to planting trees within a plaza is not acceptable. Room shall be allocated for trees to be grouped in shrub or turf areas within a plaza.
- D. The Landscape Architect is responsible for proper drainage in landscape areas including plant containers. Coordination of all landscape drainage requirements with Civil Engineers shall be the responsibility of the Landscape Architect.
- E. Installation requirements should be provided for the following:
 - 1. Soil mixtures for tree and shrub planting shall be specified. All soil mixes must be approved by METRO.
 - 2. Mulch shall be provided for trees, shrub beds, and groundcover beds. Mulch shall be specified and mulch selections must be approved by METRO.
 - 3. Soil separator shall be used in planters with sealed bottoms and drainage equipment. Soil separator shall be approved by METRO.
 - 4. Tree staking shall be done for all trees and tree form shrubs to ensure the correct posture. Staking must be as inconspicuous as possible in the landscape. Utilize METRO's Standard Drawing for tree staking system.
 - 5. Slope planting shall be such that erosion is controlled. Erosion cloth must be used on steep slopes (greater than 4:1) planted with groundcover or shrubs.
 - 6. Planters, particularly moveable plant containers, shall be avoided; however, in some cases where the landscape area may be minimal, planters may be used to add plant material that will soften the architectural impact of broad paved areas with METRO approval. Planters shall contain proper irrigation and drainage with soil separator and gravel. Soil mixes shall comply with soil mix standards. Plant containers recommended shall be vandal resistant. Water from plant containers shall not be allowed to seep onto any paved pedestrian areas. The designer shall refrain from using planters on the platforms.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

7. Fertilizer shall be used to encourage plant material to survive the initial shock of installation and to encourage growth, fertilizer shall be used for all plant material with the installation. Proper fertilization can help to ensure the vitality and growth of plant material with minimal plant loss. Commercial fertilizers shall be a complete fertilizer for groundcover, shrubs and trees. Consider the manufacturer's directions and specifications as part of these guidelines.

6.9 IRRIGATION

- A. Irrigation in the landscape has a direct relationship to the visual exposure of the area to be landscaped. The Design shall concentrate landscaping to lessen the requirements of irrigation. No irrigation lines shall be laid outside of METRO property. The Consultant shall provide dimensions to underground irrigation lines on the irrigation plans.
- B. The Consultant shall physically check the available water pressure at the site and provide METRO with this information. Civil Engineer to provide water main tap and valve/meter box location. Two meters shall be provided, one meter shall be labeled, "Irrigation Only".
- C. Shrub masses shall be limited and grouped with considerations of irrigation economy and reduced maintenance requirements. Irrigation system shall be designed such that trees, planters and shrub areas are drip-irrigated, by separate stations from turf stations, so that lawn watering can be eliminated 4 to 5 years after the Project has been completed.
- D. The irrigation system shall be designed to operate and to complete all cycles during hours the site is least busy (10:30 PM to 5:00 AM). The system shall also have cut-off valves for each zone so irrigation can operate without a zone.
- E. Consultant shall provide METRO's Project Manager with a watering schedule for each station for year 1 through year 10.
- F. Ponding from landscape irrigation in paved pedestrian areas shall not be allowed. Sprinkler systems shall be designed so as not to cause drainage problems in the landscape. Avoid overspraying.
- G. Provide backflow preventor devices per building code of agency having jurisdiction over Site. Locate backflow preventor in an unobtrusive location near the water meter vault.
- H. Sprinkler heads shall be durable and located so that they are not disturbed by maintenance or pedestrians. Maintain at least (6) six-inches behind back of curb.
- I. All irrigation piping underneath paved areas shall be encased and adequately protected. Above ground piping shall receive protection and be unobtrusive to prevent vandalism and to ease maintenance repairs. A complete plan for sleeving under the paved areas will be coordinated with the Civil Engineer and made part of paving layout with cross-references to irrigation plans. The design shall specify and coordinate all piping protection measures. Maximum depth of irrigation main shall be 3 feet.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- J. Controllers shall be a digital type with a device capable of shutting the irrigation system off when appreciable amounts of rainfall have been detected. Controllers shall be located on the outside, back wall. Automatic systems must have the ability to be operated manually without disrupting the automatic cycle. Irrigation systems must be designed for a minimum number of stations for economy, yet providing optimum water pressure for each station served by the controller. In addition, each system shall be designed with a master control valve.
- K. Hydrants shall be provided on the platform and shall be located approximately 50 feet apart in lockable receptacles mounted flush with the platform floor. All planters located at the ends of the bus platform shall have quick disconnects located within them. Provide 3/4-inch Type 'K' copper in 2-inch Schedule 40 PVC sleeve under the platform. From the edge of platform to irrigation main, use schedule 40 PVC.
- L. Utilize high-efficiency irrigation system.

6.10 MAINTENANCE

- A. So that METRO facilities will remain economical to maintain during the ongoing operation of the site, the landscape design shall encompass low maintenance features. The Landscape Architect shall be responsible for setting up a landscape program for maintenance with the following issues addressed:
 - 1. Water/Irrigation Monitoring
 - 2. Fertilizer
 - 3. Pruning/Sucker Growth
 - 4. Staking
 - 5. Pest Control/Insecticides
 - 6. Disease Control, Chemical Applications
 - 7. Edging
 - 8. Mowing
 - 9. Litter Pickup
- B. A maintenance schedule with manpower estimates based on the final landscape plans shall be provided to METRO's Project Manager.
- C. The Consultant shall specify that the Contractor shall be given one (1) year from the date of Substantial Completion to fully establish and guarantee the continued healthy condition of plant material, which is the key to a successful project. In keeping with this objective, METRO demands a program of replacement of unhealthy and dead plant material.

END OF SECTION 6.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

7.0 MECHANICAL

7.1 GENERAL

- A. This section describes the basic minimum design criteria for heating, ventilating, air conditioning, water, sanitary sewer and storm water drainage systems for METRO Park & Ride and Transit Center facilities.
- B. Provide temperature and ventilation to achieve a physical environment to METRO employees for comfort with a minimum initial cost and subsequent maintenance costs.
- C. Provide necessary conditions of environment as required for the proper operation of facilities.
- D. Provide optimum size water-meter for potable and irrigation services.
- E. Provide safe, economical, maintainable, reliable and adequate features for the plumbing system, including the storm and sanitary sewer systems.
- F. Prior to the commencement of detail design of the water and sanitary sewer system for the facility, the Consultant shall submit the following to METRO for review and approval:
 - 1. Complete analysis of the plumbing requirements for the facility.
 - 2. Water and sanitary sewer rate schedules for the agency providing the water and sanitary sewer services.
- G. All plumbing fixture locations shall meet or exceed Americans with Disabilities Act code requirements.
- H. Use high-efficiency/Energy Star fixtures.

7.2 ENVIRONMENTAL REQUIREMENTS

- A. HVAC systems shall be provided for the entire utility building, the observation mezzanine and the supervisors' booth.
- B. Provide a ventilation fan in the restroom. Fan shall be wired into the light switch.

7.2.1 Design Parameters - Ambient Conditions

Summer Outside Peak Design Conditions

- 1. Dry Bulb Temperature. (Based on ASHRAE 2½% frequency of occurrence) 95 F
- 2. Wet Bulb Temperature. 77 F

Winter Outside Minimum Dry Bulb Temperature 20 F

7.2.2 Ancillary Space Design Conditions (See Table 7.1)

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

7.2.3 HVAC Calculations

- A. HVAC calculations shall be in accordance with the requirements of ASHRAE (fundamentals volume) latest edition. Calculations shall consider optimizing energy consumption through orientation, amount of glass, insulation, and any other available means.

7.3 PLUMBING SYSTEMS

- A. Each facility shall be served with a water main sized for the total plumbing fixture and irrigation demands. In a typical Park & Ride or Transit Center facility the water demand for landscape irrigation far exceeds other plumbing demands within the facility.
- B. Separate water meters shall be installed for the potable and irrigation systems. Many water supply authorities will allow a smaller meter than the line itself. Consultant shall verify and design the systems accordingly. Main shut-off valve, water meters, isolation valves, back flow preventors (per local code) and fittings shall be placed in concrete handhole with steel access panels at ground level. If possible, handhole shall be located within the street right-of-way, if not provide water line easement for meter handhole. Work is to conform to water supply authority requirements.
- C. Provide wall hydrants on the passenger platform (see Section 6.9 K).

7.3.1 Cold Water System

- A. The Consultant shall ensure that water service provided will have sufficient pressure to operate the plumbing fixtures within the utility building.
- B. Isolation valves shall be provided in each major branch line to facilitate maintenance in individual areas without losing service for the entire facility.
- C. Any pipes subject to freezing shall be provided with a adequate means for freeze protection.

7.3.2 Hot Water Systems

- A. The restroom in the facility shall utilize "instant hot" hot water heaters, hot water distribution piping and piping accessories. All hot water piping shall be a minimum pipe size of 3/4". All piping shall be arranged in a systematic manner, with provisions made for thermal expansion and drainage. All hot water pipes shall be insulated.
- B. Isolation valves shall be provided for all branches to facilitate maintenance.
- C. Analyze potential of using solar hot water systems.

7.3.3 Soil, Waste and Vent Systems

- A. Soil, waste and vent systems shall include all piping and venting not subject to water containing oil or grease connected to the sanitary sewer system of the

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

authority providing the service.

- B. All soil, waste and vent pipes shall be sized for fixture demand as required by applicable plumbing codes and ordinances, to the first manhole outside the utility building.
- C. Soil drainage pipes will be pitched at 1/4 inch per foot whenever possible but not less than applicable code requirements.
- D. All horizontal vent pipes will be kept as short as possible, pitched 1/4 inch per foot towards soil and waste pipes, then rising to the outside in the most direct way. Each vent riser will be properly flashed at the roof penetration and terminated by a vandal-proof vent cap.
- E. All commodes shall be wall mounted.
- F. The sanitary sewer line, manholes, cleanouts and slopes shall follow applicable building codes.
- G. The sewer pipe shall be a minimum diameter of 6-inches from the first manhole (outside the utility building) to the sanitary sewer main of the authority providing the service.
- H. The sewer line shall be schedule 40 PVC.
- I. If proper slope cannot be maintained for gravity line, design a sanitary force main sized for fixture demand.
- J. Provide notes to cover the testing and certification of the sanitary sewer system to comply with the City of Houston requirements or agency having jurisdiction over the area.

7.3.4 Roof/Canopy Drainage Systems

- A. The roof/canopy drainage systems of this section are defined as all the piping and appurtenances from the roof to a point 5 feet outside the roofline of the canopy. Beyond that point, the storm drainage is part of the facility storm drainage system.
- B. Design of the storm drainage system for the passenger shelter shall be based on a 10-minute duration and 9.36 inch/hour of water accumulation.
- C. The storm water runoff from the platform shall drain to the facility storm drainage system.
- D. Utility building roof drainage system shall be designed to divert storm water runoff away from doorways and pedestrian walkways.
- E. Mechanical equipment drains will be connected by an air gap to the storm sewer system.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

7.3.5 Plumbing Calculations

- A. Consultant shall provide calculations for plumbing systems to comply with latest applicable codes and standards.

7.4 FIRE AND LIFE PROTECTION SYSTEMS

- A. All fire protection equipment shall be METRO approved, including but not limited to piping, mechanically grooved couplings, fittings, sprinklers, valves, alarm panels and components, etc.
- B. Mechanical/HVAC Equipment/Utility and Equipment Rooms are considered a Hazard 2.
- C. Electrical Rooms/Switchgear Rooms: Are not required to have fire protection systems if:
1. The electrical rooms are provided with a 2-hr fire rated enclosure
 2. METRO approved Monitored Heat/Smoke Detection is provided
 3. All wall penetrations are properly sealed with fire-rated material
 4. The area is kept free of combustibles, and housekeeping policies must be in effect.

TABLE 7.1

HEATING AND COOLING REQUIREMENTS

SPACE	INDOOR PEAK DESIGN CONDITIONS WITH SYSTEMS ENERGIZED			MINIMUM AIR CHANGES				
	WINTER	SUMMER		SPACE PRESSURE	CIRCULATE	OUTSIDE AIR	VENT TYPE	HEAT TYPE
	F	FDB	%RH					
Surveillance, Communication and Control	65	76	50	P	85%	15%	S&R	Note C, 1
Observation Mezzanine	70	76	50	P	85%	15%	S&R	Note C, 1 & 2
Supervisors Booth	70	76	50	P	85%	15%	S&R	Note C, 1 & 2
Restroom	65	76	50	P	85%	15%	S&R	Note C, 1
Electric Room	60	76	50	P	85%	15%	S&R	Note C, 1

NOTES:

- A. Space Pressure: N = Slightly Negative, P = Slightly Positive
- B. Vent Type: S = Supply, E = Exhaust, R = Return

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- C. Heat Type
 - 1. Electric heat coil in A.H. unit
 - 2. Electric wall convector or unit heater.

END OF SECTION 7.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

8.0 ELECTRICAL

8.1 GENERAL

- A. These criteria describe the design requirements for electric power, lighting, controls, lightning protection, telephone, and surveillance, communication and control (SC&C).
- B. The design shall accomplish the following:
 - 1. Provide for safe, economical and reliable operation.
 - 2. Promote uniformity and standardization in design and equipment.
 - 3. Minimize maintenance.
 - 4. Provide reasonable spare capacity.
- C. The electrical system design shall comply with all applicable laws, rules, regulations and ordinances of Federal, State and local governmental agencies having jurisdiction including Americans with Disabilities Act (ADA) code.
- D. Service shall comply with electrical providers service standards requirements. Service outlet location and data statement shall be coordinated through METRO's Project Manager.
- E. Incorporate applicable sustainability principles per LEED.

8.2 ELECTRICAL SERVICE

8.2.1 Voltage

- A. Service voltage shall be 480Y/277 volts, 3-phase, 4-wire.
- B. A generator transfer switch Nema 3R, 480V shall be included in the design.

8.2.2 Spare Capacity

- A. Service conductors shall have a spare capacity of not less than 25% of the total connected load.

8.2.3 Load Analysis

- A. A load analysis shall be provided including connected loads, spare loads, and available spare capacity based on the difference between service entrance conductors capacity and connected loads.
- B. A one-line diagram shall be provided including main components of the electrical distribution system.
- C. Estimated power requirements for the observation mezzanine are 10,000 volt-amps at 120/240 volts, single-phase, 3-wire.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. Estimated power requirements for the supervisors booth are 10,000 volt -amps at 120/240 volts, single-phase, 3-wire.
- E. Estimated power requirements for each electronic information display is 750 watts at 120/240 volts, single-phase, 3-wire.

8.3 ELECTRICAL SYSTEMS

8.3.1 Conductors

- A. Conductors shall be of copper.
- B. Conductor insulation for systems up to 480 volts shall be NEC Types THHN-THWN or XHHW for feeders and branch circuits, and Type XHHW for service entrance conductors.

8.3.2 Panelboards

- A. All panelboards shall be provided with a minimum of 25% spare circuits. Size of panelboard feeders shall include estimated loads for spare circuits.
- B. A 150A, 120/240V, single-phase, four-wire, 60HZ, panelboard shall be installed in the SC&C room. Provide a minimum of: 8 - 15A, double-pole circuit breakers; 4 - 15A, single-pole circuit breakers; 4 - 10A, single-pole circuit breakers; and 8 - 20A single-pole circuit breakers. Also provide a surge protector for the main service. All power conduits shall be terminated in this panelboard where SC&C electric loads shall be connected. SC&C electric loads are cameras, Automated Barrier Gate Controls (ABGC), electronic information signs, displays, call boxes and loads within the SC&C room.
- C. A 100A, 120/240V, single-phase, three wire, 60HZ, panelboard shall be provided for both the supervisors booth and the observation mezzanine (when applicable).

8.3.3 Conduits

- A. Wiring shall be in rigid metal conduit above ground and GRS PVC coated conduit underground. All above ground conduit shall be mounted as high as possible above finish floor elevation to prevent tampering or vandalism. All below ground conduits shall be marked with a warning tape located 1 foot above the conduit duct bank.
- B. All spare conduit(s) pull rope(s) shall be labelled with a permanent metal tag at each end of the conduit, identifying the conduit number and termination points of said conduit. Each spare conduit(s) shall be capped or plugged. If junction boxes are required in conduit run, spare conduit(s) shall be plugged in each box.
- C. Two 4-inch conduits shall be provided for the main power service. Conduits shall be run from electrical providers outlet location to the service disconnect switch location on the outside of the back wall of the utility building. One of the 4-inch conduits shall be a spare.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. All electrical distribution shall be distributed through conduit duct banks, encased with red concrete. Each conduit duct bank shall contain 25% spare conduits, with a minimum of one (1) spare conduit.
- E. Provide one (1) 1 ½" spare electrical conduit in each of four (4) different columns of the passenger shelter. Conduits shall be stubbed-up at top of columns and in the electrical room of the utility building.

8.3.4 Underfloor Duct System

- A. Provide a 3-duct underfloor duct system at the passenger shelter floor. One duct will be for power, one for telephone, and one for electronic information. Provide three empty conduits from underfloor duct junction box to the Utility Building. Conduits shall be 1- 1/2 inch for power and 2-inch each for telephone and electronic information. Conduits for SC&C equipment including power shall terminate in the SC&C room of the utility building.

8.3.5 Corrosion Prevention

- A. Electrical design shall minimize corrosion. Contact between dissimilar materials shall be prevented. Disconnect switches, cabinets and panelboards installed outdoors shall be of stainless steel mounted on stainless steel brackets with stainless steel bolts and nuts.

8.3.6 Grounding

- A. An equipment-grounding conductor sized in accordance with the NEC shall be provided in each feeder and branch circuit conduit. Electrical system neutrals, lighting fixtures, receptacles, metallic raceways, and equipment frames shall be grounded using the grounding conductor.
- B. Provide a grounding conductor within the SC&C room for the telephone patch panel and SC&C equipment.
- C. All chain link fences and gates shall be grounded to ground rods spaced not greater than 200 feet apart.
- D. All light poles shall have a ground wire tied to a ground rod (see METRO's standard detail for light poles).

8.4 ELECTRICAL DISTRIBUTION

8.4.1 Observation Mezzanine

- A. Electrical distribution shall be provided for lighting, AC/heater, wall-mounted heater, SC&C and receptacles. Provide NEMA junction box located under the observation mezzanine's floor structure.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

8.4.2 Supervisor Booth

- A. Electrical distribution shall be provided for lighting, AC/heater and receptacles.

8.4.3 Utility Building

- A. General
 - 1. AC/heater shall be provided for the entire Utility Building. Electrical service shall be hardwired. The MEP Consultant shall determine the location and size of AC/Heater unit.
- B. Outside
 - 1. Lights shall be provided near each doorway and shall be activated by security photocell and time switch.
 - 2. Provide an electronic lock with card reader at the restroom door. Controller to be located within the SC&C room adjacent to the telephone backboard. See specification 08710 for details.
 - 3. Irrigation controller shall be located on the backside of the utility building. Controller to be hard-wired.
- C. Restroom
 - 1. Ceiling lights and exhaust fan shall be controlled by same sensory/timer switch located near door. Maximum time on timer shall be 30 minutes.
 - 2. Electric hot water heater located under sink.
 - 3. Hand dryer located near sink to be hardwired.
 - 4. Two (2) GFI receptacles, one (1) near the door and the other near the sink.
- D. Electrical Room
 - 1. Ceiling lights should be controlled by switch located near door.
 - 2. One (1) GFI receptacle located near the door and one (1) other receptacle for maintenance.
- E. SC&C Room
 - 1. Ceiling lights should be controlled by switch located near door.
 - 2. One (1) GFI receptacle located near the door, two (2) receptacles located on either side of the telephone backboard, one (1) receptacle located near the electronic card reader (for restroom door), and one (1) additional receptacle for maintenance. All future outlets for SC&C equipment shall be installed with the SC&C equipment.

8.4.4 Bus Canopy/Platform

- A. Receptacles
 - 1. Provide GFIC, duplex, 120 volt, receptacles with weather resistant cover plates, for maintenance. Receptacles shall be located on top of columns or in columns at 8 feet above the finished floor elevation of the bus platform. Receptacles shall be spaced no more than 100 feet apart.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

2. Provide four (4), GFIC, 120 volt, vertical flush mounted receptacles in tamper proof boxes for vending machines. Also provide one (1) 240 volt and one (1) 120-volt flush mounted receptacles in tamper proof boxes for concessions vendor. Architect to locate vending machines and concessions vendor on platform.

B. Lighting

1. Provide 1/3 of the canopy lights on separate circuit for security, with photocell, HOA switch and time switch. Photocell to be located under the canopy.
2. Provide 2/3 of the canopy lights on separate circuits from security circuit. Provide photocell, HOA switch and time switch.
3. Use high efficiency/Energy Star fixtures.

8.4.5 Parking Lot and Perimeter

A. Parking lot lights

1. Parking lot lights shall be designed so that a minimum of 1.0 foot-candles will be provided with any one circuit out.
2. Provide 1/3 of the parking lights on separate circuit for security, with photocell, HOA switch and time switch.

B. Pylon Lighting

1. Ground mounted lights shall be provided on all four sides of pylon. Lights are to be concrete-encased and should be located 3 inches above the final grade.

8.5 LIGHTING

8.5.1 Objective

- A. Lighting shall be adequate to provide a sense of amenity, comfort, safety and security to patrons, safe movement of traffic, satisfactory vision for pedestrians and guidance for vehicles and pedestrians.
- B. Entrances to facilities shall be illuminated for ready identification of the facility by providing a minimum of twice the minimum foot-candle level specified for the parking area, see Section 8.5.6 for illuminance levels.
- C. Lighting shall illuminate signage for easy reading.
- D. Spillage of light to areas adjacent to METRO facilities shall be prevented.
- E. Use lighting products that produces white light, which aids in the recognition of persons and activity. In most cases, metal halide is desired but other types like fluorescent and LED may be considered as approved by METRO.

8.5.2 Calculations

- A. Lighting calculations shall be in accordance with the requirements of the

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Illumination Engineering Society of North America (IES) Lighting Handbooks (application and reference volumes) latest editions.

8.5.3 Printouts

- A. Computer electronic printouts indicating illumination levels in maintained foot-candles, or its equivalent in initial foot-candles including light loss factors, shall be provided.
- B. Provide METRO with electronic printouts, showing foot-candle levels, with different circuits out (see Section 8.5.8 Circuiting).

8.5.4 Luminaries

- A. Luminaries shall be selected to enhance the appearance of the facility and shall harmonize with the architectural style of the facility.
- B. All luminaries shall be made in the USA, with parts distribution outlets within 50 miles of Houston.
- C. Luminaries for parking areas, drop-off areas, bus loops, ramps, entrances and exits shall be metal halide, 400W, 480V, mounted on poles.
- D. Each luminary shall be protected by in-line fuses. In-line fuses shall be accessible by access panel, located at the base of each pole.
- E. Luminaries in passenger shelters shall be commercial type, metal halide, 250W, 277V. Luminaries shall be mounted to prevent swaying due to wind.
- F. Luminaries for pylon signs shall be pad mounted, 3 inches above ground, cast bronze with incandescent, spot krypton KR-38, 250W, 120V lamps.
- G. Luminaries for low ground signs shall be incandescent or metal halide.
- H. No landscape lighting shall be included in the facility.

8.5.5 Lighting Poles

- A. Lighting poles shall be of steel, square non-tapered section and shall have a maximum length of 35 feet in parking areas; drop-off areas; ramps; entrances/exits, and a maximum length of 20 feet in; bus loops; and within 35 feet radius of the passenger shelter.
- B. Steel poles shall be hot-dip galvanized with no paint finish.
- C. Elevation of each concrete base shall be indicated on the drawings. Concrete bases for lighting poles in parking lot or narrow landscaped areas, where subject to vehicle impacts, shall be 2 feet 6 inches above the pavement. Concrete bases for lighting poles in landscaped areas or where protected from vehicle impacts by curbs, shall be 3 inches above landscaped area.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- D. Center of pole shall be located not less than 3 feet from back of curb.
- E. Lighting poles shall be located using coordinates shown on the drawings and identified by numbering P1, P2.
- F. All lighting poles shall have Kellems wire grips installed at the top of the poles to hold wiring to lamps.
- G. All three (3) phase service to lights shall be color-coded; brown, purple and yellow, and continue to the light fixture.
- H. Provide a minimum of 1 inch clear space between lighting pole base and concrete footing.

8.5.6 Illuminance

- A. Calculated illuminances shall be as follows:
 - 1. Maintained minimum at any point at the following areas:
 - a. Parking 1.5 to 2.0 foot-candles
 - b. Drop-off 3.0 to 4.0 foot-candles
 - c. Parking for Handicapped 3.0 to 4.0 foot-candles
 - d. Entrances and Exits 3.0 to 4.0 foot-candles
 - e. Bus Loops, Ramps & Access Roadways 1.0 to 1.5 foot-candles
 - 2. Average maintained:
 - a. Platform Shelter 10.0 to 12.0 foot-candles
 - 3. Light loss factors:
 - a. Metal Halide, 250w 0.75
 - 4. Uniformity: Illuminance values for all areas, except under the passenger canopy, shall not exceed the following ratios:
 - a. Average-to-Minimum 2.5:1
 - b. Maximum-to-Minimum 5:1
 - c. Average Deviation 33% max

8.5.7 Controls

- A. Parking area luminaries, (including drop-off, parking for handicapped, entrances and exits, bus loops, ramps and access roadways) and pylon and low ground signs luminaries shall be turned on by a photocell and turned off by a time switch. Provide hand-off-auto selector switch to override system.
- B. Pedestrian canopy luminaries shall be controlled independently of the parking area.
 - 1. 2/3 of the luminaries shall be turned on by photocell, located under the pedestrian canopy and turned off by a hand-off-auto (HOA) selector switch or time switch.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

2. 1/3 of the luminaires & the outside lights of the utility building shall be controlled by the photocell only (labeled Security). Provide HOA selector switch to override system.
- C. Time switches shall be intermatic, electronic, programmable, full-year, 2 channel type.

8.5.8 Circuiting

- A. Passenger canopy luminaires shall be connected to a minimum of three circuits in order to provide for partial, uniform illumination if one circuit fails.
- B. Pole-mounted luminaires shall be circuited such that if a circuit fails the entire area will still have a minimum of 0.5 foot-candles of illumination.

8.6 LIGHTING PROTECTION

- A. A passenger shelter lightning protection system shall be provided in accordance with NFPA 78, LPI and UL-96A.
- B. Air terminals shall be solid copper, except where in contact with aluminum roofing or galvanized steel then they shall be aluminum, nickel-tipped, minimum 1/2" diameter & 18" long.
- C. Roof conductors shall be bare stranded copper except on aluminum roofs or in contact with galvanized steel where roof conductor shall be of aluminum. Roof conductor size shall indicate number and size of strands, weight per length and cross sectional area.
- D. Down conductors shall be No. 2/0 AWG copper in 1-inch PVC conduit embedded in concrete columns. Down conductors shall be connected to the reinforcing steel member at its upper and lower extremities and to the grounding loop conductor by exothermic welding covered with waterproof coating.
- E. Ground loop shall be No. 2/0 AWG copper stranded conductor installed 2 feet beyond the passenger canopy and 2 feet below grade.
- F. A minimum of two test wells evenly spaced shall be provided along the ground loop.
- G. Roof penetrations for lightning rods shall be coordinated with roofing manufacturer.
- H. Design for Construction Contractor to provide METRO with UL Master Label.

8.7 TELEPHONE SYSTEM

8.7.1 Requirements

- A. The telephone company providing service will install all wiring, patch-panel and pay telephones.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- B. Consultant shall design conduit system along with panel backboard to serve METRO's telephone requirements and shall comply with the telephone companies design requirements.
- C. Service location and data statement shall be coordinated through METRO's Project Manager.
- D. Park and Ride and Transit Center facilities require phones in the supervisor booth, observation mezzanine, SC&C room and public phone(s) located on the bus platform.
- E. All conduits shall have pull ropes. Pull ropes shall be labeled with a permanent metal tag at each end of conduit, identifying the conduit number and termination points of said conduit.
- F. All spare conduits that stub up shall be capped. All spare conduits in handholes or manholes shall be plugged. Conduits for telephone company installation shall be taped closed to prevent foreign objects from getting into conduits.

8.7.2 Service

- A. Two 2-inch conduits shall be provided from the telephone service location to the telephone patch panel backboard. One of the 2-inch conduits shall be a spare. Conduits shall be located 6-inches off the wall directly below the backboard and stubbed up 6-inches above finish floor. Conduits shall be encased in cement stabilized sand. Both conduits shall have pull ropes installed with the spare conduit being capped off at both ends.
- B. Patch panel backboard shall be located in the SC&C room of the utility building. Backboard shall be constructed out of 4' x4'x3/4" plywood, painted and attached to wall.
- C. Grounding provisions shall be provided at the backboard.

8.7.3 Utilization

- A. Two 1-inch conduits from the telephone backboard, stubbed up at all telephone locations. One of the 1-inch conduits shall be a spare.
- B. Two 1-inch conduits from the telephone backboard, stubbed up at the top of a canopy column for future use.
- C. For public telephone information, see Section 5.5.2.
- D. One 1-inch conduit from the SC&C electric panel shall be provided to all pay telephones located on the platform for telephone lights.

8.8 SURVEILLANCE, COMMUNICATIONS AND CONTROL (SC&C)

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

8.8.1 General

- A. These criteria describe the design requirements for empty conduits and underfloor duct for future installation of equipment and wiring for SC&C which consists of Electronic Information Systems (EIS), Closed Circuit Television (CCTV), Fiber Optics Interface, and Automated Barrier Gate Control (ABGC).
- B. Coordinate location of conduits and under-floor ducts with METRO. When ties to TxDOT fiber optic backbone are required, METRO tie will need to be coordinated with TxDOT.
- C. Signal and Power wiring shall be installed in separate conduits, under-floor boxes and pull boxes. Individual conduit or under-floor duct shall carry signal wiring for one signal system only. Signal conduits for more than one system may share the same pull box. Signal and Power conduits shall be encased in cement stabilized sand with a minimum separation of 6 inches.
- D. Conduit runs should be made as direct as possible. Conduit runs should be designed for pulling tension of 600 pounds for fiber optic cable. When required, junction boxes shall be used. Junction boxes shall be provided at all gate and camera locations both present and future locations. Maximize radius where possible. Minimum radius shall be 18 inches unless approved in writing by METRO.
- E. Future camera's, automated barrier gate controls, call boxes and other SC&C devices requiring electrical distribution shall be determined by the SC&C Consultant. Group all electrical conduits into duct banks as much as possible. Provide separation between electrical and communication/video cabling. SC&C electrical conduits shall be located below the electrical panels located within the SC&C room. Communication/video cabling conduits to be stubbed up in the SC&C room located under SC&C backboard.
 - 1. The number of cameras and locations are to be determined by the SC&C Consultant.
 - 2. At each gate location, provide conduits for future call boxes inside and outside the fenced area. The exact location and style are to be determined by the SC&C Consultant.
 - 3. SC&C Consultant to identify any additional power distribution needs.
- F. All SC&C conduits shall be encased in cement stabilized sand. Each conduit duct bank shall contain 25% spare conduits, with a minimum of one (1) spare conduit.

8.8.2 Electronic Information System (EIS)

- A. Generally there will be one kiosk for every two bus bays. Provide 1-1/2 inch conduits for power and 2-inch conduits for signal from the SC&C room of the Utility Building to the passenger shelter as follows:
 - 1. Where locations of electronic information kiosks are known, provide one

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

conduit for power and one for signal at each kiosk location. Conduits shall be terminated in threaded plugged conduit flush with finished floor.

2. Where locations of electronic information kiosks are not known, provide one under-floor duct for power and one for signal at locations determined by METRO. Provide power and signal conduits to under-floor ducts.
3. Provide one power conduit and one-signal conduit stubbed-up 3 inches from the top of each of two columns located at approximately one-third the length of the shelter from each end.

8.8.3 Closed Circuit Television (CCTV) Cameras

- A. For future installation of CCTV cameras under the pedestrian canopy, provide from the SC&C room one 1- 1 ½" power conduit and one 1 ½" signal conduit stubbed-up 3 inches above the top of two columns located at two opposite corners of the platform. Where platforms have more than five (5) bays on one side, provide an additional power and an additional signal conduit to the top of a column located near the middle of the platform. Provide a weatherproof junction box at the end of each power conduit. Provide a separate circuit for each CCTV camera location. Load will not exceed 100 watts per location. Minimum conduit bend radius shall be 36 inches, with a maximum of 180 degrees total bends between junction boxes.
- B. For future installation of CCTV pole mounted cameras in the parking lot area, provide one 2-inch power conduit and one 2-inch signal conduit from the SC&C room to each location. Conduits shall terminate in pull boxes located within 5-feet of the camera pole location. Coordinate with METRO locations of future CCTV camera poles and conduit runs. Minimum conduit bend radius shall be 36 inches, with a maximum of 180 degrees total bends between junction boxes. Provide for an electrical circuit for each camera location.

8.8.4 Fiber Optics Interface

- A. Generally METRO's facility will be tied to TranStar via fiber optics. Most Park & Ride facilities are located along TxDOT's right-of-way (ROW) and will utilize the TxDOT's fiber optic cable. Other facilities will utilize either RCTSS fiber or leased fiber generally accessible at nearby street ROW. METRO shall review each facility on a case-by-case study, to determine the use of TxDOT or RCTSS fiber, and will coordinate with TxDOT or RCTSS for use of that fiber.
- B. For facilities located adjacent to the TxDOT ROW, provide two (2) 4-inch conduits with inner ducts from the SC&C room to TxDOT's hub building located in TxDOT's ROW or terminate at the property line. All other facilities not adjacent to TxDOT ROW shall have two (2) 4-inch conduits with inner ducts from the SC&C room to METRO's property line.
- C. At METRO's property line provide a 48 inch by 48 inch by 36 inch deep pull box.
- D. Design conduit runs so that fiber optic cable pulling tensions do not exceed 600 psi. Minimum conduit bend radius shall be 36 inches.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

8.8.5 Automated Barrier Gate Controls (ABGC)

- A. All entrance and exit points to the facility shall have sliding aluminum gates with the ability to have ABGC. These actuators are electrically operated, locally and remotely.
- B. Provide one 2-inch power conduit and one 2-inch control conduit from the SC&C room to each gate location. Place junction box on gate side of drive located within METRO's property.
- C. If a new HOV lane access point is created ABGC will be required to prevent access to HOV lanes during non operation hours, and to prevent wrong-way traffic. Access control should be coordinated with METRO and TxDOT.

8.8.6 Pedestrian Barrier Gate Controls

- A. Provide a junction box located within 5-feet of the pedestrian gate. 1-1 1/2" power conduit and 1-1 1/2" communication conduit shall be provided from the nearest gate junction box for routing back to the SC&C room.
- B. From the pedestrian junction box provide one (1) - 3/4" power conduit and one (1) - 3/4" control conduit from the gate junction box to the access gate latch post. Stub conduits up 3-inches and cap. Locate within the concrete mow strip.

8.8.7 Call Boxes

- A. Call boxes will be provided at all vehicle and pedestrian access points. Provide one 3/4-inch power conduit and one 3/4-inch communication conduit for emergency call boxes. Conduits to be stubbed up at preferred call box locations. Electrical conduits shall come from electrical panel in SC&C room and communication conduit shall come from the communications panel board. Coordinate with METRO's Project Manager.

8.8.8 Observation Mezzanine

- A. Design of the underground system shall be such that the SC&C system can be fully monitored and operated from the observation mezzanine.
- B. Provide three (3) – 2" communication/video conduits from the SC&C room to the observation mezzanine (when applicable). Conduits shall terminate under the observation mezzanine in a NEMA junction box. Mount junction box approximately 12-inches above the concrete slab.

END OF SECTION 8.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

9.0 FARE COLLECTION

9.1 BACKGROUND

- A. The fare collection structure for METRO consists of a cash transaction component and a smart card component known as a Q-Card. Patrons may pay fares through use of the Q-Card, acquired from a variety of sites throughout the region, or with cash. The patron may also add additional value to their Q-Cards at Cashless Point of Sell (CPOS) devices, located on the Park & Ride and Transit Center facilities.
- B. The CPOS units are linked to METRO's Central Management System and Revenue System through the communications network. This link provides real-time communications for credit/debit card transactions.

9.2 SITE PREPARATION DESIGN

- A. The Designer shall include in the design, electrical and telecommunications corrections on the platforms or on other agreed-upon locations for the CPOS. The Designer's installation and integration plan shall provide real-time links to the METRO Revenue System Servers.
- B. Conduits shall be used to provide power and communications cabling to the CPOS. The conduits must meet all local electrical code requirements.

9.2.1 Power

- A. Each CPOS requires its own dedicated 20-amp circuit with one hot conductor, one neutral conductor, and one ground conductor. The wire size must conform to the electrical code requirements, with a 3 foot service loop at the CPOS location.

9.2.2 Communications

- A. Each CPOS will require a dedicated network termination point or termination to an A.S. (Assist Station) Phone, if it is within 5 feet of the CPOS.

9.3 Design Considerations

- A. The preferred location for fare collection equipment shall be a well-illuminated high activity area with consideration of not obstructing visibility from offsite vantage points. The equipment shall be under security camera surveillance and monitored from Police Dispatch.
- B. The equipment shall be vandal resistant and equipped with tamper and intrusion detection alarms. These alarms shall be annunciated at Police Dispatch.

END OF SECTION 9.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

10.0 SECURITY

10.1 INTRODUCTION

- A. The criteria in this section describe the minimum design requirements for mitigation of security risks to passengers, employees, contractors, and other members of the public who may come in contact with the METRO Park & Ride and Transit Center facilities. Security risks include (but are not limited to) acts of terrorism, crimes and vandalism against persons and property committed on transit property.
- B. The criteria described in this chapter are written to be complementary to all other security requirements contained in this document.

10.2 ACRONYMS AND DEFINITIONS

- SECURITY CAMERA - Internet Protocol; Video (IPV)
- CFR - Code of Federal Regulations
- FTA - Federal Transit Administration
- NEC - National Electrical Code
- PA - Public Address System
- EAS - Emergency Assistance Station
- OCC - Operation Control Center
- MPD - METRO Police Department

10.3 GENERAL REQUIREMENTS

The most current versions of the following documents shall be reviewed for all applicable codes and recommendations, which must be incorporated into security design for each Park & Ride and Transit Center facility:

- Code of Federal Regulations (CFR), Title 49, Section 659.333 et seq. Security Requirements for State Oversight
- Federal Transit Administration – Handbook for Transit Safety and Security Certification, November 2002
- Federal Transit Administration – The Public Transportation System Security and Emergency Preparedness Planning Guide, January 2003
- Federal Transit Administration – Perspective on Transit Security
- Federal Transit Administration – Transit Security Handbook, May 1998
- Federal Transit Administration – Transit Security: A Description of Problems and Countermeasures, March 1997
- Federal Transit Administration – Transit Security Procedures Guide, November 1997
- Federal Transit Administration – Transit System Security Program Planning Guide, November 1997
- Federal Transit Administration – Recommended Emergency
- National Parking Association, Security Design for a Parking Facility, September 2002
- Transit Cooperative Research Program (TCRP) Synthesis 21, Improving Transit Security, 1997

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- Transit Cooperative Research Program (TCRP) Synthesis 27, Emergency Preparedness for Transit Terrorism, 1997
- National Fire Protection Association, Standard 130

10.4 ADDITIONAL GENERAL SECURITY DESIGN REQUIREMENTS

- A. The following general security principles shall be adhered to in the design of METRO Projects:
1. The principles of Crime Prevention Through Environmental Design (CPTED) shall be employed in the physical design.
 2. Security vulnerabilities shall be systematically identified and evaluated
 3. A systems approach shall be used in the design of security related countermeasures.
 4. Security vulnerabilities shall be minimized through design, to the extent possible.
 5. Security systems shall be integrated, for example, security cameras with intrusion detection.
 6. Materials used in transit stations and other passenger waiting areas shall minimize injury severity to transit customers or personnel or damage to facilities/equipment as a result of a security incident, i.e. extensive spans of glass.
 7. A layered approach shall be used in controlling access to restricted areas.
 8. To the extent possible, facilities shall be hardened to minimize the potential damage from acts of terrorism.
 9. Redundancy of security critical systems shall be considered and implemented wherever possible.
- B. A comprehensive set of security deployment standards must be established and provided to METRO. The standards and corresponding design shall support video surveillance and emergency phones with automatic notification. They shall also support video response from local cameras to allow situation awareness for TranStar Watch Command, such that appropriate responses may be issued. The deployment standard and corresponding design must provide for and extend to perimeter fencing. These standards must be approved by the contractor's CPTED certified specialist(s) as well as METRO.
- C. The design shall support the following requirements, applicable to all electronic security devices (e.g. video surveillance cameras):
1. All devices must be fully integrated with existing METRO centralized monitoring and/or alarm systems. This includes (but is not limited to) required network device additions/modifications and any associated UI and database updates to be made to existing control software.
 2. All electronic security devices and any required interface devices utilized must meet or exceed the technical specifications of the most modern of equipment currently in use across the METRO system. The technical specifications to be considered for each element shall be determined by METRO and shall not be limited to Park & Ride and Transit Center facilities (e.g. existing cameras at rail stations may be identified

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

by METRO as having the minimum acceptable specifications). Additionally, all devices installed must be fully compatible with currently existing METRO equipment.

- D. Ample signage shall be included throughout the facility that indicates the presence of applicable security elements on site as deterrents to potential perpetrators.
- E. The final security system design must be reviewed and formally approved by the contractor's CPTED certified specialist(s) as well as METRO.

10.5 SITE REQUIREMENTS

While no single design feature can be totally effective in creating a secure environment, careful attention to all aspects of the design can have a positive effect in deterring, detecting, and limiting injury and damage caused by criminal activities. The cumulative effect of the following design features is to enhance security as viewed by transit customers and operating employees or contractors.

10.5.1 Site

10.5.1.1 Landscaping

- A. Plantings and site design may offer considerable aesthetic appeal, but can also restrict lines of sight and serve as possible hiding places. At a minimum, plantings and design features shall be coordinated with lines of sight so as not to obstruct or interfere with electronic or visual surveillance or result in a potential hiding place for criminals, vandals, or intruders.
- B. Landscaping may be used, where appropriate, to direct the movement of people or keep people away from an area. Consideration shall be given in the selection of plants that will not cause sight obstructions when mature.

10.5.1.2 Lighting

- A. The selective use of lighting can increase the perception of security while providing better visibility of the surroundings. Lighting shall (at a minimum):
 - 1. Support security camera surveillance.
 - 2. Be underground and have tamper resistant conduits and fixtures if within reach of the public.
 - 3. Be supported by an emergency power supply system or on a redundant independent power grid.
 - 4. The illumination of station elements shall be guided by Fire/Life Safety requirements.
 - 5. Emergency power and lighting requirements shall be developed as part of the overall security and safety requirements.
 - 6. Emergency lighting systems shall be designed, installed and maintained in accordance with the National Electrical Code, Article 70.
- B. Further lighting requirements are found in section 8.5 and throughout this design criteria document.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

10.5.1.3 Parking

- A. Transit customers have a concern for the security of their automobiles when left at a Park & Ride site. Protected parking (when provided) enhances the reality and customers' perception of security. At a minimum:
 - 1. Camera surveillance shall be provided that includes complete interior and perimeter coverage. The designer along with a MPD representative shall determine where the PTZ and fixed cameras will be positioned.
 - 2. Entrances and exits shall be limited so as to control entry/exiting from the parking area. Gates shall be controlled remotely from TranStar via the fiber backbone to the Operations Control Center (OCC).
 - 3. Parking lots shall be fenced, where appropriate, and open-spaced to provide a high degree of visibility by passers-by and roving law enforcement personnel. It shall be designed to maintain natural surveillance (openness) and territorial reinforcement.

10.5.1.4 Access

- A. A carefully planned, well-laid out entrance site and parking area can improve the movement of security forces in and around the facility site. As a minimum, traffic patterns and site layouts shall be structured to permit rapid and easy access to all portions of the site by law enforcement personnel, whether on foot or by vehicle. All portions of the interior of the facility shall be accessible to emergency personnel, with the use of a master key system.

10.5.2 Architectural Features

10.5.2.1 Visibility

- A. By making customers more visible to one another, to operating employees, and to the general public, much of the opportunity for criminal activity is removed. Should criminal activity occur, the high visibility facilitates detection and rapid response by law enforcement personnel. At a minimum:
 - 1. All levels of the public areas shall be as open as possible with long, unbroken lines of sight, eliminating all dark or obscure areas.
 - 2. Columns and other structures shall be kept to a minimum so as not to impair sightlines within the station areas.
 - 3. Obstructions to visual and electronic surveillance shall be minimized.
 - 4. Horizontal surfaces and "shelves" shall be sloped so as not to permit the placement of packages or other objects.
 - 5. Special attention should be paid to areas where there are changes from one area to another. Avoid 90° corners by angling corners where possible.
 - 6. Entrances shall be readily identifiable.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

7. MPD Police dispatch phone number shall be clearly posted in the boarding and fence gate entrances.

10.5.2.2 OCC and METRO Police Dispatch

- A. Any electronic security components furnished shall be compatible with and fully integrated into the appropriate existing METRO systems. The existing system shall be extended by the contractor as necessary to accomplish this. A non-exhaustive description of such expected functionality is described below.
- B. The METRO Police Dispatch functions are the focal point for the transit security system. Telephone messages, annunciations, and alarms come into the OCC and appear on a display monitor. In this manner, those individuals responsible for the safe, secure operation of the transit system are continuously aware of the status of all elements on a realtime basis. For security purposes, terminal usage shall be controlled through the use of multi-level passwords.
- C. The computer terminal support software shall provide accounting records for computer terminal usage and computer processing times for each user session, including user logon and log-off times. The records shall be kept by user identity keys and terminal access codes, and shall be available for output to user-selected printers and predefined auxiliary memory files. Minimum considerations are as follows:
 1. The OCC and METRO Police Dispatch shall be able to receive intrusion alarms and trouble signals from wayside facilities and stations.
 2. Separate radio frequencies shall be designated for METRO Police Services.
 3. Communication systems shall be interoperable with METRO Department of Public Safety, METRO Bus and Rail Operations.
 4. All security cameras shall be monitored primarily at METRO Police Dispatch and secondarily by OCC or other suitable location with an attendant.
 5. Security camera monitoring locations shall have security camera call-up capability to monitor any security camera.

10.6 COMMUNICATIONS AND SECURITY

10.6.1 Security Cameras

- A. Complete electronic surveillance is required and fully integrated with existing METRO centralized monitoring and/or alarm systems. Minimum requirements listed in Section 10.4 C with regards to integration and components utilized apply to the security camera system.
- B. The security camera system shall be designed with the following minimum considerations in addition to those already mentioned or recommended/required by CPTED and/or the documents listed in Section 10.3:

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

1. PTZ cameras with overlapping or 360° capabilities shall be used. Cameras shall be strategically positioned. MPD shall approve locations of all cameras.
2. Security cameras shall be encased in vandal and weather resistant housings. Lenses shall be easily replaceable with the proper tools.
3. Cameras shall be mounted as high as possible to maximize the field of view and reduce accessibility by vandals.
4. The security camera system shall have digital video recording capability with 72 hour storage, based on first in/first out.
5. Camera monitors shall function for a minimum of two (2) hours on emergency power during loss of primary power.
6. Security cameras should have a dark or reflective tint to conceal the direction of the lens focus.

10.6.2 Intrusion Detection System

- A. An intrusion detection system shall be provided to protect against unauthorized entry into sensitive areas, including:
 1. CPOS equipment
 2. Utility Building
 3. Critical asset areas as determined by a security risk assessment
- B. Signals from individual detectors shall be sent to all METRO centralized monitoring facilities for annunciation and alarm.

10.6.3 Emergency Assistance Stations (EAS)

- A. Security is improved when a patron reports potentially hazardous or serious conditions quickly and easily. As a minimum:
 1. All EAS messages answered at the METRO Police Dispatch shall be automatically recorded. The EAS answering positions shall provide a means to record emergency calls.
 2. Means shall be provided for establishing two-way voice communications or hearing impaired message transmission between METRO Police Dispatch personnel and customers located at selected points. At a minimum, these means shall be provided at selected fare vending areas, on the passenger loading areas, and parking facilities. The EAS shall function on emergency power during loss of primary power.
 3. Direct-line telephone communications with the dispatch facilities of all emergency service organizations serving the transit system shall be provided at METRO Police Dispatch.
 4. The design shall include failure detection and analytics. If any component (sound, connectivity, and video) fails the system shall automatically notify OCC and METRO Police Dispatch.
 5. All EAS stations shall be equipped with blue lights.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

10.6.4 Public Address and Passenger Information Signs (PA/PIS)

- A. The PA/PIS is an added layer of security letting patrons know an area is being visually monitored remotely by METRO Police by announcing and displaying specific and random announcements. The system shall be capable of performing the following functions:
1. The system shall allow audible and visual messages from the OCC, and METRO Police Dispatch and from the local observation mezzanine and the supervisor booth.
 2. The system shall be integrated with current METRO's system for PA/PIS services.

END OF SECTION 10.0

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

APPENDIX A

CODES AND REFERENCE STANDARDS APPLICABLE TO THIS DESIGN CRITERIA

1. AASHTO: American Association of State Highway and Transportation Officials
 - a. Standard Specifications for Highway Bridges, Latest Edition including Supplementary Interim Specifications.
 - b. A policy on Geometric Design of Highways and Streets, Latest Edition.
2. ACI: American Concrete Institute
 - a. ACI 318: Building Code Requirements for Reinforced Concrete, Latest Edition.
 - b. ACI 318R: Commentary on Building Code Requirements for Reinforced Concrete, Latest Edition.
 - c. ACI 330R: Guide for Design and Construction of Concrete Parking Lots.
3. ADA: Americans with Disabilities Act
 - a. All METRO facilities shall be in compliance with the latest requirements.
4. AISC: American Institute of Steel Construction
 - a. Standard S326: Specification for the Design, Fabrication and Erection of Structural Steel for Buildings, Latest Edition.
 - b. M011: Manual of Steel Construction, Latest Edition.
5. ANSI: American National Standards Institute.
6. Architectural Barriers Act, Article 9102, Texas Civil Statutes
 - a. Texas Accessibility Standards, Latest Edition.
7. ASHRAE: American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc.
8. ASTM: American Society for Testing and Materials.
9. COH: City of Houston
 - a. Infrastructure Design Manual (July 2011) or latest edition.
 - b. Design Manual for Wastewater Collection Systems, Water Lines, Storm Drainage and Street Paving, September 1996, with Latest Revisions
 - c. Landscape Ordinance No. 91-1701, Latest Revisions.
10. COB: International Conference of Building Officials.
 - a. Uniform Mechanical Code, Latest Edition.
 - b. Uniform Plumbing Code, Latest Edition.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

11. HCFCF: Harris County Flood Control District
 - a. Policy Criteria & Procedure Manual (adopted Oct 2004 updated Dec 2010) or latest edition.
12. IEEE: Institute of Electrical and Electronics Engineers.
13. IES: Illuminating Engineering Society of North America.
14. LPI: Lightning Protection Institute.
15. MSS: Manufacturer's Standardization Society of the Valves and Fittings Industry.
16. National Electric Safety Code
17. NEMA: National Electrical Manufacturers Association.
18. NESC: National Electrical Safety Code.
19. NFPA: National Fire Protection Association
 - a. 70: National Electrical Code (NEC)
 - b. 780: Lightning Protection Code
20. NPDES: National Pollutant Discharge Elimination System
21. State of Texas
 - a. Texas Fire Escape Law (Vernon's Civil Statutes), Title 63, Articles 3955-3972.
 - b. Health and Safety Code Volume 2, (Vernon's Civil Statutes) Chapter 752, High Voltage Overhead Lines.
22. TxDOT: Texas Department of Transportation
 - a. Standard Specifications for Construction of Highways, Streets and Bridges, Latest Edition.
 - b. TMUTCD, Texas Manual on Uniform Traffic Control Devices for Streets and Highways, Latest Edition.
 - c. Texas Foundation Design Manual, Latest Edition.
 - d. Texas Bridge Design Manual, Latest Edition.
 - e. Texas Drainage Manual, Latest Edition.
23. Texas State Purchasing and General Services Commission, Building and Property Services Division.
 - a. Elimination of Architectural Barriers, 028.13.03.575-585 (referenced as Texas State Code in this Section).
24. UBC: Uniform Building Code
 - a. Uniform Building Code with City of Houston Amendments

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

- 25. UL: Underwriters Laboratory.
 - a. 96 Lightning Protection Components.
 - b. 96A Master Labelled Lightning Protection Systems, Installation Requirements
- 26. Uniform Federal Accessibility Standards, July 31, 1984, as amended and 36 CFR, Architectural and Transportation Barriers Compliance Board.
 - a. Part 1190: Minimum Guidelines and Requirements for Accessible Design.
- 27. Leadership in Energy and Environmental Design (LEED)
 - a. U.S. Green Building Council (USGBC)
 - b. Standard for the Design of High Performance Buildings, Standard 189.1

END OF APPENDIX A

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

APPENDIX B Park & Ride and Transit Center Program Design Criteria Variance Request Form

Variance #: _____

Project Name: _____

Contract Number: _____

Date: _____

Submitted By: _____

Name: _____

Firm: _____

Current Design Criteria for which variance is requested:

Chapter No.: _____ Page No.: _____ Section Title: _____

Briefly Describe Current Criteria:

Reasons for Change

☐ Life Cycle Cost

☐ Correction of Deficiency

☐ Interface

☐ Administrative

☐ Cost Reduction

☐ Regulatory Requirement

☐ Enhancement

Requested Variance from Current Design Criteria and Alternative Solution:

Note: *The following information must be provided before this variance request will be considered by METRO, also when referencing industry standards or practices all supporting documentation must be attached to this variance.*

Technical reason/justification for the requested change:

- 1) Describe the technical details why this variance is an appropriate design solution?

Safety implications - Provide a summary statement for questions below "In my/our professional opinion".

- 1) Will granting the variance be detrimental to the public health, safety or welfare or injurious to other properties in the area?
- 2) Describe how the proposed variance provides an equal to or greater safety factor than that of the design criteria.

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Park & Ride and Transit Center Program Design Criteria Variance Request Form

Variance #: _____

Cost analysis and/or life cycle cost analysis, schedule impacts: (attach life cycle cost analysis for every variance that would impact life cycle cost.) Provide a summary statement for questions below "In my/our professional opinion"

- 1) Any other relevant information necessary to properly evaluate the necessity and request for the variance.
- 2) Will granting of this variance improve the function of the intended use of this element and the project?
- 3) Describe why the proposed variance provides equal or adequate cost effectiveness.
- 4) Describe why the proposed variance will not adversely impact schedule.
- 5) Describe why the proposed variance will not adversely impact life cycle costs.

Disposition:

METRO use only

In order for an action to take place, ALL Committee Members must concur with decision of "approved" or "denied".

DESIGN CRITERIA FOR METRO PARK & RIDE AND TRANSIT CENTER FACILITIES

Park & Ride and Transit Center Program Design Criteria Variance Request Form

Variance #: _____

METRO Action: ☐ Approved ☐ Denied

Originator: _____ Date: _____

Engineer of Record: _____ Date: _____

Project Manager: _____ Date: _____

Safety: _____ Date: _____

Dir. Program Management
Support Services/Configuration Mgmt: _____ Date: _____

Sr. Dir./Chief Engineer: _____ Date: _____

Sr. Program Director: _____ Date: _____

Sr. Dir. State of Good Repair: _____ Date: _____

Sr. Dir. Bus Operations: _____ Date: _____

AVP Engineering
and Major Capital Programs: _____ Date: _____

End of Appendix B