

P A R K I N G G A R A G E
D E S I G N C R I T E R I A

MONTGOMERY COUNTY GOVERNMENT
Department of Public Works and Transportation
Division of Parking Management

REVISED: March 2018

FOREWORD

Montgomery County, through its Department of Transportation, Parking Management Division, owns and/or operates numerous public parking garages. These garages were designed and constructed under the direction of the County. Over the years, the County has gained considerable experience with parking garage design from facility operation and maintenance. The purpose of these design criteria is to summarize what we feel are the prerequisites for a garage design that will best meet our present and future needs.

This document, when adjusted to each site-specific parking garage, will form the primary means to convey our requirements to the consulting firms who will design the facility. Deviations from the criteria will be considered with adequate justification. The criteria will be revised periodically to keep pace with advances in the state-of-the-art equipments, construction methods, energy considerations and our own experience. Contractors and development partners are advised to check with MCDOT Parking Management for the latest revision prior to signing design or construction contractions or development agreements.

County's preferences:

1. Special consideration should be given when deciding upon an Above Ground Garage vs. an Underground public parking facility. This should include but not be limited to cost, water table, geology, zoning/height limitations, proximity of other buildings (and uses).
2. Concrete poured in place structure is preferred. Avoid using steel frame structure or precast 'Double T' structure.
3. Provide back-up generator powered by natural gas. The County can share this generator with other users in the building, provided clear division of maintenance costs and responsibilities are delineated in an agreement/contract.
4. Interior lighting of the parking garages to be LED and meeting industry standards on performance characteristic and in line with County codes.
5. Parking lot and the top level of parking: provide energy efficient and low maintenance lighting from reputable lighting fixture manufacturers, who are at least 10 years in the business. This is to ensure the procurement of future parts and replacement items.
6. Avoid using County's parking space for non-county uses such as grease interceptors, pumps, fans, telephone rooms etc. Any waiver for this requirement must be sought in writing and preferably included in the contract/agreement as applicable.

PARKING GARAGE DESIGN CRITERIA

Table of Contents

<u>Section</u>	<u>Title</u>
1	Code Requirements
2	Architectural
2.1	General
2.2	Garage Layout
2.3	Support Facilities
2.4	Safety and Security
3	Site Work
3.1	Demolition
3.2	Earthwork
3.3	Caisson Foundations
3.4	Asphalt Paving and Concrete Driveways
3.5	Landscaping/Streetscaping
4	Structural
5	Mechanical
6	Electrical
7	Parking Control System
8	Elevators
9	Paints and Coatings
10	Wayfinding and Signage
11	Car Counting System
12	Security System
13	Communications

Section 1 - Code Requirements

It is the policy of the Department of Transportation, Parking Management Division to comply with all applicable Federal, State, County, and Industry codes, standards, and regulations; hereinafter referred to as "Code Requirements," in the design and construction of Montgomery County Public Parking garages. When codes conflict, the most stringent code governs. This Section identifies the primary codes that are to be followed. The latest applicable County-adopted version of each code is to be used. Consultants employed by the County are responsible for complying with these codes and any others that may be applicable. Any conflicts among codes are to be promptly brought to the attention of the Division of Parking Management.

Special attention is directed at Montgomery County Special Inspections Program. These requirements focus on testing and inspection requirements during construction. They are to be considered as minimum requirements. The designer of record of each parking garage is to assure that a documented testing and inspection program is prepared and conducted. The project manual must reflect this program, including procedures to be followed if on-site test results determine that specification requirements are not being met.

Subsequent Sections of the Design Criteria make reference to various code requirements. This is done to clarify alternatives permitted by codes or emphasize specific requirements that may have been overlooked in prior garage designs.

CODES, STANDARDS, AND REGULATIONS APPLICABLE TO MONTGOMERY COUNTY PARKING STRUCTURES

The following identifies the primary codes, standards, and regulations and their authority of applicability to the design of parking structures under the jurisdiction of Parking Management Division, Department of Transportation, Montgomery County Government. Additional codes, standards, and regulations may apply.

CLASSIFICATION	TITLE	AUTHORITY
Building	o Montgomery County Building Code	Mont. County Code Chap. 8
	Existing Buildings	Sect. 8-7
	o Applicable Montgomery County & Maryland State Building Code	Montgomery County Reg.
	o Montgomery County Complex Structure. Req.	Montgomery County
	o Design Standards Dept. of Trans., Mont. County Govt.	Department of Transportation
	o American Concrete Institute Standards	Parking Management Division
	Specifications for Structure Concrete in Buildings ACI 301	
	Building Code Requirements for Rein. Concrete ACI 318	
	Recommended Practice for Concrete Formwork ACI 347	
	Guide for Shoring/Reshoring of Concrete Multistory Buildings	
o Prestressed Concrete Institute Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, MNL-116	Parking Management Division	

Erosion and Stormwater	o	Wastewater Discharge Regulations	Code of Md. Reg.
	o	Erosion and Sediment Control - Mont. County Chap 19, Art. I and Exec. Regulation 38-86	Mont. County Code
	o	Storm Water Management - Mont. County Chap 19, Art. II and Executive Regulation 37-86	Mont. County Code
	o	General Specifications for Water Mains, Sanitary Sewers and Storm Drains - Washington Suburban Sanitary Commission.	WSSC
Fire Safety	o	National Fire Codes and Standards National Fire Protection Association	Mont. County Reg.
		#10 Installation of Portable Fire Extinguisher	
		#13 Installation of Sprinkler Systems	
		#14 Installation of Standpipe and Hose Systems	
		#15 Water Spray Fixed Systems	
		#24 Private Fire Service Mains and their Appurtenances	
		#71 Installation, Maintenance, and Use of Local Protective Signalling Systems	
		#72A Installation, Maintenance, and Use of Local Protective Signalling Systems	
		#72B Aux. Protective Signaling Systems	
		#72C Remote Station Protective Signaling Systems	
		#72D Proprietary Protective Signaling Systems	
		#73E Automatic Fire Detectors	
		#80 Fire Doors and Windows	
		#88A Parking Structures	
	#90A Installation of Air Conditioning and Ventilating Systems		

- #101 Code for Life Safety from Fire in Buildings and Structures
- #110 Emergency and Standby Power Systems
- #231 Indoor General Storage
- #241 Safeguarding Building Construction and Demolition Operations

Handicapped

- o Nondiscrimination on the Basis of Disability by Public Accommodations and in Commercial Facilities 28 CFR Part 36
- o Americans with Disabilities Act Accessibility Guidelines; 36 CFR Part 1191
- o Building code making buildings usable by handicapped persons, State of Maryland Ann. Code of Maryland
- o Maryland Building Code for the Handicapped State of Maryland Code of Md. Reg.
- o Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People ANSI A 117.1 Code of Md. Reg.
- o Ramps or curb cuts required - State of Maryland Subtitle 5
- o Braille or raised print numbers required (in elevator.) State of Maryland Subtitle 5
- o Symbols required in certain facilities (parking) - State of Maryland Subtitle 5

Mechanical

- o The BOCA National Mechanical Code Building Officials and Code Administrators, IBC, or such other regulations as specified by Montgomery County Department of Permitting Services Mont. County Regulation

Plumbing

- o IBC, BOCA Basic Plumbing Code, or such other regulations as specified by Montgomery County Department of Permitting Services Mont. County Regulation
- o Washington Suburban Sanitary Commission WSSC
Regulations Governing the Installation of Plumbing, Gasfitting and Sewer Cleaning

	Grease Interceptor Details	Manual of Accepted Practices
Signage	o Manual on Uniform Traffic Control Devices U.S. Dept. of Transportation	Mont. County Code, Part II, Chap 31, Art. III, Sect. 31-10
Zoning	o Montgomery County Code, Part II	
	In General	Chap 59, Art. 59A
	Central Business District Zone	Chap 59, Art. 59C-6
	Zoning Districts - Approved Procedures	Chap 59, Art. 59D
	Off-Street Parking and Loading	Chap 59, Art. 59E

Section 2 - Architectural

2.1 General

1. The garage shall have an exterior architectural treatment that aesthetically blends with adjoining properties and is appropriate for the site. Parked vehicles shall be shielded from view as much as possible.
2. The garage shall be recognizable as a parking garage, either through design or signing.
3. The requirements of the Americans with Disabilities Act (ADA) shall be incorporated.
4. The garage shall park the specified number of cars and be designed for future expansion up to the maximum parking capacity permitted on the site by zoning regulations.
5. The design is to be highly efficient. Building corners and other space which cannot be used for parking shall be used for required stairwells, elevators, parking offices, storage space, etc. to the extent possible.
6. The design and material selection shall consider the need for ease of maintenance, economy, and long life.
7. The parking structure shall be designed in such a manner that there will be no discharge of storm waters off the exterior and interior edges of the elevated floors. The entire perimeter of each floor shall be sloped toward the interior to provide positive drainage. Water shall drain away from elevators and stairwells. Provide positive drainage on all levels (minimum 2% slope in all directions).
8. Heavy duty, UL fire rated metal doors with metal door frames shall be used throughout the building. Use of rust resistant material shall be considered.
 - a. Hardware shall be of a heavy duty type. High strength continuous hinges shall be used for stair tower doors.
 - b. Doors to office space, restrooms, storage rooms, and equipment rooms, accessible to the public, shall be lockable, using Medeco high security type lock cylinders, master-keyed to the Division of Operations lock system. Keying shall be coordinated with the Division of Operations.
 - c. Doors in stairwells shall have rectangular vision panels positioned to provide the best possible view of hiding areas within the stairwell.
 - d. Power-operated door equipment for handicapped use shall be used where directed by the County.
9. Hand and guard rails shall be constructed of aluminum or galvanized steel with a suitable architectural finish. Galvanized steel hand and guard rails shall be painted in accordance with Section 9 of the Design Criteria.
10. Suitable provisions for washing the exterior of window walls and other glass shall be included in the design. Provide adequate space between the elevator cab and the window wall for cleaning of

the glass, including glass wall on the cab.

11. Two illuminated flagpoles with a lockable internal halyard shall be installed.
12. The contractor shall be required to provide a small supply of bricks, floor tile, ceiling tile, and other material which may be difficult to match, if needed for repairs in the future.
13. Where raised areas are required at elevators and stairs, the platforms and sloping elements created shall be protected by the installation of hand rails. Platforms in front of elevators shall be a minimum of 10-feet from the elevator doors.
14. Stairwells shall incorporate the provisions of ADA for rescue assistance.
15. Protection of the structure from the activities of birds shall be incorporated as part of the design of the structure and architectural treatments. Passive means of excluding birds from perching and roosting is the preferred long-term solution. Other methods to discourage birds, such as screening, spiked strips and Adaddy long legs@ devices, may also be utilized.
16. Utility rooms should be laid out to ensure component are accessible by Maintenance Staff
17. Parking Guidance Systems are required and to be decided by Planning Unit
18. Revenue System required and to be decided by Planning Unit of Parking Management Division

2.2 Garage Layout

1. All parking spaces shall be accessible for self-parking, i.e. no spaces shall be "buried" or situated in such a manner to make it necessary to move another vehicle to utilize a parking space.
2. The design is to permit the alternative use of meter and operator-attended parking as described in Section 7, Parking Control System.
3. The preferred minimum vertical clearance for vehicles shall be 8'6" to the underside of any obstruction, with an absolute minimum of 7' 6", except a minimum of 8'6" shall be provided for routes to van accessible spaces. See item 14. A clearance bar shall be suspended at each vehicle entrance at a height such that its clearance height is equal to the minimum clearance anywhere in the garage. Signage shall indicate the minimum clearance.
4. Pedestrian safety at vehicular exit and entry points is paramount. Pedestrian access to the garage shall be provided at points along its perimeter which are convenient to pedestrian circulation. Pedestrian and vehicle conflicts at ingress/egress points shall be minimized.
5. Garage entrances shall preferably provide adequate reservoir space (five or six vehicles per lane), either inside or outside the structure, so entering vehicles do not block the movement of other traffic.
6. A layout that allows vehicles to travel in a straight-line path after passing the entrance control point is preferable to a layout that forces vehicles to turn immediately upon entering the garage.
7. The number of points of access shall be determined within the context of the functional design of the garage and the surrounding streets. Preference is to have multiple entry and exit points for

vehicle

8. The distance between exit control points and the intersection of the driveway and street shall be determined within the context of the functional design of the garage.
9. A straight path approach for cars approaching the exit control point from within the garage with allowance for queuing without interfering with parking or unparking operation is desirable.
10. The exit area shall have no visual obstructions and vision should be unimpeded as the driver exits.
11. The facility shall be designed so that the driver encounters a minimum number of restraints from the time of entry into the facility to the point of departure. Restraints at the point of entry may consist of inadequate access point definition, insufficient access lanes, conflicts with pedestrian traffic and low lighting levels. Within the structure, an inadequate or excessive number of vertical circulation travel circuits and search patterns, steep ramps, tight turns, sub-standard park/unpark geometrics, low lighting levels, excessive decision points and improper signing constitute restraints.
12. Design preference is for 90° parking stalls, 9' x 18' and a 24' minimum drive isle and end aisle width, except for garages serving retail where the space width shall be 10.0'. Bay widths shall be 62 foot face of column to face of column. End aisles must be designed to provide an adequate turning aisle radius, per item 21 below. Only "front in" parking will be permitted. Lines between stalls should fall on column lines. Generally, "small car" spaces are undesirable, except when located in odd spaces which cannot be designed for standard size stalls. Small car spaces cannot exceed 10% of garage capacity. Coordinate the location of standpipe systems with mechanical requirements to provide a 44-inch fireman's access space between parking stalls. Access areas shall be delineated by diagonal striping the accessway. Parking stall striping shall be in accordance with Figure 1.
13. Continuous ramps with parking are preferred. Maximum slopes shall be 5 percent for parking ramps, with 3 to 4 percent preferred. Ramps without parking shall not exceed 10 percent.
14. Stalls for handicapped accessible parking shall be grouped together and be located convenient to exit points, preferable at street grade level and not on parking ramps which exceed a 2% slope. However, the need to group the accessible parking in more than one location to meet ADA requirements must also be considered. The number and size of handicapped accessible parking spaces shall be as required by code. A 5' aisle is to be provided on both sides of each handicapped accessible parking space. One of every eight required handicapped accessible parking spaces shall be van accessible. An 8' aisle on at least one side of each van accessible space is required. The handicapped should not be required to walk behind parked cars. If this is unavoidable, a path shall be clearly marked with hash marks. All crosswalks shall be similarly marked. Each handicapped accessible parking space shall be marked with a MUTCD sign R7-8 and a sign "for tag or permit parking only." Van space shall be signed as van accessible. All van accessible spaces, and the route to these spaces, shall be provided with a minimum vertical clearance of 8'-2".
15. Provision shall be made for motorcycle and bicycle parking as required by code, with special reference to utilizing dead space and odd corners which would otherwise be unused. Cycle-Safe inverted "U" bicycle racks, or approved equal, shall be provided.
16. The perimeter of the parking area shall be lined with parking stalls to the maximum extent possible.
17. Curved, triangular and other irregularly shaped parking areas/structures shall be avoided.

Rectangular shaped facilities are desirable.

18. Traffic aisles shall be double-loaded serving parking stalls on both sides wherever possible.
19. Traffic aisles shall be aligned parallel to the long dimension of the parking areas wherever feasible.
20. Raised islands shall not be provided at the end of parking bays.
21. Turning radii on all ramps shall be adequate for safe circulation.

2.3 Support Facilities

1. Support facilities consist of a management/cashiering office, office space for future security monitoring, employee facilities, restrooms for employees' use, and storage rooms (including storage for sand and salt). Public restrooms shall not be provided.
2. The type of support facilities required for any given garage will vary with the type of operation of the parking facility. When certain types of support facilities are not initially required, the design shall consider the addition of certain support facilities in the future.
3. Support facilities shall be provided with thermostatically controlled heating, ventilating and air conditioning systems, except storage rooms for large quantities of bulk supplies, barricades, large items of equipment, etc. shall only be provided with heat and ventilation.
4. Provided a traffic bearing membrane system according to ASTM C957 on all slabs.
5. Restrooms, if provided, shall comply with facilities for the handicapped, as required by ANSI A117.1 Sect. 4.1-4.2.
6. Office space shall be provided with telephone service.
7. For cashiered managed operations, the office provided shall contain an 18' x 26' (minimum interior dimensions) C rated safe, securely fastened to the structure.

2.4 Safety and Security

1. Passive security techniques shall be considered.
2. The facility shall be designed for the future addition of an active security. Sleeves shall be placed in slabs and beams for future security conduits. Any concealed future security conduits shall be installed. DTSP will provide direction on a case-by-case basis.
3. Management/cashiering offices and cashiering booths shall be equipped with a security/alarm system.
4. Openings between garage levels in stairwells, elevator waiting areas, parking areas, etc. shall be designed or protected to reduce the likelihood of accidental falls.
5. Exterior walls, including roof parapets, shall be designed to reduce the likelihood of accidental falls

6. A non-slip coating system shall be provided on concrete floors in all major pedestrian areas within the facility (elevator lobbies, stairwell landings and treads, etc.). Color shall be selected by the Consultant with approval by the County.
7. The garage structure shall be sited so as to permit fire fighting equipment access.
2. The ground level floor shall be designed to limit access to designated points in the garage periphery.
9. All paths of pedestrian and vehicle circulation shall be well lighted.
10. Where feasible, stairwells shall be visible from the exterior and/or glass enclosed. Glass is to be replaceable from the inside of the stairwell.
11. Exit stairs that continue beyond the floor of discharge shall be interrupted at the floor of discharge by gates, doors, or other effective means, except exit stairs that continue one-half story beyond the level of exit discharge need not be interrupted by physical barriers where the exit discharge is clearly obvious.
12. Hiding places, especially within stairwells, shall be eliminated. Use sloped sections for stair closures at lowest level and full height screening with lockable gates of tops for stairs where the stair extends up to a non-public service room above.
13. P-O-F machines or Master meter stations shall be visible to the public using the facility. Master meters and Queues of people using P-O-F machines shall be protected from traffic.
14. Where feasible, glass-backed elevator shafts and cars shall be utilized to provide visibility. Glass is to be replaceable from the exterior of the elevator shaft. Where glass backed elevators cannot be used, glass front elevator doors shall be considered.
3. Elevators shall be located where the door and open car are visible to the users of the facility.
4. A Closed-Circuit Television (CCTV) video monitoring system compatible with the existing Montgomery County Security surveillance system and at the approval of the Division of Operations. Sufficient cameras shall include the monitoring of vehicular entry and exit points, P-O-F or master meter stations, and pedestrian access points. Other locations shall be at the discretion of the Division of Operations.
5. Emergency Call Boxes (ECB) that connect via land-line phones to MC Security or another entity at the definition of the Division of Operations. Call boxes shall have blue strobe lights and located in below ground levels (separation and location, therefore number, depends on the size of the facility and areas not nearby to points of pedestrian access) and stairwell landings where those stairs are not located adjacent to public elevators.
6. Reasonable effort should be made in Elevator doors and interiors to feature graffiti resistant coatings or surfaces, (and) such surfaces shall be made of a material that is easily cleaned of most graffiti methods.

Architectural

Medeco locks, Heavy duty, UL fire rated metal doors with metal door frames shall be used throughout the building. Use of rust resistant material shall be considered.

- a. Hardware shall be of a heavy-duty type. High strength continuous hinges shall be used for stair tower doors.
- b. Doors to office space, restrooms, storage rooms, and equipment rooms, accessible to the public, shall be lockable, using Medeco high security type lock cylinders, master-keyed to Parking Operations lock system. Keying shall be coordinated with Parking Operations.
- c. Doors in stairwells shall have rectangular vision panels positioned to provide the best possible view of hiding areas within the stairwell. Glass shall be vertically aligned, and all glass shall be safety rated.

Communications

1. Telephone lines and equipment shall be provided for voice and data transmission as needed for the parking office, parking revenue control system (including pay stations and computers), security system, elevator maintenance monitoring, and elevator and stairway ADA rescue requirements.
2. Lightning protection shall be provided to meet code requirements.
3. Bi-Directional Amplifying system with antennae on roof or appropriate locations must be provided for 800mhz communication for emergency responding personnel. This is more critical for below grade parking facilities and facilities located in high-rise structure areas. This communication system must be compatible to and approved by County's Radio Communication Service.

Section 3 - Site Work

3.1 Demolition

1. If demolition of existing structures is necessary, or if prior use of the site suggests the possible existence of subsurface environmental contaminants, an environmental assessment may be required. In any event, the presence of lead based paint, polychlorinated biphenyls (PCB) in electrical equipment including fluorescent light ballasts, asbestos, buried fuel tanks, and contaminated soil should be determined. Removal and disposal of all hazardous substances and petroleum products must be addressed in the construction documents.
2. Do not reuse demolished material. Remove it from the site.

3.2 Earthwork

1. The design consultant will be responsible for all necessary subsurface investigations, including the preparation of a geotechnical report, as a part of the design process. If the geotechnical report is made available to prospective construction contractors for inspection during the bidding period, the construction documents must include the following statements.
 - a. The information provided in the report includes test boring data, geo-physical data, and interpretations of subsurface conditions. Bidders are cautioned that interpretations of geotechnical and geophysical data are based on opinion and judgment and are advised to have these data and interpretations independently evaluated by someone qualified in this technical field before using them for bidding purposes. Furthermore, while sub-surface investigations have been performed with reasonable care, there is no warranty or guaranty, either expressed or implied, that they will disclose all conditions which will be encountered during progress of the work.
 - b. Bidders are solely responsible for their interpretations of the subsurface information and conclusions drawn therefrom.
 - c. If the data contained in the geotechnical report are not sufficient for bid preparation, the bidder may make his own investigation and tests, at a time acceptable to the County.
2. The County desires to avoid construction contract claims and change orders that could result from the presence of buried rock, old construction rubble, etc. that must be removed during excavation to reach the elevations required for construction of the facility. Therefore, the construction documents shall classify all such excavation as unclassified, as defined below, and the cost of removal of such material is to be included in the contract sum.
 - a. **Unclassified Excavation:** The cost of removal of materials for new below-grade construction, utility relocation and construction, and other indicated site improvements regardless of the nature of the material encountered, the water content thereof, and the type of equipment required for excavating; and the proper disposal of excavated material not required or not suitable for use as specified backfill materials, shall be included in the contract sum.

3.3 Caisson Foundations

1. If soil conditions require the use of caisson foundations, the construction documents shall include the following provisions to address the probability that rock of suitable bearing value may be found above or below the level indicated in the construction drawings.
 - a. Basis of contract: The contract lump sum shall be based upon the total volume of piers, determined by the number of piers, the design lengths from top elevations to bearing elevations at bottom of piers, and the diameters of piers as shown on the drawings.
 - b. Contract adjustment: The contract lump sum will be increased, or decreased, for the net volume of excavation and concrete in excess of, or less than, the total volume of all piers as detailed by the drawings and modifications to the drawings.
 - c. Unit price for net increase, or decrease, in pier volume: The unit price per cubic yard of volume shall be \$_____. The unit price shall include all overhead and profit and cost for bonds.

3.4 Asphalt Paving and Concrete Driveways

1. The need to repave existing streets in the general project area, and replace existing curbs and gutters, shall be thoroughly investigated as a part of the project design.
2. Design asphalt and concrete mixes to meet the Design Standards, Department of Public Works and Transportation.
3. Paving sections are to be as follows:

<u>Location</u>	<u>Course</u>	<u>Type</u>	<u>Thickness</u>
Parking Lot	Sub-base	Gravel	8 inches *
	Base	Asphalt Concrete	4 inches
	Wearing Surface	Asphalt Concrete SC	2 inches
Driveways Type 1	Sub-base	Gravel	8 inches *
	Base	Asphalt Concrete	6 inches *
	Wearing Surface	Asphalt Concrete SC	2 inches
Driveways Type 2	Sub-base	Gravel	8 inches *
	Roadway	Portland Cement Concrete	8 inches

* Material to be placed and compacted in 2 equal layers.

3.5 Landscaping/Streetscaping

1. Zoning regulations (Standard Method of Development) generally require that garage structures occupy no more than 75% of the building site, that the structure be set back a specified distance from the property lines, and that 10% of the site be designated as amenity space. Setbacks shall be maintained as green areas. Amenity space, defined as open space for public enjoyment, shall be designed with lawns, plantings, fountains, art objects, walks, etc.
2. Compliance with streetscaping requirements shall be necessary. The site shall be attractively landscaped.
3. Appropriately placed pedestrian paths and shrubs shall be used to discourage excessive foot traffic on lawn areas.
4. Plant material shall be suitable for the Washington climate, hardy, and easily maintained. They shall comply with the American Association of Nurserymen, Inc. standard Z60.1 "American Standard Nursery Stock." Trees shall be selected from the Approved Tree Variety List, Std No. 17, County Department of Public Works and Transportation, and be planted in accordance with Standards 14,15, and 16. All trees, shrubs, plants, and ground cover are to be warrantied by the contractor for a period of one year from the date of final acceptance of the project. All maintenance including watering, mulching, weeding, fertilizing, and spraying to control insects and disease, are to be provided by the contractor from the time of planting through the end of the warranty period.
5. Lawns shall be established by the installation of sod, certified by the Maryland State Board of Agriculture as conforming to Requirements of Maryland Turf Grass Law and Regulations, Publication No. 41. The sod is to be warrantied by the contractor for a continuous growing period of 120 days following final acceptance of the project. All maintenance including watering, mowing, edging, rolling, fertilizing and applying herbicides, insecticides, and fungicides are to be provided by the contractor from the time of installation through the end of the warranty period.
6. Landscaping shall not provide hiding places, means of climbing to upper levels or obscure sight lines at exit portals or into a garage.

Section 4 - Structural

1. A clear span design shall be used to maximize parking efficiency and allow future parking flexibility. A column spacing that is a multiple of the parking space width, with lines between stalls falling on column lines is preferred.
2. One of the following structural systems shall be selected, after a comparative analysis has been completed. The analysis shall include initial and long-term costs, compatibility with functional requirements, and appearance.
 - a. Cast-in-place post-tensioned concrete slabs supported by a cast-in-place post-tensioned frame.
 - b. Pre-cast pre-stressed concrete beams, columns, tees and/or Alite walls.
3. The main structure shall be freestanding and separated from the "stiff" elements such as stair and elevator towers, walls, etc. Masonry components shall be separated from the main structure.
4. Consideration shall be given to alternatives to the piling of plowed snow on roof levels.
5. Vibration shall be minimized to the extent possible.
6. Means to restrain vehicles at the edges and ends of parking and driving areas shall be provided. Wheel stops shall not be used and are not required by code if suitable alternative means to restrain vehicles are used. Concrete bumper walls are preferred. Cables will not be permitted.
7. Meter platforms 3-foot 6-inches wide shall be installed for all garages to allow for garage operation by individual space meters.
8. Elevator shafts and stairwells shall have reinforced concrete roofs. Stair and landing areas shall be of concrete construction, preferable precast. Tread and riser dimensional tolerance shall be closely controlled. Any openings between the treads, risers, and landings, and stairwell walls shall be sealed. All stair treads, landings, and raised walking areas shall be sloped to drain.
9. Curb and meter platform heights shall be 6 inches.
10. The structure shall be designed and constructed to be durable, crack-free and minimize future maintenance problems.
 - a. Only normal weight concrete shall be used.
 - b. Superplasticizer shall be used for all post-tensioned structures in the beams and slabs.
 - c. Aggregate conforming to ASTM Standard C-33 shall be used.
 - d. A water cement ratio of 0.40 or less shall be used.
 - e. Freeze thaw resistance shall be improved by the use of entrained air (6% \pm 1%).
 - f. Shrinkage cracks shall be minimized by placing, finishing, and curing concrete in accordance with ACI recommended practices. Slabs shall be finished only after bleed water has evaporated.

- g. Wet curing is the preferred method of curing. If approved by the County, a curing compound which provides a maximum water loss of less than 0.019 grams/sq.cm., when tested under ASTM C-309 or AASHTO M-148, may be utilized and applied in accordance with manufacturer's directions. Curing compounds shall be certified compatible with membrane waterproofing and deck sealers. In addition, wet curing may be required to prevent hot weather cracking. For pre-cast concrete, an electronically controlled curing system which is compatible with the moisture curing specified above may be used.
 - h. All concrete decks, except for areas designated to receive a traffic bearing membrane system, shall be treated with a silane penetrating sealer as a protective system that will effectively prevent concrete deterioration from chlorides and/or water penetration shall be used.
 - i. Flexure cracks shall be minimized.
 - j. Chloride inhibitor, such as DCI-S, manufactured by W.R. Grace Chemical Company shall be used.
 - k. Design fire resistant pre-cast concrete units in accordance with PCI MNL 124.
- 15. All reinforcing steel, welded wire fabric, and tie wires used in beams, slabs, columns, bumper walls, and architectural pre-cast facades shall be epoxy coated, with a minimum cover of 1 1/2". A cover of 2" is preferred. 3/4" of cover may be allowed on the underside of slabs. A minimum cover of 3" shall be provided for concrete in contact with the earth.
 - 16. Pre-stressing steel shall be stranded, stress relieved 7-wire cables conforming to ASTM 416 with a minimum ultimate strength of 270,000 psi.
 - 17. Pre-stressing strands shall use extruded plastic sheathing on greased unbonded tendons.
 - 18. No materials containing chloride ions shall be used in concrete.
 - 19. Slabs poured on grade shall be a minimum of 5" in thickness, placed over 6" of washed gravel, and reinforced with welded wire fabric. A vapor barrier shall be used under slabs in enclosed space.
 - 20. If not postensioned, concrete slabs shall be poured in a strip pattern, with tooled contraction joints. Contraction joints shall be arranged so that the long-side panel dimension will not exceed the short-side panel dimension by more than 50%. Panel area shall not exceed 600 square feet.
 - 21. Control joints shall not be saw cut. All construction and control joints shall be sealed with a high quality, flexible polyurethane sealant 9TT-S-227E, Class A, Type 1 or 2, two component. A five year guarantee shall be provided.
 - 22. Expansion joints shall be adequate in number, properly placed, watertight and easily maintained. They should preferably be provided every 150 feet and in no case greater than 200 feet. Expansion joints shall be guaranteed for five years. Expansion joints shall be EMSEAL or Stellar-Mark. No compression seals shall be used.
 - 23. All driving and parking areas, except those receiving a traffic bearing membrane system, shall receive a medium broom finish to the main direction of traffic flow.

24. The design shall provide for openings, block-outs, embedments and attachments for other trades. Garage light fixtures shall be supported by a galvanized or stainless steel embedded properly anchored, or an embedded galvanized bolt hooked around a reinforcing bar. The bar shall be a minimum length of 18 inches. Power driven or drilled anchors shall not be used.

25. Bearing Pads for Pre-cast Construction

- a. Neoprene: Use 70 Durometer material, except for pads on stair walls which shall be 50 Durometer. Pad size shall be shown in the Construction Documents and they shall conform to Division 11, Section 25, of AASHTO Standard Specifications for Highway Bridges.
- b. Random-Fiber Reinforced Elastomeric: Use 80 Durometer material. Size shall be shown in the Construction Documents. Pads shall support a compressive stress of 3,000 psi with no crackling, splitting, or delaminating in the internal portions of the pad. One specimen shall be tested for each 200 pads used in the project.
- c. Include Tests of bearing pad material in the Construction Documents. State the frequency of testing and test specification to be met.

26. Connection Materials for Pre-cast Construction

- a. Tee flange connection plates and shapes: Stainless steel conforming to ASTM A666, Type 304, Grade A36. Only stainless-steel welds shall be used.
- b. Other steel plates: Structural quality, hot-rolled carbon steel, conforming to ASTM A283, Grade C.
- c. Other steel shapes: ASTM A-36.
- d. Anchor bolts: Bolts, regular hexagon nuts, and carbon steel washers shall conform with ASTM A-449.
- e. Finish of steel, other than stainless: All steel units shall be hot-dipped galvanized. Touch-up paint for use after erection and after welding of connections shall be a two coats zinc paint or approved equal and painted as specified in Section 9.

27. Design Loads and Requirements

Design loads shall be based on the applicable code requiring the greatest design loadings. In all cases the combination of loads which provides the greatest stresses shall be used.

- a. Members shall withstand their own weight; design loads due to pressure and suction of wind; live and dead loads including snow drift and storage of piled snow around the perimeter; and handling, hauling and erection forces as applicable.
- b. Where applicable, component connections shall accommodate building movement. Provide adjustment to accommodate misalignment of structure without permanent distortion, damage to components, wrecking of joint connection, breakage of seals, and moisture penetration.
- c. Flexural reinforcement may be replaced with pre-stressing tendons.

- d. Design loads, except where applicable codes are more stringent.

Live Loads

Driving and parking areas	50 psf
Stairs	100 psf
Ground snow	20 psf
Snow drift	Per IBC or BOCA* with live load
Wind	Per IBC or BOCA*
Seismic	Per IBC or BOCA*, Zone 1
Hand rails	Per IBC or BOCA*
Wheels	2000 lbs

* As specified by Montgomery County Code Chapter 8

Bumper walls, lite walls, and pre-cast spandrels subject to vehicle impact shall be designed to withstand a horizontal force of 10,000 pounds applied at a height of 1'-6" above the deck at any point along the structure.

Dead loads: To be added to live loads

- e. Tee warp: Warping of pre-cast tees to promote drainage will be limited to 1%, except warpage of up to 1.7%, if approved by the pre-cast manufacturer, will be allowed if drainage cannot be obtained by other means.
- f. Camber of tee units: Anticipated tee camber and differential camber between units are to be shown on shop drawings and approved by the Structural Engineer. Design of double tee shear connectors shall account for forces introduced by jacking and welding to reduce differential camber of adjacent tees. In any case, correction to differential camber shall be limited to cases where differential camber does not exceed 2 inch. After correction of camber, the resulting differential between adjacent units shall not exceed 1/8 inch. Tees shall be placed full depth in the casting yard except field cast washes (2-inch minimum) shall be used over inverted tee beams for positive sealing and may be used in corners to promote drainage. Pre-cast tee to inverted beam joint in-fills shall be cast into a tooled edge block-out in the tee with a slight hump over the beam. Saw cut over the tee to beam joint and fill all exposed joints with a high quality, flexible polyurethane sealant. The entire in-fill area shall then receive a traffic bearing membrane system finish. Heights of the humps shall be coordinated with clearances requirements so that no reduction in clearance occurs.
- g. Property of units: f'_c = 28-day compressive strength. w_c = water to cement ratio. Release strength for pre-stressed concrete units shall be 3,500 psi minimum.

Spandrels:	Pre-tensioned pre-cast $f'_c=6000$ psi $w_c=0.40$
Double tees:	Pre-topped, pre-tensioned, pre-cast $f'_c=7500$ psi $w_c=0.37$ Admixture DCI-S 2 2 gal/cy

Beams: Pre-tensioned, pre-cast

$f_c=7500$ psi

$w_c=0.37$

Admixture DCI-S 2 2 gal/cy

Columns: Pre-cast and optionally pre-stressed

$f_c=6000$ psi

$w_c=0.40$

Admixture DCI-S 2 2 gal/cy

Lite walls:

Pre-cast and optionally pre-stressed

$f_c=6000$ psi

$w_c=0.40$

Cast-in-place concrete: Deck pour strips, in-fills, floor drain setting beds, washes, and slab on grade.

$f_c=5000$ psi

$w_c=0.40$

Admixture DCI-S 3 gal/cy

Cast-in-place concrete: Beams and columns

$f_c=5000$ psi

$w_c=0.40$

Cast-in-place concrete: Retaining walls

$f_c=4000$ psi

$w_c=0.40$

Cast -in-place concrete: Footings, foundations, and caissons

$f_c=3000$ psi

$w_c=0.40$

Section 5 - Mechanical

1. Parking levels not classified as open shall be provided with a ventilation system and a carbon monoxide detection system, meeting all code requirements, to detect alarm and remove offensive odors and noxious fumes. Supply air shall be introduced at locations and velocities which the County feels will not be objectionable to garage patrons. Air intakes shall be located to preclude the intake of exhaust fumes from vehicles outside the garage. Air shall be exhausted at locations which will not allow fumes to enter air intakes of nearby buildings and pedestrian areas. Ventilation systems must not produce objectionable noise levels or air velocities in areas occupied by the public.
2. The design shall prevent the introduction of exhaust or other fumes from the parking areas into stairwells, elevator shafts, and support facilities.
3. Mechanical ventilation of stairwells shall be provided to reduce high temperatures at the top landings.
4. Piping shall be located and installed so that it does not reduce vertical clearances below 7'-6", except a minimum clearance of 8'-2" shall be provided on routes to van accessible spaces. Sleeving through beams shall be provided as required. Pipes passing through floors (except for slabs on grade) shall be sleeved. Sleeves shall extend 2 inches above the floor level to prevent water from flowing to lower levels of the garage. Sleeves shall be schedule 40 steel pipe, or equivalent thickness plate steel for non-circular openings, and hot dipped galvanized after fabrication. The annular space between the sleeve and pipe shall be tightly caulked with an appropriate caulking compound. All pipes and ducts passing through the parking or drive areas at elevations subject to vehicular damage shall be protected by pipe guards securely fastened to structural members. Pipe guards shall be fabricated from 2 inch steel, hot dip galvanized after fabrication. Design connections for anticipated impact loads.
5. Water shall be supplied at convenient locations on each floor, with adequate pressure for cleaning the facility using 100 feet of 1-1/2" fire hose. The water system shall be designed to prevent unauthorized use and for easy and complete draining to prevent freezing, without interrupting water to other portions of the garage. All piping is to be exposed, neatly and securely fastened to the surface of the structure, and located so it will not be damaged by vehicles or subject to vandalism. Hose connections shall be located between parking stalls so they will not be blocked by parked cars. Hose connections and valves shall not protrude in such a way as to present a safety hazard to pedestrians. A booster pump shall be used.
6. Standpipe, sprinkler, and fire alarm systems shall be provided if required by code. Standpipe systems shall be air supervised dry systems, in accordance with NFPA Standard 14, as amended by the addition of paragraph 1-7.2. The system is to be sized with regard to any planned additions to the parking garage. It shall be sized by the construction contractor and submitted in accordance with NFPA Standard 14, 1-10, as amended. The distance between the pumper connections serving the dry system and fire hydrants shall not exceed 100'. The number of standpipes shall be in accordance with NFPA Standard 14, 3-2, as amended to require that measurements must be parallel or at right angles to walls. Piping shall be located so it will not be damaged by vehicles. Standpipe valves and hose connections in parking areas shall be located between parking stalls, in a 44-inch fireman's access, so they will not be blocked by parked cars. Valves and hose connections at standpipes in stairwells shall be located in the stairwell. Hose connections and valves shall not protrude in such a way as to present a safety hazard to pedestrians. Standpipes shall be specified to be installed from grooved joint pipe. Welded joints are not permitted.
7. A water meter and a Reduced Pressure Zone (RPZ) backflow preventer shall be provided in accordance with the requirements of the Washington Suburban Sanitary Commission, Regulations

for the Installation of Plumbing. The meter and RPZ backflow preventer shall be installed in a heated space or otherwise prevented from freezing. Remote reading meters shall be considered to preclude the need for meter readers to enter a locked space. Separate meters shall also be considered where all water from the WSSC system does not discharge into a sanitary sewer.

8. Hose bibs shall be provided at convenient locations at the periphery of the garage. They shall be designed to prevent unauthorized use or damage by freezing or vandalism. Vacuum breakers shall be provided as required by code.
9. Drains shall be provided at the bottom of stairwells. They shall either be located outside of the main pedestrian traffic area or be fitted with covers that do not pose a tripping hazard.
10. Floor drains shall be of adequate size and located frequently enough to ensure that run-off does not reach other levels of the facility. Do not locate floor drains in driving aisles unless otherwise approved. Ordinarily, trench drains are undesirable.
11. Heavy duty, vandal-resistant drains with strainers shall be used. Drains for parking decks which are subject to storm water pick-up shall be of the rectangular trench type, with minimum dimensions of 12-inches by 24-inches and sized for the flows expected from 100 year storms or typical summer thunderstorms whichever is the greater. Set drains 1" below finished floor elevations and finish down to the drains to ensure that low points do not occur immediately adjacent to the drains.
12. All storm water drain lines, including leaders from the roof of elevator banks and stairwells, shall be protected from damage by vehicles. Exposed roof leaders shall be anodized aluminum.
13. Piping along perimeter of structure shall not be visible from the exterior of structure.
14. All garage drainage from areas receiving direct precipitation shall discharge into the County storm water system through a treatment device meeting applicable permitting requirements. All other garage areas, ie: covered, shall discharge into a sanitary sewer through a structure meeting WSSC requirements for the purpose of trapping oil/grease from sanitary sewer discharges from covered parking areas. A pneumatically-operated valve (s) arrangement shall be added to the storm water piping system for diversion to the sanitary sewer of the wash down water collected by the storm system. Where the valves are located in a valve pit, extend the pneumatic air piping and an electric signal cable to the surface and secure both to an adjacent wall or column.
15. Storm water manholes and inlets shall conform to County Department of Public Works and Transportation Design Standards 55-58C and 61.
16. Provide a sub-drainage system around the perimeter of the structure, if needed, and waterproof all wall areas below grade. A sump pump shall be provided if required to discharge water collected by the sub-drainage system to the building drainage system.
17. Provide heating, ventilating and air conditioning systems for the electrical room to keep the temperature within the operating range of electronic equipment used for power and control of lighting and emergency lighting equipment. The HVAC system shall have provisions for fire dampers to meet applicable codes. The HVAC system shall have thermostats for automatic operation. The HVAC system shall be designed for the loads encountered by the equipment designed for the specific facility. The HVAC system shall operate on 208/230 VAC. In addition, where through the wall units are used, they shall be of the high-efficiency, energy-saving, super quiet living area type, with automatic thermostats, multiple speed cooling, energy-saving switch, slide out chassis for ease of installation and removal from the inside, exterior finish of high corrosion resistant coating, easy-access filters, multiple air flow controls and exhaust and ventilation controls.

Section 6 - Electrical

1. Electrical service, adequate to meet the parking garage requirements, shall be connected to an appropriate electric power company source by an underground service entrance. Electrical service shall provide a 480 VAC 3 phase, 4 wire feed, 277 VAC and 120 VAC lighting system, and 120 VAC power. If possible, meters should be located where they can be read without the need to enter a locked space.
2. Only IMC electrical conduits may be used. Except where otherwise required by code, they shall be run exposed, and attached to the surface of the underside of slabs, or the surface of beams, columns, and walls, unless otherwise approved, except conduits at CMU walls, stairwells, and elevator lobby locations shall be concealed within the CMU. Where exposed conduits encounter obstructions, the obstructions shall be sleeved to accept the conduit. Conduits passing through floors (except for slabs on grade) shall be sleeved. Sleeves shall extend 2 inches above the floor level to prevent water from flowing to lower levels of the garage. Sleeves shall be schedule 40 steel pipe, or equivalent thickness plate steel for non-circular openings, and hot dipped galvanized after fabrication. The annular space between the sleeve and pipe shall be tightly caulked with an appropriate caulking compound. All conduits passing through the parking or drive areas at elevations subject to vehicular damage shall be protected by pipe guards securely fastened to structural members. Pipe guards shall be fabricated from 2 inch steel, hot dip galvanized after fabrication. Design connections for anticipated impact loads.
3. Central lighting control panels, secure from unauthorized use or tampering, shall be provided.
4. Any switches, controls, or thermostats not in the central panel shall not be easily accessible to the public and shall be protected from unauthorized use by locating thermostats and fan motor controls 8-foot AFF and provide locable metal covers.
5. No aluminum wire shall be used.
6. Electrical outlets (20 amp - 120 volt) shall be provided at the exterior of each stairwell on each level in a location not accessible by the public by locating 8-foot AFF. Each stairwell is to be on a separate circuit.
7. Any garage requiring standpipes shall have one 30-amp, 120 volt circuit for each standpipe riser, supplied from the emergency panel, with a 20-ampere three-wire twistlock receptacle (NEMA Type L5-20R) at each hose connection, in accordance with Montgomery County Executive Regulation 62-88, Sec. 26.
8. A lighting system shall be provided to promote pedestrian and vehicle safety and security.
 - a. Lighting intensity shall consider the intensity of natural light as it relates to various parts of the garage.
 - b. Visibility shall be optimized with respect to the vertical and horizontal planes and uniformity of illumination.
 - c. Glare shall be minimized.
9. The lighting system shall be economical, efficient, and provide for minimum maintenance.
 - a. It shall be energy efficient.

- b. It shall be vandal, breakage, and weather resistant.
- c. It shall require minimum maintenance; components, including lamps, shall have long life to reduce maintenance costs and avoid interruptions in service. Provide 10% spare light bulbs of each type and wattage used in the project. Spare light bulbs provided to the County shall not be used as warranty replacements.
- d. Fixture locations shall be easily accessible for maintenance.
- e. The control system shall permit various patterns of lighting activations during different times of the day/evening on an area-by-area basis. Additionally circuits shall be arranged by levels, such that individual levels can be deactivated when garage utilization requires closing sections of the facility.
- f. Garage light fixtures shall be anchored in accordance with the structural design criteria (Section 4). Power driven anchors shall not be used.

10. Minimum initial illumination levels at the floor level shall be as follows:

<u>Area</u>	<u>Intensity (fc)</u>
Entrance/Exit	50
Aisles	10
Stalls	5
Pay stations (P-O-F), Stairways & Security problem areas	10
Roof	2
Lobby/landing areas outside of stairs and elevators	10

The above minimum initial illumination intensities shall be produced by a lighting system with an average/minimum uniformity ratio not exceeding 4/1. The design should include calculations to demonstrate that the lowest initial intensity produced by the lighting system at any point within each area is not less than 1/4 the average intensity shown above. Point-by-point computer printouts are required to verify this performance.

- 11. Lighting shall be controlled by a combination of manual on-off switches, 7 day electronic time switches provided with reserve power, and photocontrols. Astronomic type time clocks shall not be used.
 - a. All below grade parking levels, shall always be fully illuminated. Circuits shall be provided with a manual control capable of reducing the lighting level (in diagonal alignment).
 - b. The desired lighting control sequence for all parking levels except as noted in a. above and e. below and roof levels shall be as follows:

Dusk to Midnight - All lights on.

Midnight to Dawn - Every other fixture (in diagonal alignment) off by action of a time clock, except lights at turns, corners of garages, and at elevator/stairwell access areas shall always be on.

Dawn to Dusk - Outer ramp inside rows and ramp fixtures on. Outer ramps outside rows, every other fixture controlled by electronic time clock.

- c. Roof lighting fixtures shall be controlled by a photo-control and time clock as follows:

Dusk to Midnight - All lights on.

Midnight to Dawn - Every other fixture (in diagonal alignment) off, except lights at turns, corners of garages, and at elevator/stairwell access areas shall always be on.

Dawn to Dusk - All lights off.

- d. All lights at garage entrances shall be on from dawn to midnight. From midnight to dawn one third of the lights shall be off.
- e. Exterior driveway fixtures, flagpole lighting, and signs identifying the facility as a parking garage shall be controlled by a photo-control.
- f. General site lighting, including lights mounted on the exterior of the structure shall be controlled by a photo-control, except holiday lighting outlets and band signs are always on.

12. Fixture types

- a. Parking areas –
 - a. Cree IG Series Model # IG-NM-5S-A-40 or 57k-UL-WH-PML. Wet Location Rated, 33W, 7500 Lumens, 400CCT, 6% Uplight, Type V Distribution, 120-277V. Fixture Dimension 15.97" W (406mm) x 5.8" (147mm). DLC approved, 10 year warranty on luminaire (or Pendant Mount)
 - b. Philip Gardco Softview LED. Model # SPVG-168L-800 or 1200-NW-SM-UNV-IMRIC-BZ. Type V Distribution, 4000K CCT, Lumens 6077K, 120-277V (35 or 55 Watts, Surface Mount or Pendant Mount)
- b. Stairwells, Lobby/Landing, and Pay Station Areas -
 - a. Hubbell Perimeter wall pack. Model # NRG 356L-4 or 5K- U6
 - b. Philips Day-Brite /CFI Fluxstream LED Strip. Model # SF-4-C-39-40 or 50-U-SZT-FH360 (motion Sensor Installed on End Cap)
 - c. Columbia Lighting LED Wraparound. Model # LAW 4-40 or 50-HL-ED-U (0 -10V Dimming)
- c. Roofs –
 - a. Hubbell Compactible 18' Pole Circular, Square, and or Tapered with Minmum 4 Bolt Anchor Base, Accessories - . Hubbell LED Series. Model # ASL-A-16L4K-210- 3 or 4or 5 U DB SCPW
- d. Exit Signs –
 - a. Philips Chloride. EXIT Sign VERWEM. Red Letter Color, White Housing , AC Only. Cold Weather
- e. Driveways and site lighting (exterior of the structure) –
 - a. Hubbell Compactible 18' Pole Circular, Square, and or Tapered with Minmum 4 Bolt Anchor Base, Accessories - . Hubbell LED Series. Model # ASL-A-16L4K-210- 3 or 4or 5 U DB SCPW
- f. Streetscape Lighting- Comply, where applicable, with streetscape design requirements.
- g. Traffic control signals- Each vehicle entrance and exit lane, both inside and outside the garage,

shall be controlled by a traffic signal as shown in the DTSP Sign Standards Manual, Plate 1.10. These traffic signal devices may be Howard Industries neon TC series or fiber optic signs. The signs shall be controlled by manual switches located in the cashier booths for a cashier managed facilities and the garage managers office for a Pay-On-Foot operated garage.

13. An emergency lighting system,(natural gas powered or inverter powered) in accordance with code requirements, shall be provided. The standby power supply shall be a fast transfer central battery system equipped with a means for automatic charging of the batteries. Sealed maintenance-free lead-calcium recombination batteries shall be used. There shall be no appreciable interruption of illumination or revenue control systems during changeovers between power systems. Acceptable standby power supply systems are made by Computer Power Incorporated, Dual Lite, Chloride and Ellenco. Power supply systems shall be fully assembled and tested at the factory, in the presence of the design consultant and/or a Division of Operations representative, prior to shipment. Factory representative shall be present at the garage along with County representatives, for unit start-up, load testing, power factor testing and training of County maintenance personnel. Provisions for HVAC to maintain the manufacturer's required temperature in the room containing the emergency lighting system, shall be coordinated with mechanical design criteria. Security systems shall also be on this system.

Where an emergency generator is required by codes, the emergency generator shall be incorporated in the emergency lighting system for extended use. The emergency power system shall have the capacity to operate all elevators required by code to have emergency power, all lights on the emergency lighting system, all drainage and sanitary sewer pumps, all revenue control equipment, including future equipment. There shall be no appreciable interruption of illumination or revenue control systems during changeovers between power systems. The emergency generator shall have noise silencing provisions, such that the system meets or exceeds County codes. The emergency generator system shall be the product of one manufacturer. Acceptable manufactures are Catapiler, Kohler or Onan. A maintenance contract/warranty shall be specified for a period of two years after final acceptance.

14. Circuits to serve elevator motors shall be sized in accordance with the needs of elevators meeting the requirements of Section 8, Elevators, but in no case are to be sized for motors of less than 50 hp.
15. Provisions shall be made for the installation of public telephones on the exterior of garages. This shall be coordinated with the telephone company supplying local service to the area where the facility is located or as directed by the County. No wiring is to be exposed on the facade of the garage and the location is to be compatible with the overall appearance of the garage. All public coin-operated telephones shall be set to preclude incoming calls.
16. Telephone lines and equipment shall be provided for voice and data transmission as needed for the parking office, parking revenue control system (including pay stations and computers), security system, elevator maintenance monitoring, and elevator and stairway ADA rescue requirements.
17. Lightning protection shall be provided to meet code requirements.
18. Bi-Directional Amplifying system with antennae on roof or appropriate locations must be provided for 800mhz communication for emergency responding personnel. This is more critical for below grade parking facilities and facilities located in high-rise structure areas. This communication system must be compatible to and approved by County's Radio Communication Service.
19. Install Independent Electric Vehicle Panel for current and provisional EV Chargers. Provide options for 120/208V, 480.277V or DC Chargers for Planning Unit and Engineering Sections consideration

Section 7 – Parking Control System

Coordinate with Planning Unit Parking Management Division for the options and details on Parking control System and complimentary payment systems appropriate for the proposed Garage.

General conditions are as follows:

Garages shall be designed to permit monthly contracts, metered (individual and master) and cashier operation. While any given garage will initially function under only one mode of operation, the design shall accommodate future changes. Structural components and conduit sleeves that must be embedded in beams and slabs at the time of construction, as required for future modes of operation, shall be included in the initial construction. Only those conduits which cannot be surface mounted at a later date shall be embedded in concrete. Anchor bolts to mount future equipment shall not be provided.

2. The systems to support individual meters shall allow the mounting of meters at various intervals to allow flexibility in stall width and angle of parking.
3. Master meter stations if provided, shall be sufficient in number and located so as to facilitate their use. One master meter for every 100 parking spaces has been used on other County garages. They should be well-lighted and protected from the weather, yet be open to view for security purposes. (see sample specifications in 7A below).
4. Cashiered parking systems shall provide automatic (auto-read, anti-passbook, negative progression revenue calculation, facility counting, audit counting, system status scanner) operating features and include a sufficient number of entrance and exit control points to prevent excess traffic delays. The cashiered parking system shall be designed to compile, display and print industry standard audit reports. Revenue control equipment shall include auto-read ticket snipers, fee computer, cash drawers, and printers, connected to the facility central computer. Power supplies for computerized equipment shall be connected to constant voltage transformer with filtering and surge protection. A supply of 200,000 tickets and 1,000 monthly passes shall be provided. Tickets and monthly cards shall be of the magnetically coded type and preprinted with only the County identifications and notices. Raised concrete lane control curbing and equipment islands with card readers, ticket dispensers, fee indicators, barrier gates, full signs and weather-proof, secure, temperature-controlled booths for parking attendants shall be provided. Intercom type communications equipment between the manager=s office, booths, ticket spitters and card readers shall be provided. ADA requirements for attendant booths shall be addressed. Barrier gate, ticket dispenser, card reader and cash register control loops shall be provided in the concrete pavement or slabs. Ticket dispensers and cashier booths which are not located within the parking garage shall be provided with a protective canopy. Custom color selection, by the County, for equipment and the canopy shall be provided. See Section 2.4.3 for security requirements.
4. Pay-on-foot operation shall be considered when project program requirements specify this type of operation.

SECTION 7A – MULTI-SPACE METER PARKING SYSTEM

7A.1 GENERAL

A. This section pertains to garages that shall be designed to permit monthly contracts and multi-space meter (MSM) parking operations. While any given garage will initially function under only one mode of operation, the design shall accommodate possible future changes to another mode of operation such as a gated pay on foot parking system.

B. Structural components and conduits that must be embedded in slabs at the time of construction, as required for future modes of operation, shall be included in the initial construction. Only those conduits which cannot be surface mounted at a later date shall be embedded in concrete. Anchor bolts to mount future equipment shall not be provided.

C. Manufacturers for any and all primary components of the MSM system shall be VenTek International or equivalent supplier approved by County.

D. System Design: This system shall be an un-gated MSM system with the following subsystems:

1. Revenue Control System (RCS): For parkers who pay for parking on each visit, multi-space meters (MSM) shall be provided.

2. Frequent Parkers Program (FPP): Regular users who either prepay or prearrange for payment of parking as well as others authorized to park free in the facility shall use cards to identify themselves to the MSM devices.

3. Facility Management System (FMS): The FMS shall be a network consisting of server, task or subsystem computers, and workstations that provide on-line monitoring and control of all MSM devices.

4. Enforcement System (ES): The ES will consist of an automated citation writing and reporting system.

E. The primary components of the integrated system shall include:

1. FMS, including software, computers with related monitors, data storage devices, and printers.

2. MSM.

3. FPP consisting of cards, central software, hardware and associated peripherals.

4. ES consisting of hand-held citation writing devices, central software, hardware, and associated peripherals.

F. Additional components and accessories include:

1. Initial supply of operating stock items.

2. Spare components and parts.

G. System Configuration: A minimum of one (1) MSM shall be supplied for every 100 parking spaces. A minimum of one (1) MSM shall be supplied in each of the facility's pedestrian portals per level. A pedestrian portal is any area that pedestrians use to enter or exit each level.

H. System Expansion Requirements: The MSM system shall be easily expandable to accommodate additional features and configurations. Expansion shall include, but not be limited to additional MSM units, smart card readers, and credit card acceptance.

- I. MSM system shall comply with all applicable codes, standards and ADA requirements.

7A.2 QUALITY ASSURANCE

A. Equipment that incorporates features which minimize maintenance and meet the following maintainability requirements shall be required:

1. Provide for ease of performance verification and failure detection while minimizing effort required for adjustment.
2. Provide unobstructed access to equipment components.
3. Minimize requirements for special tools and test equipment.
4. Provide for easy removal and replacement of components.

B. System and components shall be provided that have a service life of a minimum of ten years and specify periodic maintenance requirements in the maintenance manual to meet that life expectancy.

7A.3 WARRANTY

A. General: Equipment and installation (100 percent parts and labor) shall have a one year warranty from the date of final acceptance. The system shall be maintained and serviced against any and all malfunctions due to manufacturing or installation defects at no cost to the County during warranty period. Maintenance shall include preventive maintenance per manufacturer's recommendations, or as necessary to keep equipment in good working order. Equipment supplier shall be responsible for performing all maintenance and repair during the warranty period, including all preventive maintenance and minor repair tasks. Software support shall also be provided during warranty period. Equipment supplier shall keep a log of all maintenance, preventive maintenance and repair work performed under warranty to be given to the County at the end of the warranty period.

B. Warranty Period: Warranty period shall begin after equipment supplier has demonstrated satisfactory performance of completed MSM system as described in Section 7A.10 – Test and Acceptance Program.

C. Response: Warranty response period shall be five days per week, 12 hours per day excluding holidays. Response time from initiation of trouble call to on-site response of qualified service technician must not exceed four hours.

D. Repair: Equipment supplier shall repair or replace all defective or damaged items delivered under contract by end of calendar day following day on which notice was given by the Client. Equipment supplier may elect to have any replaced item returned to manufacturer at no additional expense to the County. If equipment supplier is not available, County personnel or staff may affect repairs. Equipment supplier shall then reimburse the County for parts and labor necessary to correct deficiencies as defined within warranty clause and time. Equipment supplier shall pre-qualify appropriate County personnel to affect repairs and identify the types of repair each trained individual is qualified to perform after training of County personnel.

7A.4 SITE CONDITIONS

A. MSM system components shall operate dependably within environmental conditions indigenous to Montgomery County, Maryland in which the MSM system shall be installed. Components located in a 24 hour climate controlled office shall be capable of normal performance in a business environment. Outdoor equipment shall be capable of operating in the temperature extremes of the geographic area stated. Booth equipment shall be capable of withstanding environmental extremes within both a conditioned and unconditioned cashier booth in that geographic area.

1. Special electrical power and grounding.

a. Equipment supplier shall supply and install on-line, regulating computer grade uninterruptible power supply (UPS) for:

1) Servers and task computers (system controllers) with 30 minutes of back-up battery power.

2) Work stations and MSM with 15 minutes of back-up battery power.

b. County will provide "clean" power that for the purposes of the project shall be defined as 115 VAC +/- 10% and 60 Hz from circuits dedicated to the MSM system. The equipment provider shall provide any additional power conditioning required for the operation of the system as described herein.

c. Dust and noise protection in strict accordance with equipment manufacturer's recommendations shall be provided by the equipment provider.

d. Equipment layout shall be in strict accordance with manufacturer's recommendations to allow proper movement of air through and around equipment.

7A.5 EQUIPMENT REQUIREMENTS

A. A complete operational MSM parking system with all necessary components shall be provided. It is the MSM equipment provider's **SOLE RESPONSIBILITY** to provide every component necessary for a complete functioning system.

B. The County shall be provided with two sets of keys for each piece of equipment with locks and two sets of master keys. Keys shall be unique to this parking equipment:

C. Spare Components: The following spare components shall be provided, complete and ready to use, prior to commencement of operational testing. The equipment provider shall maintain inventory of spare components at this level as components are used during warranty period. After expiration of warranty period, the County will pay for replacement of parts as used from this inventory.

1. 10% of MSM units provided or a minimum of one of each:

a. Controller

b. Receipt printer unit

c. Card reader head

d. Note acceptor

2. One each communication/port controller

3. One each local/remote lane controller

4. One intercom remote station

5. Two Relays for count and lane monitoring
 6. One circuit board for each primary component
- D. Stock: The following operating stock items shall be provided prior to commencement of operational testing. The equipment supplier must provide samples for County approval prior to final order of any item that is custom printed. The equipment supplier shall select actual size of citations and FPP ID devices. The color and artwork of FPP ID must be approved by the County. The County will provide camera-ready artwork for logos.
1. 1,000 Citations written to the County's requirements
 2. 1000 FPP ID devices
 3. 50 rolls paper for each MSM
 4. Three spare ribbons for each printer requiring ribbon
 5. Two additional removable locking coin vaults for each MSM
 6. Two additional removable locking bill vaults for each MSM

7A.6 PERFORMANCE REQUIREMENTS

- A. Primary components of MSM system shall meet following requirements:
1. MSM shall be microprocessor controlled, in on-line, real-time communication with the FMS.
 2. Each MSM shall communicate the complete transaction log to the FMS. In the event of communication failure with the FMS the devices shall continue to operate in off-line mode and shall store a minimum of 400 transactions, or have sufficient system redundancy, to insure availability of the transaction data upon restoration of the FMS. In the event of failure during communication an error checking and recovery program shall be employed to prevent corruption of data files.
 3. All field programmable functions of each device shall be reprogrammed from the FMS (pass-word protected), and any and all reprogramming changes shall be reported to the daily log.
 4. All devices shall have compatible communication ports with selectable baud rates for all communications and connections to all computer hardware.
 5. Primary components shall incorporate a crystal controlled time clock/calendar that is updated at least once daily by the FMS. The clock shall keep military time and be accurate to at least one minute per month.
 6. All devices shall be ergonomically designed for ease of use by patrons.
 7. Cabinets shall be fabricated of a material that is strong and durable such as, but not limited to, composite, stainless steel, aluminum alloy, or welded 12-gauge steel. The mounting holes shall only be accessible from the inside of the cabinet. All surfaces shall be corrosion resistant and the exterior of cabinet shall be finished in a color chosen by the County. Cabinets shall have hinged external doors.
 8. Internal components shall be modular and plugged for easy maintenance and replacement.
 9. Control logic and communication relays shall be provided for required counts.

10. Corrosion resistant connection boxes shall be provided for all wiring connections.

B. Multi-Space Meters:

1. Operational Description

a. Public Usage by cash parkers: Each MSM machine shall enable patron to key in parking space number by pushing the appropriate keys on the machine. Each machine shall be capable of accepting payment of parking fee for any space within the system. Machine shall accept payment of parking fees by coin or bill. As each coin or bill is inserted into machine, machine shall calculate and display parking time paid for. Machine shall issue a receipt for parking fee paid upon pressing of receipt button by patron. Receipt shall include a personal identification number (PIN). Machine shall have a memory system which stores data from each transaction, including space number, amount paid, and time purchased. Patrons can return to machine and pay for additional time by entering space number and PIN number from receipt.

b. FPP: Parker shall insert FPP card into reader. Machine shall check validating for use at this date and time and if authorized complete transaction. If not-authorized, machine shall request cash payment.

c. Enforcement: Upon insertion of key and/or PIN in machine by enforcement officer, machine shall print out a violation report showing spaces that are unpaid and the time elapsed since the space was last paid for. After enforcement tour, attendant will electronically off load citation number and space number into FMS via MSM machine.

d. Citation payment: Machines shall be capable of accepting payment for parking citations. Upon entering of citation number in machine by patron, machine shall calculate and display the citation amount due. Machine shall issue receipt for payment of citation upon pressing of receipt button by patron. Payment of citation shall be reported to FMS.

2. Machine shall contain concise customer instructions for user friendly operation. The machine shall have an easily readable alpha numeric display to communicate messages to user. The operating procedure shall generally progress from left to right and top to bottom; corresponding instructions shall be numbered and shall be pictorially illustrated. Messages displayed at changeable message indicator shall be instructional phrases such as; Enter Space Number, Time Bought, Please Take Receipt, Please Wait While Receipt is Printing, Thank you.

3. Machines shall conform with the latest Americans with Disabilities Act accessibility guidelines for automated teller machines, except that requirements related to persons with vision impairments need not be met.

4. Machine shall be capable of recognizing user errors, such as invalid space number, and shall provide guidance to user via display on machine.

5. The rate structure shall be programmable only from the FMS, with the ability to accommodate the following:

a. At least 6 fee structures each of which have three rate increments or blocks for each of up to 60 fee segments. Each block is an amount to be charged,

duration for that charge and number of times that duration and charge is to be repeated over each 24 hour period of stay.

b. Automatic adjustment for daylight savings time and leap year in fee calculations.

c. 24 hour maximums.

d. Grace time.

e. Differential daytime, evening weekend and holiday rates.

6. Equipment supplier shall initially set up fee structure to County's requirements. Machine shall accept coins and bills for payment of parking fees. Coins shall be accepted in nickel, dime, quarter and Susan B. Anthony dollar denominations (United States currency only). Both 1 and 5 dollar bills (United States currency only) shall be accepted.

7. Machine shall be equipped with separate coin and bill vaults. Both vaults shall be removable and locking, and shall be keyed differently than other machine locks such that access to money in vaults is not available when vaults are removed. Coin vault shall be a minimum of 7 gauge in thickness and shall have a storage capacity of \$1,000. Machine shall have capability to stack bills in vault. Bill vault shall have capacity to store 2,000 bills. Each vault shall have a separate identification number.

8. Non-Cash Payment Options: The MSM shall be capable if the County so decides to accept and process the following non-cash payment options: credit card, debit cards and checks.

a. Each MSM shall be equipped (internal to the machine) with a magnetic stripe swipe reader used for processing credit card transactions. Equipment must be Payment Card Industry Council (PCI) compliant. Credit card transactions shall accommodate as a minimum:

1) VISA

2) Master Card

3) American Express

4) Discover

5) Checking Account Debit Cards

b. MSM and/or FMS shall communicate with a central credit card processor that shall be connected via a virtual private network (VPN) to a leased telephone line. The telephone line shall be linked to a credit card clearinghouse. Authorization for credit card transactions from swipe to authorization shall not be greater than ten seconds. Equipment provider shall be responsible for confirming the record formats required by the County's financial institution which is to be determined.

9. Receipt shall be issued upon customer request by pressing receipt button.

Information provided on receipt shall include space number, amount of money deposited, time bought, expiration time, facility identity, PIN and time and date of transaction. Printer shall dispense a minimum of 12,000 receipts per roll of paper.

10. Machine shall be capable of accepting payment for citations issued. System shall be capable of computing and displaying amount due and for each citation using one or both of the following methods:

a. Applying a programmable factor to time not paid for.

b. Applying a programmable fixed amount.

11. Each machine shall be capable of controlling a minimum of 1,000 parking spaces.

12. Upon completion of each transaction, machine shall communicate transactions throughout the system and to central computer. Transactions reported shall include payment of citations issued for violations. Each transaction shall be identified by machine number and transaction number.

13. Machine shall recognize a transaction as completed if any one of the following occurs:

a. 40 seconds has elapsed since the last bill or coin was inserted

b. The receipt button is pressed

c. A new space number is keyed into the machine

14. Machine shall contain locking system and appropriate alarm contacts to monitor for tampering. Machine shall be furnished and installed with locking anti-tamper devices to prevent unauthorized disconnection of both power and communications wiring connections.

15. Each machine shall monitor critical machine functions and transmit alarms to FMS. Functions monitored shall include low paper, low battery, coin jam, bill jam, coin vault full, bill vault full, A.C. power off, door open, door closed, tampering and door forcements.

16. Machine shall be capable of performing a self-diagnostic routine at programmable times or intervals. Self-diagnostic routine shall verify that machine functions are working properly. Functions to be checked shall include, but not be limited to, accuracy of fee calculation, clock, and coin and bill recognition.

System shall be capable of producing a printout documenting the results of the diagnostic routine.

17. Machine shall dispense printed revenue report with current totals, grand totals, transaction distribution totals, and number of users. Reports shall be available from both dollar unit and coin unit.

18. Upon insertion of key in machine by enforcement officer, machine shall print out a violation report showing unpaid spaces and associated time in violation. If all machines are not communicating for any reason, violation reports shall not be issued to prevent citation paying customers. Machine shall allow printout of violation report encompassing up to 200 spaces. Space numbers included in violation report shall be programmable from central computer or each machine.

19. MSM machine shall have a minimum accuracy of:

a. Fee calculation accuracy: 99.99%

b. Data transmission error rates: Less than one message retransmission per hour. Data received and accepted by FMS as valid shall have 99.9% accuracy.

c. Clock accuracy -- one minute per month.

20. Timing: System shall meet the following time performance requirements:

a. Elapsed time from time that bill or coin is accepted until time purchased is displayed shall not exceed 1.5 seconds.

b. Elapsed time from time that receipt button is pressed until receipt is issued

shall not exceed three seconds.

C. FPP Software

1. The FPP shall be an on-line, computer-based system for those authorized by the County to have access to the parking facility without paying cash on every visit. Distributive, networked or centralized processing may be employed. The FPP software may be integrated to FMS or separate but with on-line real time communication. The system shall control access for the following distinct user groups:

- a. County or other vehicles allowed to park, free of charge, in the parking facility.
- b. Monthly parkers who will prepay for parking on a monthly basis and have unrestricted in and out privileges during designated hours of operation.
- c. Frequent parkers, who will prepay or prearrange billing and will be charged for parking at fees equal to, or discounted from the public parking fees.

2. The system shall:

- a. Individually recognize and process at least 1,500 FPP users at all MSM locations.
- b. Have at least 16 preprogrammed access levels. Access level of ID shall be capable of being changed without reprogramming of FPP. User capacity shall not be lost due to changes to FPP programming and access levels.
- c. Link users to each other to allow one entity to be identified with and/or pay for a group of users. Up to 100 such FPP groups shall be provided.
- d. Error checking communications protocol shall not allow partial ID numbers to be transmitted to FPP controller(s).

3. The central FPP controller, independently or in concert with the FMS, shall:

- a. Issue and reprogram ID devices.
- b. Allow the authorized supervisor to create, store, send and receive user programming from the FPP readers. Access to programming shall be password protected, with multiple levels of access. The system shall have password-protected access to any and all information regarding specific blocks and/or suites of cards.

c. Provide a data base for FPP management, including the following:

1) Provide at least 20 record fields on each FPP parker. Record fields may include, but not be limited to:

- a) ID Number
- b) User Name
- c) Employer/Department (coded numbers may be used)
- d) Billing Address
- e) Work Phone
- f) Home Phone
- g) Primary vehicle license plate number
- h) Secondary vehicle license plate number
- i) Access group (coded numbers may be used)
- j) Access level (coded numbers may be used)
- k) Billing group (specifying type/rate; coded numbers may be

used)

l) Date first issued

m) Expiration date

n) Last access point (with date, time and location)

o) Current FPP status

p) Date record last changed

q) Last changed by (coded numbers may be used)

r) Current account payment status (declining balance, month to date billing or credit card charges outstanding)

2) Allow specific parker record files to be retrieved, displayed and/or printed based on selectable criteria, such as current FPP status, access group, access level, and/or ID numbers (except data that is password protected.)

3) Allow sorting and printing of the database for routine and special forms such as invoices or mass-mailings.

4) Monitor and estimate counts of FPP holders present on hourly basis by group, lot and total occupancy. Track occupancy and report peak occupancy during each hr to FMS. Provide reports to show daily and/or weekly peak occupancy by access level, group and lot.

d. The system shall be capable of the collection of fees from parkers on monthly prepayment, declining, decrementing, end of month billing, and/or credit card basis. The fee schedule for FPP parkers shall be the same as or discounted from the schedule employed for RCS parkers. If not otherwise generated by the FMS, the system shall monitor and report revenue associated with the FPP system to FMS. The system shall provide for positive posting of payments and automatic lock-out of FPP users within programmable grace period after expiration of a prepaid monthly account.

e. The system shall issue billing invoices for monthly accounts as well as separate corporate billing invoices.

f. The system shall provide a credit card billing interface to allow automated credit card billing for those electing that payment option. The credit card number shall be "on file" rather than swiped for each transaction.

g. An Accounts Receivable function must handle all normal accounting functions such as aged trial balance, aged trial balance by responsible collection agent, statements, mailing labels, cash receipts journals, adjustment journals, customer ledgers showing account detail (payments and invoices), general ledger journal, etc. Violations will be presented by vehicle on a separate report. Efficient monitoring of Accounts Receivables shall be provided through a series of management and audit reports.

h. The system shall provide automatic on-line real-time monitoring of FPP usage with storage of transaction data from current line available for on-line retrieval and previous year on tape or other accessible media for audit and analytic purposes.

i. The system shall allow the user with appropriate password to change rate structures.

- j. The system shall have the capability of monitoring and reporting of alarm conditions to the FMS.
- k. The system shall have the ability to register and utilize compatible foreign ID devices in FPP just as if they were issued by the County.
- l. All administrative actions shall be password protected and report to the FMS in the daily log.
- 4. Readers shall be designed for exterior use in access and security settings of high volume. Readers shall be weatherproof, and shall operate optimally under all environmental conditions such as precipitation, vibration, snow, ice, dirt and/or extreme heat or cold.
- 5. Operational Description:
 - a. The reader identifies that an ID device has been presented to the reader. The validity of the user for current authorization in this system shall be checked through the FPP Controller and, if approved, a message sent to the MSM indicating a valid ID.
 - b. Activation of the reader shall automatically disable the cash operation. Initiation of an cash transaction shall automatically disable the FPP reader.
 - c. Declining Users: When a declining user's ID is presented, the MSM shall ask the patron to select the amount of parking time to be provided, display it on the fee indicator, deduct the fee from the balance, display the payment balance, and reset with the new balance. If the balance on the declining account is not sufficient to cover the fee due, the system shall display the fee due and inform the patron that the balance is insufficient. The patron shall then have the option of simply paying the insufficiency or increasing the balance to an authorized level allowing future visits. The system shall recognize when the decrementing visit expires and thereafter include the user on the violation report.
 - d. Decrementing Users: When a decrementing user ID is presented to the reader, the system shall check the account and determine if the user is authorized for this date and time. If so, the system shall deduct this visit from the balance, and display the new balance. If the visit is not authorized, the system shall display the fee due and inform the patron of the reason for denial. The patron shall then have the option of simply paying the insufficiency or increasing the balance to an authorized level allowing future visits. Decrementing users only authorized parking for specific dates or times shall go to the facility office to purchase additional visits. The system shall recognize when the decrementing visit expires and thereafter include the user on the violation report.
 - e. If the FPP ID is not valid for the system or is not authorized for entry at that location and/or at that time, the FPP controller shall send an invalid user attempt message to the FMS system. The invalid user attempt shall also be posted to the daily exception transaction log.
- D. Facility Management System:
 - 1. The Facility Management System (FMS) shall be a software package operating on a network of computers and/or servers that provide on-line monitoring and

control of all MSM equipment. FMS system shall include individual and multiple software packages capable of running concurrently with other active programs under control of operating system.

2. The FMS shall be configured with two subsystems. Each subsystem shall be password protected to restrict access to individual functions of each subsystem to authorized users. The subsystems are:

- a. Revenue Reporting
- b. Equipment Functions

3. The Revenue Reporting/Control Subsystem shall accomplish the following tasks from any workstation in the FMS, with appropriate password:

- a. Remote programming of MSM payment stations.
- b. Test fee structure against existing facility usage statistics.
- c. Uploading and consolidating reports from payment stations.
- d. Retrieval and review of individual transactions. Retrieval shall be based upon user defined parameters. Reports shall be displayed on a monitor, printed on a printer, and/or converted to an ASCII file for export.
- e. Consolidating and retaining data that allow for report generation. The reports shall be either viewed on a work station monitor or printed.

4. MSM system software shall be capable of generating all reports for individual MSM machines as well as summary reports for all machines within a facility.

5. Revenue reports shall include:

- a. Total revenue from all transactions
- b. Revenue from cash purchases of parking time
- c. Revenue from violation collections
- d. Revenue from debit card sales
- e. Revenue from validation card sales
- f. Revenue from monthly pass sales
- g. Total cash in vaults

6. Activity reports shall include:

- a. Usage by time of day
- b. Usage by space number
- c. Usage by MSM machine number
- d. Usage by space number
- e. Length of stay reports

7. Violation reports shall include:

- a. Violation reports by date
- b. Violation reports by space
- c. Violation reports by office

8. Cash collection reports shall be printed in full showing the amount collected in coins and bills with non-resettable coin and bill totals and the date and time of the previous collection.

9. Equipment Monitoring: Subsystem shall have the following characteristics:

- a. Monitor the operational status of all equipment supplied and real time status of cash position.
- b. Each of the following alarm conditions shall be immediately signaled

showing the time of occurrence and the machine number:

- 1) Low paper for receipt printer
- 2) Coin or bill jam
- 3) Full coin or bill vault
- 4) Low battery or AC power failure
- 5) Open door indicating access to coin or bill vaults
- 6) Loss of communications to any MSM machine
- 7) Tampering or door forcements

c. A record of alarms shall be kept, including the transmission of repeated messages that may indicate possible problems with the system.

d. Abnormal status conditions shall be flashed on the monitor(s) and accompanied with an audible alarm. The display shall continue to flash until the abnormal condition is corrected. The audible alarm shall continue until it is turned off by a command issued through the monitoring computer(s). Acknowledgement and turning off of any alarm condition shall be able to be performed at any of the workstation connected to the FMS. It shall not be necessary to acknowledge the alarm condition at every workstation. The system shall record the abnormal status condition and the acknowledgement of the alarm condition by time, workstation and operator.

e. Monitor electrical circuits and frequency of operational error in MSM components to identify maintenance actions that would prevent later failure of a component.

E. Computer System:

1. The FMS computer system shall consist of:

a. Network server or host computer with monitor and keyboard located in facility parking office.

b. Workstations with monitor, keyboard, processor and printer located in facility parking office.

c. Subsystem Controllers and Local Controllers (LC) may be provided as necessary for the performance and operational requirements herein.

Distributive, networked or centralized processing may be employed in any subsystem or the system as a whole, so long as required multi-unit control features such as payment of fees for any spaces from any station can be maintained. Subsystem controllers may include but are not limited to: FPP management and ES System. Subsystem Controllers shall have, at a minimum, monitor and keyboard and shall be in the parking office.

2. Security: The FMS and all subsystem controllers shall have security protocols, password protection and reports to the exception transaction log that prevent unauthorized access to and manipulation of data and reports, including individual transactions. All data bases of transactions, FPP users, reports, etc shall be secured from unauthorized entry and tampering from either within or outside the FMS.

3. The equipment supplier shall furnish and install all computer hardware devices needed for the MSM system. The computer hardware configuration shall be of sufficient size and capacity to meet or exceed the functional and performance

requirements as well as accommodate growth and expansion as set forth elsewhere herein. All computers shall be of the latest technology and include at a minimum standard memory and micro processor provisions at the time the MSM is purchased. Subsystem controllers shall be capable of processing all required functions as specified for each task. Performance of any specified function shall not be slowed or delayed by performance of any other function. In particular any of the workstations may be used to generate any and all reports without disruption to, or being slowed by count/occupancy monitoring or any other functions.

4. Data Storage: All MSM equipment provided shall be capable of dependably processing the projected traffic volume for each facility.

a. Data storage capabilities shall be based upon the traffic levels delineated above with the following data requirements for each parking transaction:

- 1) Transaction Number
- 2) Facility Number
- 3) Space Number
- 4) Entry Date / Day of Week / Time
- 5) Device Number
- 6) Parking Rate Structure
- 7) Parking Cost
- 8) Length of Stay
- 9) Transaction Type (normal, time extension citation payment, FPP)

5. Provide on-line storage solution with software and sufficient capacity to automatically back-up data at the end of each day and to store all data for the current calendar year so that it is accessible from the server without manual loading of disks, tapes, etc. Provide additional storage solution, including all required hardware, to store all data from the prior calendar year so that it can be loaded into the system from a single disk, tape, etc.

6. FMS shall communicate to the County's network via a Virtual Private Network (VPN) connection. The equipment supplier shall be responsible for all VPN network interface hardware.

7. All software shall have Graphical User Interface (e.g. Microsoft Windows).

8. Workstations shall be provided with following software for further manipulation and reporting of data.

- a. Word processing: Microsoft Word
 - b. Spread sheet: Microsoft Excel
 - c. Database: Same as the FMS platform
9. All printers shall be laser printers.

F. Citation Issuing System:

1. Citation Issuing system shall be an electronic citation writing system including hand-held data entry device, citation printer, battery pack, software and all peripherals required to operate in the manner described herein.

a. Hand-held data entry units shall provide the following features:

- 1) 4 M bytes RAM.
- 2) ROM as required for operating software.

- 3) Clock speed 8 MHz.
 - 4) Full alphanumeric keyboard with a traditional 10 key numeric format.
 - 5) 4-line LCD display (60 characters each) with integral back lighting which is highly visible in daylight and darkness.
 - 6) Unit shall be user-friendly and ergonomically correct.
 - 7) A synchronous RS-232C serial communication port.
 - 8) Removable, rechargeable nickel cadmium battery pack with recharging unit.
 - 9) Battery operation for twenty-four hours between recharging.
 - 10) Less than 2 pound weight, including battery.
 - 11) Waterproof against immersion in 3 ft of water for 2 hours.
 - 12) Able to withstand 6 ft drop onto concrete surface.
- b. Citation printer shall be:
- 1) Thermal-line printer.
 - 2) Capable of printing the citation number, location, space number, violation type, amount due and due date in format coordinated with citation envelope.
 - 3) Print at 1 in. per second.
 - 4) Include: synchronous RS-232C serial communication port.
 - 5) It shall be integral to the data entry device or belt carried.
 - 6) If belt carried, it shall meet the following requirements:
 - a) Removable, rechargeable nickel cadmium battery pack with recharging unit.
 - b) Battery operation for six hours between recharging.
 - c) Less than 2 pound weight, including battery.
 - d) Able to withstand a 6 ft drop onto concrete surface.
- c. Citation software on hand-held data entry devices shall issue citations in numbered sequence with user definable data entry fields and a review screen that allows the officer to review the citation prior to printing and storing. Software shall allow for the correction of mistakes made during the enforcement process. Software shall include license plate check against scofflaw list. System shall control and monitor citations voided by officer.
2. ES software, independently or in concert with FMS shall:
- a. Manage and compile all enforcement data.
 - b. Provide controls over citation issuance including numbering system, void tracking, reporting of enforcement tours and productivity of officer.
 - c. Allow data to be electronically uploaded from hand-held issuing devices with error-checking protocol, in standard ASCII characters.
 - d. Control payments of citation whether by MSM, mail or at parking office.
 - e. Provide automatic generation of overdue notices.
 - f. Provide for an appeals function/process during which further collection action is suspended.
 - g. Provide a collection function process for monitoring tickets after turned over to collection agencies.
 - h. Provide for scofflaw list for downloading to hand-held citation writers.

i. Provide cash management reporting, which is down-loaded to FMS for consolidation with other revenue sources.

G. Intercom System:

1. Master panel shall be provided in the parking office.
2. Remote intercom call stations shall be furnished at all MSM machines. Stations shall include "Press for Assistance" signs and visual verification that assistance has been requested, and that assistance has been dispatched. The intercom system shall comply with current Americans with Disabilities Act requirements.

Intercom System:

3. The entire system shall operate without malfunction due to climatic conditions stated herein.

7A.7 COORDINATION

A. General: Meet with County, Engineer/Architect, and General Contractor within 30 days of contract award to verify all details of MSM system. Schedule must be achieved with adequate time for hookup, testing, and trial period as described herein.

B. Submittals: Equipment supplier shall provide those responsible for related work with all product and installation submittals as necessary.

C. Meetings: Meet with General Contractor, before any rough-in work begins, to review building plans as they relate to MSM equipment, to explain details or precautions necessary to assure that all parking equipment shall work properly, and to determine that all required conduits and wiring are properly laid out.

D. Additional Wiring: Equipment provider shall provide all additional conduit and wiring which is needed for total system performance.

7A.9 INSTALLATION OF MSM SYSTEM

A. MSM equipment shall be installed in accordance with manufacturer's recommendations.

B. Installation and Start-Up: Equipment supplier shall be responsible for installation of all control and communication wiring and Contractor supplied equipment and its interfacing and interconnection with County supplied equipment. The equipment supplier shall authorize and accept responsibility for application of power to the equipment and initiation of operation, be responsible for running all initial diagnostics and system generation programs necessary to provide a complete working system.

7A.10 TEST AND ACCEPTANCE PROGRAM

A. General: Format for all system acceptance testing reports shall be submitted to Engineer/Architect and County and must be approved before acceptance of MSM system.

B. Installation Test Demonstrations: Upon installation of each piece of equipment, an installation test shall be performed. This test shall exercise the equipment in accordance with specific test procedures document required to test every function of

equipment. A County representative may witness tests. The equipment supplier shall notify the County and Engineer/Architect in writing at least one week prior to each official test session. In the event that first test is not successful, the equipment supplier shall correct noted deficiencies and notify the County and Engineer/Architect, at least two days in advance, that test session is ready to resume. The equipment supplier shall promptly correct all problems encountered at the equipment supplier's expense. A schedule of all tests shall be submitted for the County's review and approval. The following specific tests shall be included in installation testing:

C. Thirty-Day Operational Test and Final Acceptance: Upon completion of all installation tests, demonstrations and training required herein, County or its agents shall operate complete system for test period of thirty days. During this period, following performance standard must be met in order for final acceptance to be issued:

1. All mechanical components must be operational without downtime. For each downtime period of four hours or more, one working day will be added to acceptance cycle.
2. All electronic components must be operational without downtime or programming problems for complete monthly reporting cycle. For each downtime period of more than one hour, but less than eight hours or less or programming problem that delays report cycle, one working day will be added to acceptance cycle.
3. All test reports must correlate 100% with cash receipts in each fee computer for test period.

7A.11 TRAINING PROGRAM

A. The equipment provider shall develop and implement a comprehensive training program for the County's personnel. Such training program shall be implemented through the use of formal classroom training and/or other forms of training that the equipment provider shall propose.

B. The curriculum shall be designed so that each group of trainees shall be trained in the full repertoire of system commands that they may have to use in the course of performing their designated functions. This training shall be accomplished through the use of lectures, visual presentations, hands-on operation of the equipment, and any materials necessary to perform the job. Each student shall be provided with a complete set of training materials and operating manuals during the training session, which he/she shall retain for use on the job at the completion of training.

C. The equipment provider shall conduct the required training at times and locations coordinated by the County. The County shall make personnel available to receive training. The full complement of training courses shall be conducted over a five day period, as required to accommodate shift personnel. The training shall include, but not be limited to, the following groupings of staff:

1. Enforcement Officers
2. Supervisors/Cash Collectors
3. Maintenance Personnel
4. System Managers/Administrators

D. At the conclusion of the maintenance training session(s), the equipment provider shall

submit to the County a list naming qualified County (or County representative) maintenance personnel. The list shall detail the level of maintenance/repair functions each of the County personnel are qualified to perform.

E. Training shall consist of the following:

1. Enforcement Officers shall be trained to operate the MSM and the ES.

2. Supervisors: Supervisors shall be trained to:

a. Operate the MSM, FPP and ES.

b. Perform primary maintenance on MSM components (trouble shoot/replenish supplies).

c. Understand any and all system messages provided by the FMS, including but not limited to alarm messages, indications of attempts to compromise the MSM and explanations of atypical lane activity displayed by the count system, revenue control system.

d. Be able to understand the purpose and data contained within any and all reports produced by the FMS.

e. Be able to operate the FMS.

3. Maintenance personnel: Maintenance personnel shall be trained to perform primary maintenance on all major components of the system. Additionally, maintenance personnel shall be trained to:

a. Replenish all system supplies.

b. Clear paper jams.

c. Reset the system after a power failure.

d. Replace internal elements such as circuit boards.

e. Lubricate and clean internal components.

f. Be certified by the equipment supplier to perform primary maintenance.

g. Perform all MSM and ES functions (only if there is a policy for crosstraining maintenance personnel).

F. System Administrators: System Administrators shall have the same basic training as Supervisors. In addition to such training, System Administrators shall be trained to operate the FMS and to understand statistical reports which reveal trends in revenue generation, facility utilization, and based on information available from the FMS, to perform checks and balances over actions of Supervisors and their subordinates.

Section 8 - Elevators

1. Unless otherwise directed, parking garages shall be provided with a minimum of one elevator bank containing two elevators. Additional banks of two elevators shall be provided as required to meet the pedestrian demands of the facility. They shall be placed at points which are convenient for pedestrian circulation while compatible with garage architecture and structural design. A stairwell shall be located adjacent to each bank of elevators.
2. Elevators shall comply with all codes, including handicap requirements, except a certificate of registration and inspection is not to be posted in the car. A waiver from the Maryland Department of Labor, Licensing and Regulation is required for this exception.
3. Weather protected waiting areas shall be provided at all exposed levels of the elevator and stairway access. Elevator entrances shall be protected against driving snow and rain. No water shall be able to enter elevator hoistways or accumulate in door tracks. If available, weather resistant option packages shall be included. Elevator entrances shall be equipped with full width hanger covers, two guides on every door panel positioned at or near the leading and trailing ends of the panels, full width sills such that guides will always be in sill groove and site guards where applicable.
4. Elevators shall be designed, manufactured and installed such to address the specific environmental conditions associated with a parking garage structure. All equipment shall be resistant to vandalism.
5. Elevators shall be designed, manufactured and installed such to promote proper and convenient maintenance and repair.
6. All elevators shall be sized and configured to address accessibility requirements. All entrances shall be 42-inches wide.

Performance Requirements

- a. Hydraulic elevator - operating speed 150 feet per minute. Tolerance - plus or minus 10 percent of operating speed under any loading condition.
 - b. Traction elevator - operating speed 350 feet per minute. Tolerance - plus or minus 3 percent of operating speed under any loading condition.
 - c. Stopping accuracy - plus or minus 3/8 inch under any loading condition.
 - d. Hydraulic system pressure - shall not exceed 400 psi measured at the pump unit.
 - e. Remainder of performance requirements shall be in accordance with values stated in the Building Transportation Standards and Guidelines NEII -1-2000.
7. Elevator machine rooms shall be provided with heat, ventilation and/or air conditioning to automatically maintain the temperature and humidity in these spaces within the range stated in the Building Transportation Standards and Guidelines NEII-1-2000. A thermostatically controlled heating system shall also be provided to maintain the temperature of the hydraulic fluid within the manufacturer=s recommended range. Elevator shafts shall be adequately ventilated, as required by the Building Code. Machine room door hardware is to be self-closing and self-locking as required by ASME A17.1.

8. Beams, floor slabs or other building construction shall not project more than 2 inches inside the general line of the hoistway unless the top surface of the projection is beveled, as required by ASME A17.1, nor shall recesses be permitted in hoistway sides not used for loading/unloading, except as necessary for elevator equipment.
9. Elevator pits in excess of 3 feet shall be provided with a fixed vertical ladder, as required by ASME A17.1. Drains in the bottom of pits shall not be installed; however, sumps with covers shall be provided for the use of portable pumps. Provide a portable pump as part of the project equipment.
10. A fire alarm initiating device shall be installed in each elevator lobby at each floor, and machine rooms, as required by ASME A17.1.
11. Each elevator shall have a 24 hour, 7 day, electronic time switch equipped with a battery back-up to operate the switch during power failures. The time switch shall automatically control the outside call buttons at each landing so an out-of-service elevator will not respond; however, the call buttons inside the elevator cars shall not be affected. The time switch shall shut down each elevator at a predetermined P.M. time on a daily basis, but will allow an elevator passenger at that time to retain control of the elevator car while exiting. After every call and when the time switch deactivates the elevator hall station button, the elevator shall return to dispatch level. The next day, at a predetermined A.M. time, the time switch shall be capable of reactivating the elevators. The time switch shall not affect the Firefighters= Service key switch.
12. Elevators shall be provided with a full height multi-beam infrared door protection device to prevent car and hoistway doors from closing, when obstructed, in accordance with ASME A17.1.
13. Vandal-resistant call buttons constructed of stainless steel and flush mounted shall be provided. Call buttons in the elevator cars shall be color coded to match the garage floor level identification color codes.
14. Vandal-resistant combination position indicator with direction arrows and directional lanterns shall be placed in each elevator lobby above each elevator entrance. Vandal-resistant car position indicator with direction arrows shall be placed in each elevator car above the entrance. An internally illuminated sign with the words "Elevator Not In Service" shall be incorporated in the combination position indicator and directional lantern device above each hoistway door. The light shall be activated and blink when 1) the electronic time switch has deactivated the hall station panel, and 2) when the elevator has been taken out of service by any other means. Power for the elevator not in service light and its controls shall be arranged so that it will remain in flashing operation when the elevator main breaker is turned off. A sign shall be posted on the elevator machine electrical control cabinet indicating the presence of a separate 120 VAC power supply for this function.
15. Where elevator control functions are detected by optical devices in the elevator shaft, coordinate the location for painting a flat black vertical stripe along the shaft wall to prevent false signals from being generated by the control system.
16. Each car shall be provided with a separate telephone line and flush mounted speaker phone with built-in auto dialer and ringer to permit two-way conversations in accordance with ASME A17.1. Emergency communications equipment in cars shall comply with ADA requirements, including service for hearing and speech impaired persons. The device shall be incorporated into the car operating panel and be vandal resistant.

17. Hoistway doors and frames, and car doors and walls shall be satin finish stainless steel except for glass car walls provided for security purposes. All glass shall be laminated (safety glass). Stainless steel walls shall be removable and held in place with vandal-resistant fastenings. Elevator car floors shall be rubber tile equal to Jason/Pirelli, low profile stud, series 100, color selected by the County. A top emergency exit, secured by a **hand**-operating lock accessible only from the exterior of each car, shall be provided in accordance with ASME A17.1. Lighting in the car shall provide a minimum illumination level of 5 foot candles at the car threshold, in accordance with ASME A17.1. Use high-output light fixtures.
18. A 15 amp, 120V GFCI type electrical outlet, shall be located in each car, in a position that is not visible to the public.
19. The elevator capacity, required data and required instructions shall be engraved and a permanent part of respective device cover plate.
20. A minimum of one elevator in each garage shall be sized to accommodate a horizontally-carried 6 foot 8 inch rescue litter, in accordance with Art. 89, Par. 49B(p), Annotated Code of Maryland, unless an alternative acceptable to the Maryland Department of Labor, Licensing and Regulation and the County Fire Marshall is approved.
21. Control shall be of the microprocessor-based non-proprietary type. Equipment that must be maintained, secured and adjusted by the original equipment manufacturer shall be considered proprietary. This also includes equipment that requires use of tools and equipment along with the instructions for their use that are not available to the County. The control shall incorporate diagnostic and control/design parameter adjustments which shall be adjustable. All equipment provided shall contain non-volatile components or software. No equipment shall include functions that require periodic interventions by the manufacturer. All equipment shall include means for on-site and remote monitoring and diagnostic procedures.
22. A sign prohibiting smoking in elevators shall be engraved in the car operating panel of each car, and a receptacle for the disposal of smoking material shall be attached to the wall near each hall station, as required by the State of Maryland, Rules and Regulations Prohibiting Smoking on Elevators, 09.12.61. The receptacle shall be so located as to not interfere with access to the corridor stations.
23. Engraved signs warning against use of elevators during fires shall be incorporated in the corridor operating station at each floor in accordance with Art. 89, Par. 49B(o), Annotated Code of Maryland.
24. Braille characters and raised identifications that indicate the parking level and passenger operating devices shall be installed in the control panels in each elevator car in accordance with Par. 2-506 of the Annotated Code of Maryland and accessibility standards.
25. Each elevator system shall have an elevator controller and a device, compatible with a Central Monitoring System as manufactured by Motion Control Engineering, Inc., that monitors the elevator operation and reports information on failure and trouble to a central station as described in the following requirements. The equipment and telephone lines shall be installed, made operational and the entire system tested:

ELEVATOR MONITORING SYSTEM REQUIREMENTS

The Elevator Communications Interface (ECI) shall be connected to the elevator controller to

monitor and record system events by connection to an individual telephone line for each car to the

central Elevator Command Center (ECC). The ECC is provided by the County at an offsite location. The elevators must have non-proprietary remote monitoring software. The ECI shall have the capability for monitoring and transmitting events to the ECC, as stated in the following events paragraphs a and b listed below:

The AECEI shall monitor and transmit to the central AECC records of the following types of events as a minimum:

- a. SYSTEM EVENTS: Fire Safety Phase I, Emergency Power, System Out of Service.
 - b. CAR EVENTS: Fire Safety Phase II, Safety Circuit Open, In Car Stop Switch, Motor Limit Timer, Value Limit Timer, Communications Loss, Door Zone-Stepping Fault, Car Out of Service with Door Lock, Car Out of Service without Door Lock, Lost Door Lock During Run, Inspection, Independent Service, Car Door Protection.
 - c. At least one elevator should be operational during power outage to perform emergency required operations, unless code requires none or additional
26. The County will provide specific requirements for incorporation in project specification. The elevator installer shall be required to furnish one set of reproducible wiring diagrams, complete adjustment procedures, special adjustment tools or devices, and a written preventive maintenance program, specific to the elevators and controls provided in the garage, which should be followed to prevent premature failure of elevator components and ensure dependable operation. The instructions shall include a master Monthly Check Chart, Call Back Log, Lubrication Chart and other necessary reporting forms. It should include a complete list of supplies and replacement parts as well as a recommended list of supplies and replacement parts that the County's elevator maintenance contractor should have on hand to expedite repairs. The manufacturer/installer must agree to promptly provide and sell replacement parts to the County's elevator maintenance contractor, after the installer's maintenance/warranty period expires.
27. The installer shall provide a two (2) year maintenance /warranty agreement. Perform at least monthly maintenance and inspection visits as well as respond to all call backs and perform tests in accordance with ASME A17.1, as directed by the State of Maryland, Department of Labor, Licensing and Regulation, Division of Labor and Industry.

Section 9 - Paints and Coatings

1. Each painting system (primer, intermediate, and finish coat) shall consist of compatible materials produced by a single manufacturer.
2. No spraying in the field shall be permitted.
3. Levels shall be color coded in elevator and stairway areas. Colors are to match the latest DTSP Sign Standards Manual and be painted with Tnemec-Gloss Series 2H paints or MAB equivalent paint.

Drainlines shall be painted grey to match the concrete color. Firelines (standpipes and sprinkler lines) shall be painted Federal Standard Safety Red.

4. Elevator shafts for glass backed elevators shall be painted a dark neutral color, except for any below grade areas visible from within the car, which shall be painted a light neutral color to reflect light. Paint a vertical flat black stripe on the elevator shaft wall in a location coordinated with elevator requirements.
5. Do not paint stainless steel, and galvanized and non-ferrous metal surfaces unless otherwise directed.
6. Provide a concrete sealer on floors in elevator machine rooms, storage rooms, supply rooms, electrical rooms, and similar interior space not covered with a flooring material.
7. Painting systems. Tnemec and M.A. Bruder Co. are acceptable paint manufacturers:

- a. Structural Steel, precast panel connections and miscellaneous metals (Interior and Exterior).

Surface Preparation: SSPC-SP6 commercial blast cleaning

First Coat/Shop Primer: Urethane Zinc-rich primer at 2.5-3.5 mils DFT (Tnemec Series 90-97 Tnemec-Zinc or approved equal)

Intermediate Coat: Polyamidoamine Epoxy coating at 2.0-3.0 mils DFT (Tnemec Series 69 Hi-Build Epoxoline 11 or approved equal)

Finish Coat: High-build Acrylic Polyurethane enamel, semi gloss at 2.0-3.0 mils DFT (Tnemec Series 75 Endura-Shield or approval equal)

- b. Metal Doors and Frames (Interior and Exterior)

Surface Preparation: SSPC-SP2 and SP3 hand and power tool cleaning.

Primer Coat: High-solids Polyamidomine Epoxy at 2.0-3.0 mils DFT (Tnemec Series 135 Chem-Build or approved equal)

Finish Coat: High-build Acrylic Polyuethane semi-gloss at 2.0-3.0 mils DFT (Tnemec Series 75 Endura-Shield or approved equal)

c. Concrete Masonry Units and Dense Concrete (General):

Surface Preparation: Clean and dry.

*Primer Coat: Cementitious-acrylic masonry filler at 60-80 sq. ft. per gallon (Tnemec Series 130 Envirofill or approved material)

Intermediate Coat and Finish Coats: High-solids Amine-cured epoxy coating at 5.0-6.0 mils DFT or 219-263 sq. ft. per gallon per coat (Tnemec Series 83 Ceramilon 11 or approved equal)

*Not required on Dense concrete

d. Concrete Masonry Units and Dense Concrete (Stairwells and Bathrooms):

Surface Preparation: Clean and dry

*Primer Coat: Cementitious-acrylic Masonry Filler at 60-80 sq. ft. per gallon (Tnemec Series 130 Envirofill or approved equal)

**Intermediate Coat: High-solids Amine-cured Epoxy coating at 6.0-8.0 mils DFT or 160-219 sq. ft. per gallon (Tnemec Series 83 Ceramilon 11 or approval equal)

Finish Coats: High-build Acrylic Polyurethane enamel, semi-gloss, at 2.0-3.0 mils DFT or 375-561 sq. ft. per gallon (Tnemec Series 75 Endura-Shield or approved equal)

*Not required on Dense Concrete

**If brushed or rolled, (2) coats are required to achieve recommended DFT.

e. Concrete Masonry Units and Dense Concrete (Exterior)

Surface Preparation: Clean and dry.

*Primer Coat: Cementitious-acrylic Masonry Filler at 60-80 sq. ft. per gallon (Tnemec Series 130 Envirofill or approved equal)

**Intermediate and Finish Coats: Modified-acrylate Elastomer, matte, at 4.0-6.0 mils DFT or 134-200 sq. ft. per gallon per coat (Tnemec Series 156 Enviro-Crete or approved equal)

*Not required on Dense Concrete.

**For sand texture finish use Tnemec Series 157.

f. Dense Concrete (Underside of Parking Deck for projects serving retail utilization):

Surface preparation: Clean and dry.

*Finish Coat: Modified-acrylate Elastomer, matte, at 8.0 mils or 100 sq. ft. per gallon (Tnemec Series 156 Enviro-Crete or approved equal)

*(2) coats are required to achieve recommended DFT.

g. Galvanized Metal (Interior and Exterior)

Surface Preparation: SSPC-SP1 solvent cleaning.

Primer Coat: Polyamidoamine Epoxy coating at 2.0-3.0 mils DFT (Tnemec Series 69 Hi-Build Epoxoline 11 or approved equal)

Finish Coat: High-build Acrylic Polyurethane semi-gloss at 2.0-3.0 mils DFT (Tnemec Series 75 Endura-Shield or approved equal)

h. Drywall (General):

Surface Preparation: Clean and dry.

Primer Coat: Water-based Epoxy primer at 1.0-2.0 mils DFT (Tnemec Series 151 Elasto-Grip or approved equal)

*Finish Coat: Water-based Acrylic Epoxy coating, semi-gloss, at 4.0-6.0 mils DFT (Tnemec Series 113 H.B. Tneme-Tufcoat or approved equal)

*If brushed or rolled, (2) coats are required to achieve recommended DFT.

1. Traffic Coating materials
Comply with ASTM C957

For heavy duty vehicular traffic within drive lanes, turn aisles, curbs, island and toppings adjacent to elevator/stair enclosures:

Neogard Division of Jones-Blair; "odor Free." Autogard F heavy Duty System with Flint aggregate

Qualideck F 100% solids by Advance Polymer Technology with Flint aggregate
Conipur II heavy duty deck coating system. 100% solids by sinneborn flint aggregate

8. Guarantee

Work performed shall be guaranteed in writing free of defects relating to workmanship or material deficiency for two (2) years from date of final acceptance. Any repair(s) necessary during this period shall be done immediately at no expense to the County. All materials shall have their original adherence at the end of two years, and there shall be no evidence of blisters, running, peeling, scaling, chalking, rust, streaks, fading or stains at the end of this period. Washing with alkali-free soap and water shall remove surface dirt without producing any deteriorating effects. During guarantee period, annual inspection of the completed installation shall be done jointly by the Contractor and the County, or at a time deemed necessary by the County, and any corrections required shall be done immediately by the Contractor at no cost to the County. All work shall be done on weekends only, unless otherwise approved.

Section 10 – Wayfinding and Signage

1. Wayfinding and Signage for garages shall be designed and installed in accordance with the latest edition of the MCDPWT/ MC Parking Facility Sign Standards Manual.
2. At the beginning of the project the County officials will clarify the signage to be used, based on the project location.

Section 11 – Car Counting System

1. The County will pay for (or include an allowance) and install Car Counting system.
2. All the necessary power conduits, rough-ins, data wiring including conduits must be designed, reviewed and installed as part of the construction project.
3. The County staff will coordinate this effort with the designers and the developers/contractors.

Section 12 –Security System

1. The County will pay for (or include an allowance) and install the cameras, DVRs and connect it to either County's or Verizon's fiber system.
2. All the necessary power conduits, rough-ins, data wiring including conduits must be designed, reviewed and installed as part of the construction project.
3. The County staff will coordinate this effort with the designers and the developers/contractors.
4. Connectivity of fiber connection to County's DVR from the street or service location is the responsibility of the developer/contractor.
5. Elevators must be equipped with security cameras connected to DVR.
6. Many doors will be activated by card swipe system. The project must include necessary hardware, conduits and wiring. The County will make the final activation of the card swipe system. The County staff will designate the doors required to be operated during the design process.

Section 13 – Communications

1. Coordinate all Wide Area network and communication solutions with DTS, Fibernet and Network Services division
2. Coordinate all Communication system solution within Parking Garage with Parking Engineering.
3. Coordinate all Local Area Network solution within the Parking Garage with Engineering Section, Planning Unit (IT Manager)