
SECTION 11 12 00
PARKING ACCESS AND REVENUE CONTROL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specifications apply to this Section.

B. Abbreviations List:

1.	ACS	Access Control System
2.	API	Application Programming Interface
3.	AVI	Automated Vehicle Identification
4.	APM	Automated Payment Machine
5.	EMV	Credit Card Payments via Chip
6.	ENS	Entrance Station
7.	EST	Eastern Standard Time
8.	EXS	Exit Station
9.	FAT	Factory Acceptance Test
10.	FMS	Facility Management System
11.	GUI	Graphical User Interface
12.	IP	Internet Protocol
13.	LAT	Lane Acceptance Test
14.	MST	Metro Smart Trip
15.	NEMA	National Electrical Manufacturing Association
16.	OCT	Operational Completion Test
17.	OWNER	Loudoun County
18.	PA-DSS	Payment Application Data Security Standard
19.	PAE	Pay-At-Exit
20.	PARCS	Parking Access and Revenue Control System
21.	PC	Personal Computer
22.	PCS	Proximity Card System
23.	PCI-SSC	Payment Card Industry Security Standards Council
24.	PCI-DSS	Payment Card Industry Data Security Standard
25.	PM	Preventative Maintenance
26.	PMS	Property Management System
27.	RAID	Random Array of Independent Disks
28.	RCS	Revenue Control System
29.	RF	Radio Frequency
30.	RFID	Radio Frequency Identification
31.	UPS	Uninterruptible Power Supply
32.	VOIP	Voice Over Internet Protocol
33.	WMATA	Washington Area Metropolitan Transit Authority

1.2 SUMMARY

- A. The extent of work included in this Section is shown on the Drawings and is specified as follows:

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1. Provision of all material, equipment, labor, services, testing, and training required to furnish and install a fully integrated on-line, real-time PARKING ACCESS AND REVENUE CONTROL SYSTEM (PARCS) that shall function in the manner described. Major system components of the PARCS includes, but is not limited to the following:
 - a) Parking Barrier Gates for gated control points.
 - b) Vehicle Detection Systems.
 - c) Exit Station accepting debit/credit card payment.
 - d) SmarTrip® Target Module System.
 - e) VOIP Intercom System.
 - f) Traffic Lane Control Signals indicating entry and exit lanes.
 - g) Facility Management System server.
 - h) Fiber optic connections to WMATA's MetroNET Network using cabling acceptable to WMATA.
 2. The Vendor shall bear total system responsibility for all specified work and for specified additions and changes to Owner systems of any type (except Contract deliverables) not requiring Contractor services, construction, testing, documentation, warranty and other areas of responsibility which are subject to periodic review and acceptance by the Owner (specified elsewhere).
 3. The Vendor has the responsibility to integrate the various necessary elements of Contract work so that overall specification performance goals are met.
 4. All Vendor provided systems, equipment and services shall perform and be suitable for their intended purpose, in accordance with best commercial practices, (as a minimum), and in compliance with all applicable specification requirements.
 5. The Vendor shall be required to deliver complete operable parking access and revenue control systems meeting all applicable performance and availability specification requirements, notwithstanding any errors or omissions in Technical Specifications that would otherwise prevent such delivery.
 6. The Vendor shall assume total responsibility for the configuration of equipment, parts, interconnecting wiring, software, and other materials and services furnished. Systems provided by the Contractor that do not meet performance levels required by the Specifications shall be modified, at the Contractor's expense, until the performance levels specified in the Contract are achieved. Any modifications to approved system designs shall be subject to prior approval by the Owner.
 7. The Vendor shall assume total responsibility for the correction of any degradation of the performance of existing systems or equipment, which results from the installation of any system or equipment interface required by the Specifications.
 8. Although the ultimate Owner retains rights to review the Vendor's system and component configuration and products selected and to accept or not accept for reasons of specification compliance or noncompliance; the Vendor retains sufficient latitude to ensure compliance with all specified performance and availability requirements. The Contractor shall, therefore, present engineering data, technical documentation, test program and quality assurance program data, and product selections that will ensure compliance with the system testing standards and all other technical specifications. In the event, these submissions are not accepted by the Owner, the Vendor shall resubmit with corrections, or resubmit completely revised documentation. The Contractor shall remain responsible for bearing any additional costs associated with change necessary to affect compliance with all specified performance and availability standards.

9. In the event the Vendor claims relief from specified performance or availability standards due to the application of Brand Name proprietary or detailed specifications, Owner directed changes, Owner engineering or drawing reviews, or any other Owner actions claimed to be in conflict with such performance standards; the Vendor shall furnish written notice to the Owner within 10 days after the discovery of such action attributed to the Owner. The Owner will review action cited and Vendor problem(s) involved, in an attempt to resolve these difficulties. In the absence of such timely notice, no such specification relief will be granted. The burden of proof for such claim(s) shall rest with the Vendor. The submission of timely Vendor claim(s) for specification relief as described shall be required as a prerequisite to the acceptance of resulting claim(s) for increased Contract cost or performance time extensions.

B. DESCRIPTION

1. The Parking Access and Revenue Collection (PARC) System for the parking facility shall be designed, furnished, installed and tested to allow Owner to operate this facility with regard to access control and revenue collection, in the same manner as other recently opened parking facilities. The PARC System shall incorporate features to permit Owner to add certain enhancements to the PARC system as described herein, without replacement of the system components provided under this contract.
2. PARCS shall include the following:
 - a) Gate and lane control signal control console(s).
 - b) Communications support installations.
 - c) Vehicle detector loops and loop leads to operate gates, credit card reader and In-lane Voice over IP (VoIP) intercom. Vehicle detector loop amplifier electronics and logic, including associated software, may be included as needed.
 - d) Barrier/lane control gates, with articulated arms suitable for applications with limited overhead clearance, as necessary.
 - e) Barrier/lane control gate controller/microprocessors.
 - f) Fiber optic connections to WMATA's MetroNET Network using cabling acceptable to WMATA (low smoke zero halogen cables, i.e. Series HZA by Superior Essex or accepted equal).
 - g) Back-up power supplies for all PARC System equipment to an emergency power circuit connected to the facility's emergency standby generator.
 - h) Controls for lane control signals.
 - i) Bollards.
 - j) Interfaces, wiring and miscellaneous equipment required to complete the system.
 - k) A Facility Management System server to be located on the equipment island with communications runs to the WMATA's Parking Operations Control Center and facilities controller servers through WMATA's MetroNET located at 600 Fifth Street, N.W., Washington, D.C. 20001 and back-up facilities controller servers located at 3500 Pennsy Dr, Hyattsville, MD 20785.
 - l) The facility PARC System equipment, including all I/O's and associated software shall be connected to WMATA's Parking Operations Control Center and facilities controller servers through WMATA's MetroNET located at 600 Fifth Street, N.W., Washington, D.C. 20001 and back-up facilities controller servers located at 3500 Pennsy Dr, Hyattsville, MD 20785.
 - m) Integrated Logistics Support (ILS).

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- n) Provisions and full compatibility with installation and operation of in-lane VoIP and intercom and credit card readers (including proximity smart card read/write readers).
3. The parking facility will be operated in a pay-on-exit mode of operation with fixed (daily) fees collected using WMATA's SmarTrip® System and Card and integrated magnetic stripe credit card readers. Fees are to be assumed fixed.
 4. Payment will be enforced with the use of barrier gates between the hours of 7:30 a.m. and 12:30 a.m., Monday through Thursday, and 7:30 a.m. and 2:00 a.m. on Fridays, but hours will be subject to change. The changing of hours and daily parking fees will be controlled by the parking facility managers from the Parking Operations Control Center located at 600 Fifth Street, N.W., Washington, D.C. 20001. No changes in software shall be required, only simple parameter changes resettable in the PARC software on the facilities controller servers that are described in the user manual.
 5. There will be provision for in-lane VoIP video intercom and credit card readers in all exit lanes.
 6. There shall be a SmarTrip® Target Module System installed at each exit lane to permit processing of a parking fee payment transaction using WMATA's SmarTrip® system and card. The SmarTrip® Target Module System consists of a SmarTrip® target with display and an operator display for each lane. The SmarTrip® card is one of two methods for payment of regular parking fees at the prevailing rate from the exit lanes.
 7. There shall be an EMV-ready credit card reader with receipt printer, VoIP intercom, programmable customer display and power supply installed at each exit lane to permit processing of a parking fee payment transaction using a magnetic stripe or chip credit card and remote communication with WMATA's Parking Operations Control Center. Credit card payment is one of two methods for payment of regular parking fees at the prevailing rate from exit lanes.
 8. All lane barrier gates shall be fully operable remotely from WMATA's Parking Operations Control Center and/or from the Loudoun Gateway Station parking operations office as designated by Owner.
 9. Traffic lane control signals mounted over traffic lanes will be controlled remotely from WMATA's Parking Operations Control Center.
 10. The facility's PARCS equipment will receive input from and monitor the functioning of the vehicle counting equipment, consolidate vehicle counting data, and create custom reports upon command either automatically or upon specific requirements through I/O's and associated software connected to WMATA's Parking Operations Control Center and facilities controller servers through WMATA's MetroNET located at 600 Fifth Street, N.W., Washington, D.C. 20001 and back-up facilities controller servers located at 3500 Pennsy Dr, Hyattsville, MD 20785. Automatic report generation shall be user controlled (on/off).
 11. Any microprocessors or other peripherals in the parking operations office will be supervised and controllable through the facilities controller servers located at 600 Fifth Street, N.W., Washington, D.C. 20001.
 12. The facility PARCS equipment, including all I/O's and associated software, shall be connected to WMATA's Parking Operations Control Center through WMATA's MetroNET, located at 600 Fifth Street, N.W., Washington, D.C. 20001 and back-up facilities controller servers located at 3500 Pennsy Dr, Hyattsville, MD 20785
 13. The facilities controller servers located at 600 Fifth Street, N.W., Washington, D.C. 20001 and back-up facilities controller servers located at 3500 Pennsy Dr, Hyattsville, MD 20785 shall have a real-time interface with all equipment and system I/O's in each parking lot/structure complex to be constructed. All data, alarms and other report/computer files should be remotely retrievable by parking operations specialists from WMATA's Parking Operations Control Center. The barrier gates, controllers, and credit card readers should

have the capability to be monitored and controlled from WMATA's Parking Operations Control Center.

14. All software licensed for use on the facility PARCS equipment shall also be licensed for use on the facilities controller servers located at 600 Fifth Street, N.W., Washington, D.C. 20001, on the back-up facilities controller servers located at 3500 Pennsy Dr, Hyattsville, MD 20785 and WMATA's MetroNET Network in general.

C. Work Included (To be provided by Vendor):

1. Design, fabricate, deliver, and install all new PARCS equipment as described in specifications. Included will be supply, delivery, unloading, setting, anchoring, and control wiring installation and wiring termination, and start-up of all PARCS equipment including operating software. The Vendor shall be responsible for providing a complete and working system
2. Pull all wires for the data and communication requirements. Conduit runs from each device back to each termination location point, have already been installed. Cabling provided shall be acceptable to WMATA. Vendor is advised that acceptable cabling options are limited and specialized.
3. Make final wire connections of all equipment. Electrical devices and other necessary devices or interfaces required to make the system function properly shall be included as part of the work.
4. Installation of fiber patch panel in existing 19" equipment rack located in Rail Station Communications Room.
5. Provide an install a PARCS that complies with all applicable codes and standards including State and Americans with Disabilities Act.
6. Obtain any and all permits that are required to complete work.
7. Vendor is responsible for reviewing plans, specifications, existing and proposed infrastructure and existing conditions to be certain that all functional requirements, as described, will be achieved with equipment to be supplied.
8. Submit Shop Drawings and product literature as specified herein.
9. Vendor to furnish drawings and specifications for lane islands necessary to support equipment installation and operation.
10. Vendor to provide all required power conditioners in bid amount if PARCS system or any component thereof requires power differing from that specified.
11. Attend construction meetings, provide schedules for base and add alternates as requested, and schedule fieldwork that shall be coordinated with other trades.
12. Test equipment in accordance with these specifications.
13. Provide record drawings, operating manuals, maintenance manuals, spare parts, and training sessions as specified herein.
14. Provide information to Owner about type, and location of high-speed data communications line needs for credit card processing system within two weeks after notice to proceed.
15. Terminate and connect all communications cabling. Install all Vendor supplied equipment and the interconnection with Owner's supplied equipment. Furnish and install all network and internet connection devices, electronics and equipment for communications network.

D. Work by Others:

1. Owner to provide high speed communications for credit card processing at system server location.

1.3 SYSTEM DESCRIPTION

- A. General: The PARCS will be used for transient parking. General transient parkers will enter the facility through a loop-activated lane and satisfy flat rate daily fees at the exit by using credit/debit card or Metro SmartTrip card.
- B. The facility provides a combined total of approximately 200 parking spaces within the facility.
- C. Description of Lanes:
 1. Entry lane:
 - a) One (1) standard WMATA parking rate, hour and regulations sign shall be prominently located adjacent to the entry lane. Sign shall be installed at the leading end of the concrete traffic island.
 - b) One (1) Overhead Lane Control Signal mounted as shown in drawings, with a lighted green arrow signal indicating the designated entry lane directed to approaching drivers.
 - c) Four (4) bollards. Bollards shall meet all standards and requirements as detailed in Section 05 12 00 (Structural Steel) and Section 05 50 00 (Miscellaneous Metals).
 - d) Two (2) induction loops.
 - e) One (1) barrier gate.
 - f) One (1) facility "Lot Full" sign.
 2. Exit lane:
 - a) One (1) standard WMATA parking rate, hour and regulations sign shall be prominently located adjacent to the exit lane. Sign shall be installed at the leading end of the concrete traffic island.
 - b) One (1) Overhead Lane Control Signal mounted as shown in drawings, with a lighted red "X" signal and "Do Not Enter" messaging oriented towards approaching drivers indicating the designated exit lane.
 - c) Four (4) bollards. Bollards shall meet all standards and requirements as detailed in Section 05 12 00 (Structural Steel) and Section 05 50 00 (Miscellaneous Metals).
 - d) One (1) Exit Station with integrated VoiP intercom unit and credit card.
 - e) One (1) WMATA SmarTrip® Target Modules.
 - f) Two (2) induction loops.
 - g) One (1) barrier gate.
 3. See drawings for additional details.
- D. Operation:
 1. Entrance Lanes - Transient Parkers
 - a) A vehicle enters the entry lane, activating the arming loop buried in the lane next to the entry station.
 - b) The loop detector reads the activation signal and in turn the barrier gate raises, allowing the driver to enter the facility.

- c) As the vehicle passes over the closing loop, located just beyond the gate in the drive lane, the loop sends a pulse to the loop detector, which in turn signals the gate arm to be lowered and deactivates the entry station.
- d) The system will allow 30 seconds after the gate is raised for the vehicle to move forward, off the arming loop and onto or over the closing loop. Under no circumstances will the gate lower as long as the closing loop is activated.
- e) If after 30 seconds the vehicle has not moved forward off the arming loop, an alarm will be issued by the system, notifying the Owner's agent that there is an issue in the lane. The gate will remain raised as long as the arming loop is activated.
- f) If after 30 seconds the vehicle has moved backward off the arming loop and not progressed across the closing loop and into the lot (i.e. a 'back out'), an alarm will be issued by the system, notifying the Owner's agent that there is an issue in the lane. The system will flag the last transaction, signal the entry gate arm to lower, and deactivate the entry station.

2. Exit Lanes - Transient Parkers

- a) The exiting vehicle will be automatically detected as it passes over the front inductive loop. The EXS device will audibly instruct the user to make payment with a Metro Smart Trip card or debit/credit card.
- b) Should a patron wish to pay with a credit/debit card, the patron will insert the credit/debit card into the credit card slot at the EXS. Once verified, the card will be returned automatically. The payment card will be returned and system will reset.
- c) Should a patron wish to pay with a Metro Smart Trip Card, the patron will present the card to the SmarTrip Module. The SmarTrip system will validate the credential, process payment, acknowledge successful settlement, and signal the PARCS that the account holder may exit the facility.
- d) Should an invalid card be used, the card will be rejected, the PARCS will log the occurrence with date, time, card/tag reader location, encrypted card number and type of invalid access. The gate will not be activated (gate arm will not rise to allow passage of the vehicle through the lane) and the in-lane display shall read "INVALID". The lane equipment will reset for processing the next vehicle and the necessary steps to correct the situation shall be determined by use of the intercom system.
- e) Upon a successful completed transaction, the gate will be activated (gate arm will rise to allow passage of the vehicle through the lane). When the vehicle passes over the gate inductive loop, the gate will close, and the lane will reset to repeat the operation for the next vehicle.
- f) The system will allow 30 seconds after the gate is raised for the vehicle to move forward, off the arming loop and onto or over the closing loop. Under no circumstances will the gate lower as long as the closing loop is activated.
- g) If after 30 seconds the vehicle has not moved forward off the arming loop, an alarm will be issued by the system, notifying the Owner's agent that there is an issue in the lane. The gate will remain raised as long as the arming loop is activated.
- h) If after 30 seconds the vehicle has moved backward off the arming loop and not progressed across the closing loop and out of the lot, an alarm will be issued by the system, notifying the Owner's agent that there is an issue in the lane. The system will signal the entry gate arm to lower, and deactivate the exit station. The parker's ticket will be retained by the exit station if ingested or invalidated if not.

1.4 SUBMITTALS

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- A. General: Submit the following in accordance with the Conditions of Contract, specifications and Division 01 Sections.
- B. Schedule: Vendor shall submit a detailed schedule of project requirements including milestones for shop drawings, equipment fabrication, necessary (Owner-provided) site preparations, delivery, installation, training, transition plan and testing within 30 days after award of contract. Schedule to be updated at 30-day intervals. At a minimum the following shall be included:
1. Schedule in Gantt or similar format identifying milestone dates, project start and completion dates, lane-by-lane installation dates, testing and training dates.
 2. Phasing Plan: Provide schedule for provision of power and communications to lanes (by Owner), development of equipment islands and podiums (by Owner), installation of new equipment and activation for public use.
- C. Product Data:
1. Submit manufacturer's product data, specifications, installation, and maintenance instructions for each type of parking equipment furnished.
 1. Product data/literature to include equipment dimensions, finishes, power and electrical requirements, communications requirements, temperature ranges and NEMA or intrusion protection (IP) ratings.
 2. For system software and associated hardware provide the following at a minimum:
 - a) Software user interface including GUI and screenshots.
 - b) Diagram in schematic format showing communication between FMS and all major devices.
 2. Provide templates (if applicable) for anchor bolts and other items encased in concrete or below finished surfaces in sufficient time so as not to delay the Work.
- D. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Detail equipment assemblies and indicate dimensions, required clearances, method of field assembly, components and location and size of each field connection.
1. Wiring Diagrams: The Vendor shall supply three sets of wiring diagrams and maintenance manuals for each of the major components of the system, as well as the entire as-built system wiring diagrams.
- E. As-Built Documentation:
1. Submit drawings showing the actual location of each piece of equipment utilizing drawing provided with bid documents prior to acceptance of system.
 2. Submit three hard copy sets and one set of CAD (AutoCAD 2012 or newer format) as-built documentation of all systems and components installed. Vendor shall update the most recent as-built documentation submitted as further changes occur in the field as a result of upgrades throughout the warranty period. Include identification of all TCP/IP devices with each device's IP address.
- F. Proof of PA-DSS validation suitable for new installations. Implementation guide from all systems subject to PA-DSS validation.
- G. EMV Status: Provide a statement of EMV status for either of the following:

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1. EMV Complete: This certifies that the credit card devices are EMV ready, certified and tested to provide credit card transactions as a Chip based transaction as well as a mag-stripe.
 2. EMV Not Complete: Either the credit card payment devices are not Chip enabled, not upgradeable or incompatible with EMV. This provision must be listed as an exception on forms provided in front end documents.
- H. Samples: Provide samples of paint colors and finished for ENS's, EXS's and APM's; ACS proximity cards (if applicable); standard reports including screenshots and layouts and other elements requiring selection by Owner with 30 days of contract approval. Approved selections will be returned to Vendor within 30 days of submittal.
- I. Qualification Data: Submit qualifications per Section 1.6.
- J. Operation and Maintenance Data: Provide Owner with Manuals and Record Drawings for all aspects of the PARCS. Manuals should clearly delineate day-to-day operation and maintenance of the equipment. As a minimum, the following shall be provided:
1. Operation and Maintenance Manual: This manual shall contain all information required to operate the system and perform scheduled maintenance including inspection, lubrication, adjustment and parts removal and all schematic and system operation required to accomplish on-line trouble shooting, fault isolation and repair. It shall include drawings depicting layout and locations of controls, indicators, cranks and cut offs, and emergency procedures and safety requirements. This manual shall contain assembly exploded views and isometric drawings and detailed step-by-step instructions for the removal, repair and replacement of all subsystems and components. Off line trouble shooting shall also be covered. For software developed or modified for this contract, the manual shall include a complete annotated source code to enable trouble shooting by Owner users/and or programmers. The manual shall include reference and documentation for any commercial software used in the system.
 2. Parts Catalog: Enumerate and describe every component with its related parts, including the supplier s number, the Contractor s number and commercial equivalents. Include provisions for entry of an Owner part number. Use cut-away and exploded drawings to permit identification of all parts. Parts common to different components (for example bolts and nuts) shall bear the same Contractor s number with a reference to the other components in which they are found, including cross reference and indexing system in the replacement components list. Items which have been manufactured by others shall be identified by the manufacturer s name and part number as well as by the Contractors component number, if any., Each part or component shall be identified to the next larger assembly.
 3. Each manual shall be organized into the following parts:
 - a) Part One - Subsystem Characteristics
 - 2) A physical description of the subsystem and pertinent technical characteristics.
 - 3) A description of the functions the subsystem is designed to perform and the general methods employed to accomplish those functions.
 - b) Part Two - Principles of Operation
 - 4) Detailed discussion of the theory of operation.
 - 5) Interface between subsystem components.
 - 6) Signal flow sequence correlated to block diagrams.

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- c) Part Three - Operating Procedures
 - 7) Turn on and turn-off procedures.
 - 8) Detailed operator instructions sufficient to operate the equipment in each available mode of operation.
 - d) Part Four - Maintenance Procedures
 - 9) Preventive maintenance procedures and schedules.
 - 10) Fault isolation and analysis procedures and schedules.
 - 11) Corrective maintenance and repair procedures.
 - 12) System calibration and test procedures.
 - 13) Parts catalog.
 - 4. Bind each copy of the above manuals as required by the General Requirements. One copy of each manual required shall be in a Windows-compatible electronic format.
 - 5. Five of each manual (Operations and Maintenance Manual and Parts Catalog). Revisions shall be supplied in the same quantities as specified for the manuals.
 - K. Warranty Documentation: Provide manufacturer's warranty documents in the format, and quantities as specified in Warranty section.
 - L. Software: Provide Owner with original copies of all licenses, registrations, documentation, disks and other media as may have been included with those commercially available software packages provided with system.
 - M. Training:
 - 1. The Equipment Familiarization Course shall provide management, supervisory and engineering personnel with a functional understanding of the equipment (hardware and software). The functions of each item shall be covered, including the interrelationships of the equipment with vehicles and patrons.
 - 2. A Line Maintenance Course shall provide maintenance supervisors and technicians with the knowledge and skills required in the performance of preventive maintenance of all components of the system. Additionally, the course shall cover any deliverable software, and maintenance of special test equipment provided, whether portable or stationary, including built-in test features. The course shall emphasize preventive maintenance as well location and correction of malfunctions to the system. Sufficient training in operation, theory of operation and fault isolation to isolate problems to the equipment component or software module level shall be presented.
 - 3. The Shop Maintenance Training Course shall provide maintenance supervisors and technicians with the knowledge and skills required in the performance of preventive and corrective maintenance of the entire system. Additionally, the course shall cover any deliverable software, and the maintenance of special test equipment provided, whether portable or stationary, including built-in test features. The course shall provide in-depth training on theory of operation of the system, individual software modules, printed circuit boards (including Contractor designed, off the shelf, OEM and all other vendor supplied not covered by written expressed Contractor full labor and material lifetime warranties), any other special test equipment, shop test procedures, module and printed circuit board repair procedures, and overhaul and testing procedures to the equipment component level. Operations procedures shall also be covered.
 - 4. Training Criteria and Instructor Qualifications:
 - a) The Vendor shall develop and provide all familiarization, line and shop level training necessary for Owner designated personnel to support the system, and shall have

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- fully qualified instructors presenting the instruction. Classroom instruction shall include the anatomy and functioning of the parts under discussion, the essentials of their routine care including lubrication schedules, adjustments, limits test, and inspection frequency, troubleshooting, removal and replacement. Instruction shall cover theory of operation of the system, individual modules and all printed circuit boards. Software flow diagrams shall be used to show sequence of events and timing of system operations.
- b) Instruction shall be designed to cover, in detail, the functions of each item of equipment. Fault isolation and troubleshooting technique will be covered to the extent necessary to permit a technician to diagnose and repair faulty items of equipment. There shall be instruction designed to permit Owner maintenance personnel with practical experience in the performance of preventive and corrective maintenance. The course shall include hands on troubleshooting and fault isolation of all subsystems using simulated faults provided for each. Students shall be allocated adequate time to perform preventive maintenance operations on the system components in addition to troubleshooting bugged system components.
 - c) Instructors shall be experienced and fully qualified to teach the course as outlined. The Vendor shall provide a resume outlining the instructor s qualifications and skills. The Vendor shall obtain approval of instructors from the Owner 120 days prior to the beginning of the training. Qualifications will be considered adequate when:
 - 1) The Vendor's designer of the system is the instructor and has the ability to communicate facts about the system in understandable terms: or
 - 2) The instructor has been trained in teaching methods and is fully familiar with the subject matter.
 - d) In all cases, lesson plans shall be prepared and submitted to the Owner at least 120 days prior to the class. These lesson plans shall outline material to be presented and list training aids to be used. The Vendor shall assume that Owner employees have no knowledge of the features of the new equipment. The Owner shall be permitted to video tape all class presentations on a non-interference basis.
5. Provide first generation reproducible training materials that meet the following requirements:
- a) An instructor's guide for each course, which shall include:
 - 1) Table of Contents listing each topic and the time allotted.
 - 2) List of applicable documents.
 - 3) List of training materials.
 - 4) Course learning objectives including course length and recommended number of students.
 - 5) Each topic shall have a cover sheet listing the topic, objectives, time allotted and training aids required.
 - 6) Examinations, if applicable.
 - 7) Training aids shall be developed with the instructor guides.
 - 8) Student and Training Course Evaluation forms.
 - b) A course outline with learning objectives stated for each topic, shall be provided. It shall include a topic outline for each item of equipment. Maintenance courses shall include a section devoted to system fault analysis and troubleshooting.
 - 1) Description of course including course objectives and type of training.
 - 2) Course length and recommended number of students per course.
 - 3) List of training materials required including documentation and equipment.

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- 4) Each course outline shall list all topic objectives and the time allotted to each topic.
- c) A set of lesson plans shall be developed for each item of equipment, corresponding to the topic outline, and shall contain the following information: lesson title, time, objectives, training aids required, instructing sequence (outline), tests and summary.
- d) Visual training aids shall be developed for each topic.
- e) The primary source of instructional material shall be the applicable sections of the operation and maintenance manual(s), approved by the Owner and certified by the Vendor as being correct and reflective of as-built conditions and equipment. In addition, the Vendor shall develop, for each course, notebooks containing such additional drawings, descriptive information and procedures necessary to ensure meeting all learning objectives in an orderly and timely manner. Copies of diagrams, drawings and procedures shall be produced from engineering data and manuals by the Contractor for inclusion into the notebooks. Arrange notebook material by each item of equipment and sequence according to the topic outline. This material shall be submitted for Owner approval not later than 120 days prior to the start of training.
- f) Training shall be concluded utilizing installed equipment in the normal operating condition, except in the case of classroom or shop and maintenance training lab equipment shall be used. The Vendor shall provide the production equipment for use during conduct of the training program described herein. Any special tools or test equipment required for maintenance shall be supplied by the Vendor and delivered to the Owner.
6. Supplemental Training: In the event the Vendor changes or performs modifications to the equipment subsequent to the training that impacts form, fit or function, the Vendor shall provide supplementary training to the Owner's training instructor on a onetime basis.
7. Location: Training classes will be conducted at facilities provided by the Owner.
8. Practical training on equipment shall be no less than 60 percent of the course duration. Personnel attending training sessions will be identified by Owner.
9. Time: Class time will be at the convenience of the Owner.
10. Schedule: The Vendor shall develop a detailed training program plan.
- a) The Vendor shall submit a final outline and schedule of classes for the training program 120 days prior to scheduled completion of the parking facility
- b) The Vendor shall submit lesson plans course materials for students and instructors, notebooks and instructor manuals, 120 days prior to course beginning. This material will become the property of the Owner following the conclusion of the training course. Two copies of the material for each course shall be provided 120 days in advance of this course for Owner approval.
11. Scope: The following number of Owner personnel will attend the training program:
- | Course Title | Length of Session | Number of Students per course | Number of Courses |
|--------------|-------------------|-------------------------------|-------------------|
| Equipment | 4 Hours | 8 | 1 |
| Line | 16 Hours | 8 | 1 |
| Shop | 8 Hours | 4 | 2 |
12. Until final delivery of the product to the Owner, a document configuration control system approved by the Owner shall be used to maintain all training material. All revisions shall be identified at the beginning of each manual. Revisions shall be made for all design changes and, retrofit, error corrections and as otherwise required. Include a control list for each manual produced which shall show the date and latest revision of each page in the manual. Include the list as an index in each manual, to be issued with each revision of the manual until expiration.
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N. Testing Plan and Documentation:

1. Submit a PARCS testing plan for review and approval by Owner and/or other Owner's Representative 30 days prior to commencement of first test.
2. Plan must include testing scripts for testing all system functionalities described in this specification document and all other standard functionalities (included with the proposed PARCS) that are not described herein.
3. Owner to return comments/edits to the testing plans provided. Vendor shall incorporate all changes and edits requested by Owner and submit revised testing plan for verification.
4. Approval of final testing scripts are required prior to commencement of first test.
5. Test procedures and scripts are to be provided for the following tests:
 1. Factory Acceptance Test (FAT)
 2. Lane Acceptance Test (LAT)
 3. Operational Completion Test (OCT)

1.5 QUALITY ASSURANCE

- A. The equipment shall be designed, fabricated and installed to operate effectively under the climate and exposure conditions of the installation site and of the individual site requirements of each exit/entrance lane. All equipment shall be new. Rebuilt, reconditioned or used parts are not acceptable.
- B. All electrical equipment shall be approved by Underwriters Laboratories, Inc. (UL) where such approval is standard in the industry. Where required by Code, provide electrical enclosures complying with applicable NEMA standards. Equipment and materials not covered by UL Standards may be considered if equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory.
- C. Provide equipment housings, conduits, and junction boxes exposed to weather that meet or exceed NEMA 4 or IP54 standards.
- D. Provide a PARCS with equipment and related components that have a useful service life of ten years. Specify periodic maintenance requirements in maintenance manuals to meet life expectancy.
- E. Vendor shall be responsible for all software and ensure that communications are properly received/transmitted by all computers and devices.
- F. Vendor of Parking Control System shall provide an experienced field representative to meet with Owner before any work begins, to review construction plans as they relate to the PARCS, to explain details or precautions necessary to assure that all parking and revenue control equipment, and in particular, detector loops will work properly and to determine that all required conduits and wiring are properly laid out. Manufacturer representative is to coordinate with Vendors contractor the required depths for detector loop installation and, based on the structural system, ensure depth does not impact underlying utilities.

1.6 QUALIFICATIONS

- A. Vendor shall have at least 5 years of experience in the sales, installation and service of PARCS and maintain a stock of replacement parts for the equipment specified. The equipment Vendor shall have a service outlet within 200 miles of the project.
- B. In the event the parking control system manufacturer is not the installer, then the installer shall be approved in writing by the system manufacturer.
- C. Said installer shall have previously worked successfully with the PARCS manufacturer and shall submit names, locations, contacts and telephone numbers for the five most recently installed, completed projects.
- D. Contractor/Installer shall use only fiber-certified technicians for fiber installation, related equipment and connections.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. The equipment shall be delivered to the site packaged to prevent damage and marked for easy identification of each component.
- B. The equipment shall be stored in a clean, dry location. OWNER shall provide Vendor with a designated storage/staging area for PARCS equipment pending installation. Damaged equipment shall be replaced at no cost to Owner.

1.8 PROJECT CONDITIONS

- A. Vendor shall familiarize itself with project conditions within the local environmental area of the project. Weather conditions typical to the project area shall in no way interfere with the operation of the equipment proposed.

1.9 OPERATING CONDITIONS

- A. Equipment shall be designed, fabricated, and installed to operate effectively under the climate and exposure conditions to which the equipment will be exposed. All equipment located within the parking areas is for exterior, exposed-to-weather use.
- B. Provide a system such that environmental conditions in a cabinet do not cause failure of the installed electronics (i.e. moisture, condensation etc.).
- C. It is recognized that certain solid state and computer-type parking and revenue control equipment may require special electrical power and grounding considerations. If required by the parking and revenue control equipment, the Vendor of the parking control system should:
 - 1. Include in the bid amount, the cost to provide and install voltage stabilization modules or devices to protect each component from normal voltage variations.
 - 2. Furnish and install on-line, regulating computer grade uninterruptible power supply (UPS) with thirty minutes of backup battery power for data protection only.
 - 3. Advise Owner in writing at the time of the award of contract of any special electrical power and grounding requirements.

1.10 TIME OF COMPLETION

- A. Vendor shall coordinate installation and testing of equipment so that Owner may operate the parking lot prior to or at the same time as the other project components are activated.

1.11 WARRANTY

- A. All equipment is to be covered by a manufacturer's warranty covering all equipment and installation (100% parts and labor) for a two-year period, excluding misuse or vandalism.
 - 1. System shall be maintained and serviced against any and all malfunctions due to manufacturing or installation defects at no cost to Owner during warranty period.
 - 2. Vendor shall provide Manufacturer's recommended schedule and preventative maintenance list. Preventative maintenance shall be performed by experienced technicians based on a preplanned schedule.
 - 3. All warranties commence upon final system acceptance when the respective equipment is totally operational and is accepted in writing as such by Owner.
 - 4. Warranty shall not cover acts of vandalism, third party damage, damage from natural phenomena or damage caused by maintenance actions of untrained/unapproved Owner's personnel.
 - 5. Starting at the time of acceptance of the PARCS by Owner, provide complete systematic inspection and maintenance of parking equipment for the duration of the warranty period.
 - 6. Furnish equipment and trained experts to check, adjust, lubricate and otherwise maintain the parking equipment in operation without defects or deterioration.
 - 7. Warranty Response:
 - 1. Local service shall be provided to maintain all equipment and systems during the warranty period and any extended maintenance periods with regularly scheduled maintenance.
 - 2. Emergency call-back service for minor repairs and adjustments to return the parking control system to service shall be available on demand, 24 hours per day, seven days per week. In the case of any malfunction.
 - 3. Warranty and any subsequent extended maintenance contract response shall be Seven days: 7:00am – 10:00pm (EST), the response time for repairs shall be limited to four (4) hours, and no equipment, system or component shall be left non-operable after the next business day following notification by Owner.
- B. Software: Vendor shall repair or correct software functions required by specifications, even if undiscovered during testing or commissioning, including report formatting and data recovery resulting from software deficiencies at no additional cost to Owner.
- C. Software Updates: Vendor shall notify and provide with all commercially released software updates and patches applicable to PARCS that are released during warranty period and extended maintenance contract periods at no additional cost to Owner.

1.12 INTEGRATED LOGISTICS SUPPORT (ILS)

- A. The spares, manuals and training shall provide the Authority with the capability to support the system. The spares, manuals and training must satisfy the following requirements, in addition to those stated in the General Requirements.
- B. Maintenance Support will be on two levels as follows:
 - 1. Line Maintenance;

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- a) This level will be first link in the corrective maintenance chain with the requisite skills, tools and test equipment to analyze trouble calls and take corrective action. Line maintenance personnel will troubleshoot and repair malfunctions in the field.
 - b) Line maintenance personnel shall perform periodic scheduled preventive maintenance in accordance with Contractor published manuals. The Vendor's recommended preventive maintenance schedule shall be based upon the number of machine actions and/or machine service time.
2. Shop Maintenance
- a) Shop maintenance personnel shall have the skills, tools and test equipment to adjust, replace, repair, maintain and test the system in accordance with Contractor published manuals and instructions. Detailed assembly and sub-assembly engineering shall be developed by the Vendor and reviewed by the Owner for approval to support shop maintenance. Those drawings must be included in the applicable technical manuals. Nothing in this section is intended to require the disclosure of certified manufacturer's proprietary information. If certified manufacturer's proprietary information is involved with any assembly, subassembly or system, the Vendor shall so state, identify the assembly, sub-assembly or system and shall alternately cover the Authority with an expressed in writing full labor and materials equipment lifetime repair and/or replacement warranty. The Owner only has to identify the defective system, assembly or sub-assembly to the best degree possible and ship the defective item back to the manufacturer. The manufacturer will return the repaired unit or a new or reconditioned replacement within 10 working days of receipt. Widely available consumer computer hardware purchased from other manufacturers is exempt.

C. Spare Components

- 1. 1. The Contractor shall provide spare components incidental to this contract. The total value of spares provided incidental to this contract shall be ten percent of the price of the equipment and materials installed under this section of the Contract.
- 2. 2. Submit a recommended spare parts list to WMATA Office of Parking (located at 600 Fifth Street, NW, Washington, DC 20001), with prices, showing the spare parts necessary to support the maintenance requirements for five years of revenue collection service. The recommended spare parts list shall be based on the following guidelines:
 - a) Group the list by subsystem and equipment item for stocking identification, include ordering and procurement information for subassemblies and components.
 - b) Include component name, description, rating accuracy, manufacturer's name, part number, drawing references, and correlate with the maintenance manuals. Prepare the list in a format that can be easily adapted for entry into a computer. Provide electronic media copies of the list.
 - c) Correlate the quantities recommended with reliability requirements and lead times, and considering the following classifications:
 - 1) Wear: Components which may be expected to require regular replacement under normal maintenance schedules, such as mechanical parts subject to continuous operation.
 - 2) Consumables: Components with an expected life of less than five years, such as indicator lamps.

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- 3) One Shot: Components which normally require replacement after performing their function only one time, such as fuses.
 - 4) Long lead: Components which are not available at short notice from commercial distributors or within 48 hours from the manufacturer, such as specially made or selected components
 - 5) Exchange assemblies: Assemblies which will be exchanged with malfunctioning on the supplied equipment during maintenance and which must be inventoried as complete assemblies.
 - 6) Cross referencing: Where replacement components are common to more than one system or subsystem.
 - 7) Non-unique parts: Items which are not unique to the system and have been manufactured by others.
3. The recommended spare parts shall be identical with all corresponding items of apparatus, components, assemblies and subassemblies incorporated into the system.
 4. Package and label spare parts procure under this Contract for long term Owner storage.
 5. Delivery shall be delivered to Loudoun County and stored in the adjacent parking structure.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS OF PRIMARY COMPONENTS

- A. PARCS manufacturer shall be able to demonstrate successful performance of proposed system and equipment. Proof of successful performance shall be submitted as specified herein. Acceptable manufacturers for any and all primary components shall meet the following requirements
 - 1. Manufacturer shall have been continuously in operation for past five years.
 - 2. Manufacturer shall have current version of each primary component currently operating successfully in two or more parking facilities of comparable size, type and activity.
- B. Substitutions:
 - 1. Where functional performance, features or quality of vendor's proposed system or components varies materially from that specified, submit request for substitution identifying substitution being offeree/proposed. Provide documentation for substitution via the concurrent submittal of supporting data sheets, brochures, and technical specifications for Base Bid alternate items.

2.2 GENERAL CONDITIONS:

- A. All lane devices shall be ergonomically designed for ease of use by patrons.
 - 1. Internal components shall be modular and plugged for easy maintenance and replacement.
 - 2. Connection boxes for all wiring connections shall be corrosion resistant.
 - 3. Barrier Gates and EXS's shall have:
 - 1. Access doors shall open away from traffic lane.
 - 2. Grounded 115VAC convenience outlet.
 - 3. Thermostatically controlled heaters.

2.3 MATERIALS:

- A. Cabinets shall be fabricated of a material that is strong and durable including but not limited to:
 - 1. Stainless, steel, aluminum alloy, composite or 12-guage steel.
 - 2. All mounting holes shall be accessible from inside of cabinet only.
 - 3. All surfaces to be corrosion resistant and cabinet exterior shall be finished in a color approved by OWNER.

2.4 LANE CONTROL INDICATORS

- A. Lane Control Signs: Shall be provided in the quantities and locations as specified. Sign shall be activated automatically by FMS when a lane is opened or closed, or manually.
 - 1. Lane Control Signs shall be Signal-Tech© Model TCL1212RG-175DS or approved equivalent.
 - 2. Display technology shall be super bright direct view LED.

3. Functional Requirements.

1. All messages shall be clearly legible, attracting attention under any lighting condition.
2. Technology shall be solid state, redundant circuitry so that removal or failure of one component has minimal or no effect on overall sign performance.
3. Signs shall be capable of continuous operation from -35° F to 165° F.

- B. Provide a control panel in the Server Container for the Lane Control Signals. A separate key set on/off switch shall be provided for each lane with a two position selector toggle switch.

2.5 LOT FULL SIGN

- A. FULL signs, activated automatically by differential vehicle counter (hardware and/or software) with anti-coincidence and directional logic and, will be installed in advance of and at each roadway entrance to the parking lot/structure complex.
- B. LED sign with 4-inch-high letters in a weatherproof housing with built in sun shield. Finish white baked on enamel. Mount sign on 42-inch-high pedestal.
- C. Full sign shall be capable of being activated manually or automatically from the facility management software system. When the sign is activated, the access equipment may be deactivated to prevent patrons from gaining access.

2.6 SERVER CONTAINER

- A. The Facility Management System Server will be contained in a waterproof cabinet to be located on the equipment island. The Server Container shall:
1. Be at least 950 mm wide by 450 mm deep by 1,272 mm high.
 2. Include a single locking door with two or more locking points and stainless-steel hinges.
 3. Be constructed of stainless steel, galvanized steel or aluminum with protective coating to resist vandalism and weathering.
 4. Include an EPDM conductive gasket between frame and contact surface.
 5. Be ground mounted.
 6. Rated NEMA Type 4 or higher.
 7. Rated IP 66 or higher.
 8. Include an integrated climate management system which maintains an operating environment of:
 1. Not less than 40°F nor more than 80°F.
 2. Not less than 40% nor more than 60% relative humidity.
 9. Include sufficient space for the required 1U rack-mount fiber cabinet for patching applications (Legrand Model OR-FC01U-P or equivalent).

2.7 INTERCOM SYSTEM

- A. Intercom system to be a VoIP system utilizing a software or hardware-based intercom server system with following features:

1. Intercom system shall provide for two-way communications between intercom call stations at EXS's to intercom PC based substation at the Parking Operations Control Center located at 600 Fifth Street, N.W., Washington, D.C. 20001.
2. Programming for all intercom features shall be performed through system workstation.
3. Include all required operating software and programming software.
4. Provide one (1) client module licenses (software-based solution) or one (1) intercom masters to enable communications (via PC or master) at remote monitoring stations.
5. Include the following features:
 1. Ability to forward VoIP calls initiated at an intercom station to a land-line or mobile phone number.
 2. Ability to dial and forward calls to a backup number if initial phone number is busy or unanswered within a number of rings. Number of rings to be programmable by Owner. Include ability to dial two external phone numbers at a minimum.
 3. Provide programmable volume control for each intercom station.
 4. Include ability to provide up to 20 pre-recorded messages at intercom stations.
 5. Include ability to queue calls received based on first come, first serve basis.
6. Intercom stations to be installed by manufacturer at height to enable a patron to easily access it from a passenger vehicle in a seated position at lane equipment.
7. System to comply with current Americans with Disabilities Act requirements.

2.8 CREDIT AND DEBIT CARD PROCESSING

- A. The following types of credit card payments shall be accepted:
 1. VISA
 2. Master Card
 3. American Express
 4. Discover
 5. Bank Debit Cards with Credit Card logo
- B. Utilize credit and debit card acceptance hardware, software, and other system components that are PCI DSS and EMV compliant:
 1. PCI-DSS Compliant Systems: For all devices and systems that are in scope of PCI-DSS compliance as defined within the latest version of PCI-DSS, provide verifiable proof that all such devices are:
 1. A currently validated PA-DSS Application, suitable for new installations, as listed at the PCI-SSC web site.
 2. For EMV readiness all devices that accept a payment card must accommodate point to point encryption (P2PE) EMV payments with the following level of readiness:
 1. Device is fully ready to accept P2PE EMV payments. Devices that are not EMV upgradeable or ready will not be accepted.
 1. Provide a list of all available options for Payment Processors and Gateways that may be selected to support EMV processing.

2. All attended devices (where an employee facilitates the transaction) must have a P2PE EMV PIN-pad included. All unattended (automated) devices (APM, EXS) may have a PIN pad, but it is not required.
- C. Credit Card Approval System: The credit card reader with each fee computer, APM and EXS shall be connected directly or indirectly (via intermediary server) to a payment processing gateway via a high-speed connection to receive real time authorizations. Authorization for credit card transactions from swipe (or Dip if EMV) to authorization shall not be greater than five seconds. Vendor shall be responsible for confirming record formats required by Owner's financial institution. Credit card processing shall integrate with OWNER's credit card processing clearinghouse. Vendor to include cost of integration in Base Bid.
- D. Confirm and provide record formats required by Owner's financial institution.
- E. Credit Card on File: Provide ability to have a credit card "on file" to enable recurring charges to credit card. This feature must be fully PCI-DSS compliant. Provide details on how credit cards "on file" are encrypted and protected.

2.9 EQUIPMENT LIST

- A. The following equipment list consists of basic system components. Auxiliary items required for the proper functioning of the system, whether mentioned or not, shall include but not be limited to: heaters, coolers, wiring, transformers, relays, pedestals, etc. It is the vendors' and manufacturer's responsibility to provide every component necessary for a complete functional system.
 1. See System Configuration in Part 1 of this section and drawings for scheduled quantities of the basic system components for various locations within the facility.
- B. Equipment should be located as shown on the drawings. Adjustments may be necessary due to field conditions and may be permitted following consultation with the Owner.

2.10 AUTOMATIC BARRIER GATES

- A. General: Each automatic barrier gate unit shall consist of an operator and controller housed in a cabinet enclosure with gate arm. Include the following features:
 1. Operation Modes: On-line communication to FMS computer with automatic switch to standalone mode if communications are interrupted.
 2. Field programmable with built-in service diagnostics.
 3. Gate system shall have safe guards to ensure that gate arms do not continue to lower onto any vehicle or person regardless of size. Gate shall provide method of rising immediately upon contact with anything under gate arm, without causing damage or injury.
 4. In the event of a power failure, gate arms shall move to the open (up) position, and remain in that position until resumption of power service.
 5. A signal shall be generated to send an alarm located in the WMATA Parking Operations Control Center when a vehicle breaks through a barrier gate arm.
- B. System Performance: Automatic barrier gate unit shall be capable of the following:
 1. Provide unit with all necessary control logic for activation by a signal from the PCS reader, ENS, EXS, remote switch or the Vehicle Detection System.
 2. Report generation for exception events.

C. Operation:

1. Controller:

1. Controller shall contain logic for one-way lanes, two-way lanes, operations with automatic and push button ENS's, card/tag readers, detector loops and be easily field programmable through the use of easily accessible DIP type switches or by keypad buttons.
2. All gate logic controllers shall be removable and interchangeable with the logic controllers of all other gates on this project.
3. Provide output signals for the following counts: Total monthly, total transient, total vehicle and total illegal vehicles (see illegal vehicle counts below). These counts shall be taken directly from the control logic and not from detector loops. Provide a momentary contact any time a car illegally passes through the lane by tailgating the previous automobile.
4. Provide two vehicle detectors inside the control logic (see Vehicle Detection System this Section). The logic controller shall send and receive information from the FMS computer.
5. Storage of at least three vend inputs and sequentially processing each vend. Gate arm shall remain up until stored vend input vehicles have cleared lane. This feature shall be selectable on/off from FMS.

2. Automatic Barrier Gate Reporting: Automatic barrier gate units shall provide full reporting functionality including, but not limited to, the following:

1. Gate off line/powered off, online.
2. Gate manually raised or manually lowered.
3. Gate manually raised and a car crossed over the loop detector.
4. Gate opened remotely via a command from the controller.
5. Communication failure.
6. Device Malfunction.

D. Gate Arm:

1. Gate shall have appropriate length barrier arm constructed of aluminum with breakaway gate arm design that allows for easy and inexpensive replacement when broken. Provide folding gate arm if required by low height clearance. Height of arm approximately 36 inches from drive in the down position.
2. Provide signage on both sides of gate arm in graphics and text to warn pedestrian not to pass through a gated lane.
3. Provide a protective sleeve or foam strip along the bottom edge of gate arm.
4. Gate shall not be able to be raised or lowered by any manual force applied to the gate arm.

E. Mechanical: Gate motor and other components shall be designed with a minimum 1/3 HP, heavy duty, high output torque, accepting single-phase 115 VAC power input and instant reversing.

F. Electrical: Self-contained, replaceable components. Include wiring for control units. Supply a cadmium-plated connection box for all external connections.

1. All external inputs shall be low voltage control.

2.11 VEHICLE DETECTION SYSTEMS

- A. General: For use in temperature range of -40 to 160 °F, each vehicle detection system shall consist of detector module and one or more inductance loops (sensing loops) working in conjunction to detect the presence of a vehicle as it passes over the loop(s) and generate an electric signal to operate other control equipment.
- B. Detector Modules:
 1. Vehicle detectors shall be RENO AE Model DL-ATG anti-tailgating intelligent detectors with directional logic or approved equivalent where required herein.
 2. Unless indicated otherwise, vehicle detector modules shall be installed within adjacent parking equipment cabinetry serving the same lane (no separate enclosure required). Installation shall be shielded to prevent Radio Frequency Interference (RFI), allowing for vehicle detector operation within an electrically noisy environment typically found in parking systems.
 3. Required Features/Functions:
 1. Dual channel detectors.
 2. Incorporate a tailgate recognition system capable of detecting two automobiles within one foot of each other over a standard 2.5 ft. x 6 ft. loop.
 3. Compact Plug-In Design
 4. Loop Frequency Selection
 5. Self-Tuning and self-compensating, and tune to its loop environment.
 6. Selectable Permanent Presence
 7. Automatic Sensitivity Boost
 8. Detection Filter (Small or Fast-Moving Objects)
 4. Electrical Requirements:
 1. LED Indicators for all Functions
 2. Low Voltage Loop Interface
 3. Loop Isolation Protection
 4. Modular plug-in construction or built in, and easily serviced.
 5. All relay output lines shall terminate in a weatherproof terminal block.
- C. Inductance Loop Requirements:
 1. Loops may be either embedded (typically only for new construction) or saw cut into paving surface. Coordinate saw cut loops with Engineer to avoid damage or work of other trades.
 2. Loop Wire: #14 or #16 AWG, stranded wire with XLPE coating/insulation; loop size as required to meet functional requirements listed above
 3. Loop wire shall not be spliced.

4. Loop Groove Fill: Loop sealant and backer rod, as recommended by the manufacturer, shall be compatible with loop wire, substrate, and all substrate sealants/coatings. Contractor to coordinate.
5. Contain loop wire in a separate conduit to prevent interference.
6. Loops shall be placed in saw cuts .25-inch-wide and 1 to 1 1/2 inches deep in paving surface, installed per manufacturer's recommendations.

2.12 WMATA SMARTRIP® TARGET MODULES, OPERATOR DISPLAYS, PARKING CONSOLE UNITS, TARGET MOUNTING CABLING, CONDUITS, & CONNECTORS

- A. This SmarTrip® system is a basically stand-alone smart microprocessor chip proximity debit card system which is principally components developed for WMATA and manufactured by Cubic Transportation Systems (CTS) 5650 Kearny Mesa Road, San Diego, CA 92111 Attention: Roger Kuitie. Alternate sources of this system are not available. This CTS manufactured SmarTrip® system shall include:
1. A Micro Tri-Reader Target Module - including patron display (9345-11104) for the revenue collection exit lane.
 2. Parking Console Unit.
 3. Operator Display.
 4. Interconnection, cable conduit and connectors to connect Micro Tri-Reader Target Modules, Parking Console Unit and Operator displays with each other to achieve operation and all connectors supplementally required conduit and cable to connect with the SMADS computer in the Station kiosk, lane control gates, and the facilities controller servers located at 600 Fifth Street, N.W., Washington, D.C. 20001 and back-up facilities controller servers located at 3500 Pennsy Dr, Hyattsville, MD 20785.
 5. Target posts or brackets and connection assembly shall be bolted either to the concrete island surface as an access card reader post assembly or side wall connection bracket. Provide detailed shop drawings showing fabrication and installation details for approval. The Targets are to be mounted so that the working face of the target is 2-inches from the face of the curb and not an injury hazard to either technicians or patrons paying for parking by cash or other means.
 6. All equipment shall be installed according to the manufacturer's instructions.
 7. The SmarTrip® System shall interface with two other operating systems.
 - a) There shall be an output of the SmarTrip® system connected with appropriate lane exit control gate to operate (open) the gate upon completion of a payment transaction at the respective Target. The gate shall close immediately upon passage of the vehicle. The central processor server located at 600 Fifth Street, N.W., Washington, D.C. 20001 shall count each vend and gate cycle.
 - b) The SmarTrip® system manufacturer (Cubic Transportation Systems) shall provide a means to furnish an output of SmarTrip transactions by type and individual transaction completed.
 - c) Two (2) individual stand-alone SmarTrip® Module Systems shall be provided in addition to the SmarTrip® equipment installed at each parking lane as back-up revenue collection units. Each of these SmarTrip® Module System consists of two (2) Micro Tri-Reader Target Modules (targets and displays), a Parking Console Unit and Operator Display.

2.13 EXIT STATION (EXS)

- A. General: Each exit device unit shall consist of a customer display, controller(s) and debit/credit card reader. Include the following features:
 - 1. Operation Modes: On-line communication to Central Computer with automatic switch to standalone mode if communications are interrupted. Provide off-line transaction buffer for 1000 transactions minimum.
 - 2. Customizable display with minimum 5" display.
 - 3. Time and date display.
 - 4. Built-in VoIP intercom with call button.
 - 5. Real-time clock synchronization with central computer with programmable daylight savings time adjustment.
 - 6. Field programmable with built-in service diagnostics.
 - 7. Program timer for closing barrier gate.
 - 8. Time and date display.
 - 9. Credit card reader capable of accepting and reading both mag-stripe and EMV credit cards.
 - 10. Alarm for ENS offline condition to be displayed on the PARCS GUI.
- B. System Performance: Exit device unit shall be capable of the following:
 - 1. Provide unit with all necessary control logic for activation by a Vehicle Detection System.
 - 2. Fee Calculation:
 - 1. Calculate and display amount owed on unpaid or insufficiently paid ticket based on current exit time and system rate schedules.
 - 2. Accept exit grace period programmed at central computer.
 - 3. Elapsed time from insertion of a valid paid ticket into reader until gate is fully open shall not exceed three seconds.
 - 4. Report generation for events and exception events.
- C. Operation:
 - 1. Reader:
 - 1. Inserting Credit/Debit Card into the reader results in the following actions:
 - 1) Valid Credit/Debit Card: Reader captures and sends card information to the Credit Card Server for on-line real time processing or point to point direct to credit card processor for EMV enabled cards, displays programmed message, returns card and automatically sends signal to raise barrier gate.
 - 2) Invalid Credit/Debit Card: Reader displays programmed message, plays audible "Invalid Card" message, rejects card, displays programmed message and sends alarm signal to the system server. Once debit/credit card is removed, the system resets.
 - 2. Exit Device Reporting: Exit device unit shall provide full reporting functionality including, but not limited to, the following:

1. Encoding Not Read.
 2. Arming Loop Activated.
 3. Closing Loops Activated.
 4. Gate Opened.
 5. Device Malfunction.
- D. Cabinet: Manufacturer's standard construction.
1. Keys: Locks shall be uniquely keyed as specified herein.
- E. Mechanical: Reader mechanism shall be of quality constructed material with rust protective coating on exposed parts. The reader mechanism shall be removable as a unit, and all electrical connections shall be keyed plug.
- F. Electrical: All components shall be replaceable, plug-in and self-contained. On the approach side of the cabinet a color graphic display shall be provided. Supply a cadmium-plated connection box for all external connections and provide a 115 V.A.C. grounded convenience outlet, 500-watt heater, heater on/off switch, preset heater thermostat, dispense on/off power switch and clock on/off switch.

2.14 FACILITY MANAGEMENT SYSTEM (FMS)

- A. General: The PARCS FMS system shall consist of and utilize a network of computers and/or servers, peripherals and software. System software shall provide automatic on-line monitoring and control of all PARCS equipment, supervision, and remote control of peripheral equipment from one or more selected locations. System shall automatically collect data for revenue and activity reporting, access and space control, ticket tracking, and equipment programming.
- B. Facility Management System Server: HP ProLiant DL380 G7 or comparable; Configured for optimal PRCS performance. The central computer station shall be additionally equipped as follows:
1. Windows Server 2008, 32-bit operating system or higher.
 2. Peripherals: Switched-access sharing of PRCS Workstation peripherals.
 3. Locking Rack.
 4. Surge Protector/Line Filter/Isolator Module: Provide an 8-Outlet (min.) surge protector for the AC line voltage to be used by the PRCS computer system and all peripherals. Surge protection shall include 1-in and 2-out RJ11 telephone/fax. 3550 Joule energy rating (min.). Surge protector shall also filter out EMI/RFI noise with up to 58 dB reduction. Provide a communicator isolator module to prevent damage
- C. Facility Management System Software: The FMS software shall have the following features:
1. System shall utilize an open architecture structure to support, accommodate and provide features and functionalities including but not limited to the following:
 - a. Operating System: Windows Server
 - 1) Windows Server 2008 or higher.
 - b. Database: Use of Industry standard SQL databases
 - 1) Microsoft SQL Server 2008

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- 2) Oracle
 - c. Interoperability.
 - d. Integration via open communications protocols.
 - e. Support standard hardware.
 - f. Support separated environments for production and test.
 - g. Connection to database server with regular user account instead of Sysadmin or other privileged accounts.
 - h. Use of standard setting on servers.
 - i. Access of backend database from frontend or middle tier of the application via credential with minimal privileges.
 - j. Support customization to both backend and frontend modules with minimum effect on future enhancements and upgrades
 - k. Client Application:
 - 1) Shall use Active Directory for authentication and authorization.
 - 2) Browser based client application preferred.
 - 2. Communication capabilities with all PARCS equipment for the purposes of monitoring and control.
 - 3. Strict security protocols with multiple passwords providing limitations of access.
 - 4. Remote (internet) access capabilities.
 - 5. System shall accommodate a minimum of sixteen simultaneous users of the FMS without degrading system performance or interference with each other's work.
 - 6. Hand-off of all transaction data for general analysis using standard Windows-based applications such as MS Excel, Access and Word.
 - 7. User interface by means of a series of graphical menus that shall meet or exceed the following functional requirements:
 - a. Main Menu: A Main Menu shall allow access to sub-menus. Software functionality shall be distributed amongst the sub-menus.
 - 1) Sub-Menus: Sub-menus shall include the following:
 - a) System Configuration Menu
 - b) System Monitor Menu
 - c) System Control Menu
 - d) System Programming Menu
 - e) System Device Report Menu
 - f) System Data Manager Report Menu
 - D. Graphical Menu Configuration:
 - 1. System must have a Window-based graphical user interface (GUI).
 - 1. Physical and remote workstations shall have identical GUI's.
 - 2. GUI to provide a user interface with the following capabilities:

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- 1) Access to and ability to view, print or export system reports.
 - 2) Real-time monitoring of all PARCS field devices.
 2. System Configuration Menu: The System Configuration Menu shall be as follows:
 1. Log On: Provide up to minimum of ten user programmable passwords to gain access into the Main Menu and Sub-Menus.
 2. Set Passwords: Each password can be programmed into any level of the Main Menu or Sub-Menus. Provide name insertion with the password of each person to be programmed.
 3. Set Message Filters: Provide message filters for the information that is being received by the Central Computer. These filters provide the end user a means of controlling incoming message data from each Card Reader (access granted and egress) and Fee Computer (transaction audit trail). Programming shall provide the following filter options to the end user:
 - 1) Send data to Hard Disk (store).
 - 2) Send data to Printer.
 - 3) Send data to Display.

Note: End user may program any combination of the above filter options.
 4. Set Gate Count System: Provide the following sub-menus for count configuration to all lanes, areas and facilities:
 - 1) Set Lanes: End user will be able to define which auto gates are assigned to a particular facility. Provide a lane assignment menu for the end user to number each auto gate by lane.
 - 2) Set Areas: End user will be able to define which areas are assigned to a particular facility. Provide an area assignment menu for the end user to identify the areas by number that are assigned to each facility.
 - 3) Set Facility's: end user will be able to define the name of each facility, the lane number, if the lane is one-way or reversing and if the counting by that lane is forward exit, forward entrance or reversing. This menu shall also be user programmable and display the total capacity of the facility, total monthly reserved spaces, total available spaces, total monthlies currently in the facility, total transients currently in the facility, total illegal entries into the facility and total illegal exits out of the facility.
 5. Set Reader Count System: Provide the end user the means of programming the following:
 - 1) Provide differential counters per facility to display the total monthly vehicles that can be in the facility by parker group or card access level at one time. The end user shall be able to program the maximum number of vehicles for each facility and parker group.
 6. Set Time and Date: Provide user setting of current time and date.
 3. Equipment Monitoring Software: Shall allow the end user to monitor the following:
 1. Monitor operational status of all PARCS devices/equipment provided under this contract.
 2. Monitor All Lanes: Provide a matrix that will display ALL lanes and will identify the following activity:

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- 1) Lane number.
 - 2) Lane status; open or closed.
 - 3) Vehicle in lane.
 - 4) Gate arm up.
 - 5) Gate in over-ride (gate arm locked in up position).
 - 6) Gate failure.
 - 7) Lane on-line or off-line.
 - 8) Operating mode of lane.
 - 9) Illegal entrance or exit reverse direction through lane.
 - 10) Backout
 3. Abnormal status conditions shall be flashed on monitor(s) and accompanied by an audible alarm. Display shall continue to flash until abnormal condition is corrected. Audible alarm shall continue until it is turned off by a command issued through monitoring computer(s). Alarms may be acknowledged and turned off through any workstation connected to FMS. A record shall be saved of
 4. System Control Menu: The System Control Menu (SCM) shall have the following Sub-Menus and shall allow the user to send these commands to one lane or all lanes on one port or all lanes on all ports:
 1. SCM/Gate Control Menu: The Gate Control Menu will have the following features:
 - 1) Disable Monthly Card Readers.
 - 2) Enable Monthly Card Readers.
 - 3) Disable Transient Ticket Dispensers.
 - 4) Enable Transient Ticket Dispensers.
 - 5) Tune Loop Detectors.
 - 6) Remote Raise Auto Gate: This command will raise the auto gate and the gate will close after the vehicle enters the facility.
 5. System Programming Menu: The System Programming Menu (SPM) shall allow the user to program any card reader auto gate or fee computer directly from the Central Computer. Provide a means for the end user to create a program, save the program and/or send the program to a group of external devices or an individual device.
 - E. REPORTING: FMS reporting subsystem shall upload and consolidate reports from EXS's, APM's, fee computers. In addition to reports described in other parts of this Section system the following reports and reporting functionality shall be provided (at a minimum):
 1. Ability to retrieve and review individual transactions. Parameters shall be defined by authorized user accessing reports.
 2. All reports produced shall be capable of being displayed on a monitor or printed from any workstation with the appropriate authorization level.
 3. Exporting of reports to Excel, MS Access, converted to a pdf or ASCII file.
 4. FMS shall consolidate and retain data for report generation.
 5. Reports Menu shall include selections and/or sub-menus as required to provide the following minimum reporting functionality for standard reports generated from each facility's central computer database. The configuration of standard reports may vary from the structure indicated below provided the required minimum reporting functionality is maintained. All report configurations shall be customizable by user-selected options.
 6. System Status Reporting:

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1. System Status Summary Report: This report shall list the various system status data with any system alerts or errors flagged for action.
 2. Holiday Report: This report shall list the holidays that are entered into the system.
 7. System Activity Reporting: This report shall list facility-specific data pertaining to system activity within a specified date, time period, device and/or message type.
 8. Patron Activity Reporting:
 1. System-wide Patron Activity Report (all patron classes)
 2. Patron Class Activity Report (multiple owner-editable patron classes)
 9. User Access Log Report: This report shall provide login data within a specified date and time range. Reports shall include, but not be limited to the following: Log IN or OUT Time, User Name, User Number, Action (include Transaction Number if applicable), Date and Time of Day.
 10. System Financial Reporting:
 1. Transaction Summary Report: This report shall provide detailed information on all transactions. Reports shall include, but not be limited to the following: Date and Time Range, User Name, User Number, Lane/Device ID(s), Transaction Number, Transaction Type, Transaction Number Range, Ticket Number Range, Ticket Status, Clock IN, Clock OUT, Account ID, Fee(s), Fee Type(s), Tax(es) Paid, Total Charges and Payment Type.
 2. Deposit/Withdrawal Report: This Report shall enable the User to select the Central Computer or a particular User or Fee Computer. Reports shall include, but not be limited to the following: Date and Time Range, User Name, User Number, Transaction Number, Transaction Type, Transaction Time, Deposit Amount, Withdrawal Amount and Totals.
 3. Tax Summary Report: This report shall provide a summary of pulled and cleared Tax Reports within a specified date and time range.
 4. Billing/Invoicing/Payment Summary Report: This Report shall enable the User to select a Patron or range of Patrons. Reports shall include, but not be limited to the following: Date and Time Range, Patron ID, Payment History, Paid-Through Date, Date Last Invoice Sent, and Next Invoice Date.
 11. Facility Reports:
 1. Device Reporting:
 - 1) Active Port Summary Report: Provide a listing of all active ports on-line to the central computer.
 - 2) Device Reports: All reports required by the Device Report Menu section above shall also be able to be pulled using data retrieved solely from the central computer.
 12. Vehicle Count Reporting:
 1. Count Configuration Summary Report: This report shall list all saved Count Differentials Report settings by saved report name (determined by user), last User to revise each report type and date last revised.
 2. Count Differentials Report: This report shall provide single facility or multiple facility activity data (by Zone) for a specified time/date period. The report shall provide

capacity, start, minimum, maximum and average counts for monthly, transient and total amounts.

13. Statistic Reporting:
 1. Statistical Report Configuration Summary Report: This report shall list all current Statistical Report settings by saved report name (determined by user), last User to revise each report type and date last revised.
 2. Statistical Reports: These reports shall include, but not be limited to the following:
 - 1) Revenue Statistics
 - 2) Entry, Exit and Entry/Exit Statistics
 - 3) Length of Stay Statistics
14. Event Log – Report shall include at a minimum all modifications/changes to PARCS identifying the authorized user initiating changes. Report shall include date and time of user log on and log off and all actions initiated during logged on period.
15. Shift Reports – To include the following:
 1. Daily and Monthly Shift Reports - Report summarizing each fee collection devices on a daily, monthly or shift basis.
16. Individual Transactions Report - Provide listing of every transaction processed by shift or lane.
17. Credit Card Reports – Provide totals and listing of credit card transactions by bankcard or payment location.
 1. Provide batch # and authorization code in reports or via query.
 2. Provide a report of manual credit card transactions (if allowable) performed on the system.
18. Lane Activity Report – Provide a summary report by exit lane of revenue, rate type and transactions type. Time period for report shall be defined by user.
19. No-Revenue and Void Transaction Report – Provide a report of no-revenue and void transactions. Time period for report shall be defined by user.
20. Lane Volume Report – Provide a report of entry and exit for a selectable date and time period.
21. Duration of Stay Report - Provide duration of stay report based on entry time and length of stay. Time period for report shall be defined by user.
22. Debit Card Payment Report – Report of debit card payments applied.
23. User Sign On/Sign Off Report - Report of all users signed on/off, time period of shift, and all transactions that occurred during shift.
24. Backout Ticket Report – Provide a list of backout tickets issued by ENS. These are tickets that are issued at an ENS where the patron did not proceed completely through the entrance lane.

PART 3 - EXECUTION

3.1 PROJECT COORDINATION

- A. Meet with Owner and/or Owner's Agent, Architect, Engineer, Consultant and/or General Contractor within 30 days of contract award.

3.2 EXAMINATION:

- A. Verification of existing conditions before starting work:
 - 1. Prior to beginning installation, examine areas to receive parking control equipment. Verify that critical dimensions are correct and that conditions are acceptable.
 - 1. Do not proceed with installation of parking control equipment until unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Provide specifications and technical drawings for equipment islands in sufficient time so as not to delay work.
- B. Provide templates for anchor bolts and other items encased in concrete or below finished surfaces in sufficient time so as not to delay work.

3.4 INSTALLATION

- A. General: Sequence, coordinate and integrate the various elements of PARCS System materials and equipment. Coordinate PARCS System with other building components. Install PARCS System as specified herein.
- B. Rough-In: Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to equipment specifications and to product data for rough-in requirements.
 - 1. Anchor Bolts: Furnish anchor bolts and other connectors required for securing equipment to in-place work.
 - 2. Detector Loops: The corners of all rectangular loops shall have 45-degree cuts to prevent sharp corners from puncturing loop wire.
- C. Install systems, materials, wiring and equipment to conform with manufacturer's instructions and approved Submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Owner.
 - 1. Detector Loops: Install loops in accordance with manufacturer's instructions. After testing loop wires, seal slots with manufacturer's recommended sealant.
- D. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.

- E. Install PARCS System equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- F. Protection: Provide final protection necessary to ensure that the equipment will be without damage or deterioration at the time of acceptance.

3.5 TESTING/ACCEPTANCE

- A. All equipment is to be tested for compliance to requirements of this specification and manufacturer's performance standards.
- B. General
 - 1. Submit schedule and format for all system acceptance testing to Owner for approval prior to start tests.
 - 2. Provide a checklist to test equipment for all functions. Checklist documents shall include provisions to indicate the pass/fail status of lane/device tested. A lane/device shall receive a passing grade only if all criteria for passing the test is satisfied.
 - 3. Provide all items necessary to complete testing including stock of tickets, AVI transponders, and other stock materials and consumables required.
 - 4. Owner shall be notified in writing at least seven days prior to each test session. In event that the first test is not successful, correct noted deficiencies and notify the Owner, at least two days in advance that test session is ready to resume. Vendor shall promptly correct all problems encountered at Vendor's expense.
 - 5. Tests observed by Owner shall not relieve Vendor of responsibility for providing hardware, software and documentation in accordance with this Specification.
- C. Factory Acceptance Test (FAT)
 - 1. Vendor shall conduct a FAT to verify the functional performance of all systems and components of the PARCS to ensure adherence to these specification requirements, prior to the installation of any equipment.
 - 2. FAT shall be conducted at a mutually agreed upon location. Typically, the FAT is conducted at the PARCS manufacturing facility or at a local distributor's office (space permitting).
 - 3. A mockup consisting of all equipment proposed shall be setup to simulate the system to be installed.
 - 4. All systems and components of the PARCS must successfully pass the FAT prior to the shipment of any equipment to the project site. Minor deviations from testing script results may not be considered grounds for failure of test. Major deviations found shall require a retest upon correction by Vendor.
 - 5. At a minimum test scripts shall include the following:
 - 1. Testing procedures to be followed;
 - 2. Expected results;
 - 3. Checklist for the components of each lane or device;
 - 4. Signature page for all FAT participants' signatures;
 - 5. Tests for verifying reports;
 - 6. "Pass" or "Fail" check-off boxes; and
 - 7. Notes section for describing issues found.

6. Owner will have designated representatives participate in the FAT.

D. Lane Acceptance Test (LAT)

1. Vendor shall conduct LATs after each lane of equipment is installed to demonstrate to Owner that the installed equipment complies is operating correctly as installed.
2. When a PARCS equipment location installation has been completed, the Vendor shall conduct its own testing of the installed equipment. This testing shall follow the identical LAT test procedures that shall be used during by Owner.
3. Signed passing LAT's shall be provided to Owner at least one day prior to testing.
4. Test procedures shall be the same as for the FAT.
5. Vendor shall make provide sufficient personnel to perform the LAT.
6. All systems and components of the PARCS must successfully pass the LAT prior to use of equipment. Minor deviations from testing script results may not be considered grounds for failure of test. Major deviations found shall require a retest upon correction by Vendor.
 1. Minor deviations are any failure that does not affect system functionality, fee calculation accuracy, transaction count accuracy, exception count accuracy, active ticket inventory accuracy (system vs. actual), transaction processing, credit card processing, calculations, or report accuracy.
 2. Major deviations are any failures that affect system functionality, fee calculation accuracy, transaction count accuracy, exception count accuracy, active ticket inventory accuracy (system vs. actual), transaction processing, credit card processing, calculations, or report accuracy.

E. Operational Completion Test (OCT)

1. Upon completion of all LAT the system shall be required to pass an OCT for a period of thirty consecutive days. The OCT shall monitor the performance of the PARCS as an installed system.
2. The Vendor shall submit an OCT test plan which shall outline the procedures for testing entire PARCS system.
3. The OCT test plan documents shall include:
 - a. General procedures to be followed.
 - b. Methodology for calculation of downtime and accuracy for the various PARCS components.
 - c. Electronic reporting to be used during the OCT period for documenting failures and downtime.
4. If during the 30-day OCT the system fails to meet any one of the following specified performance criteria, the test shall be extended or begin anew on a day agreed upon by the Owner and Vendor. Whether the test is extended or restarted depends on the impact/severity of the failure as specified below.
5. The performance criteria for successful completion of the OCT shall include:
 - a. No individual subsystem shall be operationally unavailable for four or more hours cumulative during the 30-day test period.

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- b. No individual subsystem shall be operationally unavailable for more than two consecutive hours.
 - c. If any single component fails, more than once during the 30-day period for the same reason, it shall be replaced upon the second failure with a newly manufactured component of the same type and the test shall continue.
 - d. No component of a given type shall fail more than three times during the 30-day test period for the same reason. Upon the fourth failure all components of that type shall be replaced or modified to correct the common deficiency, and the test shall be restarted from the beginning.
 - 6. In addition to the PARCS reports generated during the OCT, the Vendor shall provide Owner with a report that clearly provides the overall percentage of system downtime and causes of that down time.
 - 7. The Vendor shall provide to OWNER a corrective action report that provides a detailed description of each failure that occurs during the OCT. The corrective action report shall include the type of failure, why the failure occurred, what was done to remedy the failure, and whether or not the failure resulted in a restart of the OCT.
 - 8. A subsystem shall be considered unavailable as long as any major component of the subsystem is not functioning. The following items which cause a subsystem to become inoperative shall not be deemed as a subsystem or system failure:
 - a. Power outage for a duration in excess of required duration of UPS power backup.
 - b. Damage or vandalism caused by an outside party.
 - c. Network connectivity issues outside of the PARCS.
 - d. Failures caused by a 3rd party.
 - e. Act of God.
- F. Punch List
- 1. Starting with the beginning of installation through Final System Acceptance, the Vendor shall submit a document on a weekly basis showing the status of all outstanding system issues, regardless of severity, including the plan for resolution and estimated completion date.
 - 2. All deviations noted during acceptance testing shall be recorded on the Punch List.
- G. Final System Acceptance
- 1. Final System Acceptance will be submitted by Owner, in writing to the Vendor, upon completion of the following:
 - a. All PARCS equipment has passed LATs and OCT
 - b. Verification by Owner of complete resolution of all outstanding items on the Punch List
 - c. All spare parts, stock, and manuals are on site and have been approved
 - d. All training is complete to Owner's satisfaction
 - e. All completed test documentation has been provided to Owner.
 - 2. Warranty period for the PARCS will start upon Final System Acceptance.

3.6 ADJUSTING AND CLEANING

- A. Adjust all equipment provided this section so that it operates smoothly, easily and properly. Confirm that locks engage accurately and securely without forcing or binding.
- B. Lubricate hardware and other moving parts.
- C. After completing installation of exposed, factory-finished parking equipment, inspect exposed finishes and repair damaged finished to the satisfaction of the Architect.
- D. Remove barrier-gate arms during the construction period to prevent damage, and install them immediately before Substantial Completion.

3.7 MAINTENANCE RECORDS

- A. Vendor shall maintain accurate and up-to-date records of service calls, preventive maintenance operations and equipment failures for each component and sub-system. Records in the form of a log shall become the property of Owner at the end of the one-year period.
- B. Extension of Maintenance Contract shall be at the option of Owner. Vendor will notify Owner for a request to extend sixty (60) days prior to expiration of base term. Increase in cost shall be limited to the percentage increase of the cost of living for that year.

END OF SECTION