

GENERAL MEETING OF THE BOARD OF DIRECTORS
OF THE
CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

RESOLUTION NO. 05-36

WHEREAS, the Central Texas Regional Mobility Authority ("CTRMA") was created pursuant to the request of Travis and Williamson Counties and in accordance with provisions of the Transportation Code and the petition and approval process established in 46 Tex. Admin. Code § 26.01, *et seq.* (the "RMA Rules"); and

WHEREAS, the Board of Directors of the CTRMA has been constituted in accordance with the Transportation Code and the RMA Rules; and

WHEREAS, in Resolution No. 04-47, dated September 29, 2004, the Board of Directors recognized the need for toll integration services for CTRMA projects, including without limitation 183-A and projects within the CTRMA/TxDOT Regional Implementation Program; and

WHEREAS, the Board of Directors directed its staff to issue a Request for Proposals (RFP) for firms interested in providing toll systems implementation and maintenance services to the CTRMA; and

WHEREAS, based on a review of the responses to the RFP and the interviews conducted, the evaluation committee recommended to the Board of Directors that Caseta Technologies be retained to provide toll systems implementation and maintenance services; and

WHEREAS, in Resolution No. 05-29, dated March 30, 2005, the CTRMA Board of Directors authorized and approved of the retention of Caseta Technologies to provide toll systems implementation and maintenance services to the CTMRA and authorized the Executive Director to negotiate an agreement with Caseta Technologies, to be executed upon the approval of the full CTRMA Board; and

WHEREAS, the Executive Director has negotiated a Toll Systems Implementation and Maintenance Agreement with Caseta Technologies, attached hereto as Attachment "A" and has developed an initial scope of work as detailed in the Work Authorization attached hereto as Attachment "B";

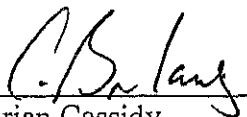
NOW THEREFORE, BE IT RESOLVED, that the CTRMA Board of Directors hereby approves the entry into a Toll Systems Implementation and Maintenance Agreement in the form, or substantially the same form, as attached hereto as Attachment "A" with Caseta Technologies; and

BE IT FURTHER RESOLVED, that the Work Authorization attached hereto as Attachment "B" is approved and may be issued after all contractual prerequisites reflected in Attachment "A" are satisfied; and

BE IT FURTHER RESOLVED, that the Executive Director is authorized to execute such Agreements on behalf of the CTRMA.


Adopted by the Board of Directors of the Central Texas Regional Mobility Authority on the 27th day of April, 2005.

Submitted and reviewed by:



C. Brian Cassidy
General Counsel for the Central
Texas Regional Mobility Authority

Approved:



Robert E. Tesch
Chairman, Board of Directors
Resolution Number 05-36
Date Passed 4/27/05

Attachment "A"

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

CONTRACT
FOR TOLL SYSTEM IMPLEMENTATION

THIS CONTRACT is made this _____ day of April, 2005, by and between the Central Texas Regional Mobility Authority (Authority or CTRMA), a political subdivision of the State of Texas, 13640 Briarwick Drive, Suite 200, Austin, Texas 78729 and Caseta Technologies, Inc. (Contractor) with offices located at 700 Brazos Ave., Suite 500, Austin, Texas 78701.

WHEREAS, the CTRMA issued a Request for Proposal (the "RFP") dated December 20, 2004, as supplemented by Clarification Notices Nos. 1, 2 and 3 and Addendum Nos. 1 and 2, which contains requirements for the design, procurement and Implementation of a Toll Collection System on the CTRMA Turnpike System (the "Turnpike System"); and

WHEREAS, the Contractor has carefully reviewed available designs and documentation on the Turnpike System related to the installation of the Toll Collection System and has submitted its Proposal dated March 1, 2005, (the "Proposal") in response to the RFP; and

WHEREAS, the CTRMA has determined that the Proposal best satisfies the objectives set forth in the RFP and best serves the CTRMA's interests; and

WHEREAS, the CTRMA desires to purchase from the Contractor and the Contractor desires to design, sell, install and maintain the Toll Collection System pursuant to the terms and conditions of this Contract;

NOW, THEREFORE, for and in consideration of the mutual covenants and conditions herein contained, and other good and valuable consideration the receipt and sufficiency of which are hereby acknowledged, the CTRMA and the Contractor hereby agree as follows:

1. AGREEMENT TO PURCHASE. The Contractor shall design, sell to the CTRMA, install, and maintain, and the CTRMA shall purchase from the Contractor, the Toll Collection System pursuant to the terms and conditions of this Contract.

2. CONTRACT DOCUMENTS. This Contract includes the Price Schedule, the Time Period Schedule, Attachments A, B, C, D, E, F and G, the Proposal, and all amendments added hereto as Exhibits, all of which are incorporated herein by reference and are made a part hereof (together such documents are referred to herein as the "Contract Documents").
3. PRIORITY. In the event of a conflict, the order of prevailing precedence (a-highest order to d-lowest order of precedence) shall be as follows:
 - (a) Any amendments to the Contract Documents, which amendments are attached as Exhibits to the Contract.
 - (b) The Contract Documents.
 - (c) Contractor's Detailed Design Documents as approved by the CTRMA.
 - (d) The Contractor's Proposal, to the extent it meets or exceeds the requirements of the Contract Documents. In other words, if the Proposal can reasonably be interpreted as providing higher quality materials or services than those required by the Contract Documents or otherwise contains offers, statements or terms more advantageous to the CTRMA, Contractor's obligations under the Contract Documents shall include compliance with all such statements, offers and terms contained in the Proposal.

Notwithstanding the order of precedence set forth above, in the event of a conflict within documents of the same priority (for instance, between Attachments B and E), the CTRMA shall have the right, in its sole discretion, to determine which provision applies.

4. AMENDMENTS TO CONTRACT DOCUMENTS. Any changes and/or additions made to the Contract Documents as a result of negotiations with the CTRMA shall be included as part of this Contract and attached hereto as an Exhibit.
5. CONTRACT CHANGES IN GENERAL. Changes in the Contract Documents or the work required thereunder may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in Contract, subject to the limitations stated in the Contract Documents.

A Change Order shall be based upon agreement among the CTRMA, the Contractor and the CTRMA's Engineer, HNTB Corporation (the "Engineer"). A Construction Change Directive requires agreement by the CTRMA and the Engineer and may or may not be agreed to by the Contractor. An order for a minor change in the Toll Collection System may be issued by the Engineer alone.

Changes in the Toll Collection System shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly therewith, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change (total costs less than \$10,000) in the Toll Collection System.

If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order or Construction Change Directive that application of such unit prices to quantities of work on the Toll Collection System proposed will cause substantial inequity to the CTRMA or Contractor, the applicable unit prices shall be equitably adjusted.

6. CHANGE ORDERS. A Change Order is a written instrument prepared by the Engineer and signed by the CTRMA, Contractor and Engineer stating their agreement upon all of the following:
- (1) a change in the Toll Collection System;
 - (2) the amount of the adjustment in the Contract Price, if any; and
 - (3) the extent of the adjustment in the Contract Time, if any.

Methods used in determining adjustments to the Contract Price may include those methods described under Construction Change Directives.

For purposes of this Contract, "Contract Price" shall be equal to the total price for the particular segment of the Project as specified in the Work Authorization for that segment based on the unit prices contained in the Price Schedule attached to this Contract, and "Contract Time" shall be the time for completion of a specified segment of the Project as specified in the Work Authorization for that segment, such specified time to be no later than the estimated completion date for that segment set forth on the Time Period Schedule attached to this Contract.

7. CONSTRUCTION CHANGE DIRECTIVES. A Construction Change Directive is a written order prepared by the Engineer and signed by the CTRMA and Engineer directing a change in the Toll Collection System and stating a proposed basis for adjustment, if any, in the Contract Price or Contract Time, or both. The CTRMA may by Construction Change Directive, without invalidating the Contract, order changes in the Toll Collection System within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Price and Contract Time being adjusted accordingly.

A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

If the Construction Change Directive provides for an adjustment to the Contract Price, the adjustment shall be based on one of the following methods:

- (1) mutual acceptance of a lump sum properly itemized and supported by sufficient data to permit evaluation;
- (2) unit prices stated in the Contract Price Schedule or subsequently agreed upon;
- (3) cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed fee.

Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the work involved and advise the Engineer of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Price or Contract Time.

A Construction Change Directive signed by the Contractor indicates the agreement of the Contractor therewith, including adjustment in the Contract Price and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

If the Contractor does not respond promptly (within 48 hours) or disagrees with the method, then the adjustment shall be determined by the Engineer on the basis of reasonable expenditures and savings of those performing the work on the Toll Collection System attributable to the change, including, in case of an increase in the Contract Price, a reasonable allowance for overhead and profit. In such case, the Contractor shall keep and present, in such form as the Engineer may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, cost shall be limited to the following:

- (1) costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- (2) costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- (3) rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- (4) costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the work; and
- (5) additional costs of supervision and field office personnel directly attributable to the change.

Pending final determination of cost to the CTRMA, amounts not in dispute may be included in applications for payment. The amount of credit to be allowed by the Contractor to the CTRMA for a deletion or change which results in a net decrease in the Contract Price shall be actual net cost as confirmed by the Engineer. When both additions and credits covering related work on the Toll Collection System or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

If the CTRMA and Contractor do not agree with the adjustment in Contract Time or the method for determining it, the adjustment or the method shall be referred to the Executive Director of the CTRMA for determination, whose decision shall be final.

When the CTRMA and Contractor agree with the determination made by the Engineer concerning the adjustments in the Contract Price and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and shall be recorded by preparation and execution of an appropriate Change Order.

8. MINOR CHANGES IN THE WORK. The Engineer will have CTRMA to order minor changes in the work on the Toll Collection System not involving adjustment in the Contract Price or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the CTRMA and Contractor. The Contractor shall carry out such written orders promptly.
9. GOVERNING LAW - CHOICE OF FORUM AND WAIVER OF TRIAL BY JURY. The Contract shall be governed and construed in accordance with Texas statutes without taking into account conflicts of laws rules. The parties hereto expressly agree that the proper forum for adjudication of matters arising under or relating to the Contract shall be Travis County, Texas. The parties hereto, having the benefit of advice and counsel of their own legal counsel and understanding the import hereof, expressly agree and WAIVE TRIAL BY JURY as to the adjudication of matters arising under or relating to the Contract.
10. SECTION HEADINGS. Section Headings are included for section identification purposes only and are not to be considered Contract terms.
11. NOTICE PROVISIONS: Notices under the Contract Documents shall be in writing and (a) delivered personally, (b) sent by certified mail, return receipt requested, (c) sent by a recognized overnight mail or courier service, with delivery receipt requested, or (d) sent by facsimile communication followed by a hard copy and with receipt confirmed by

telephone, to those individuals designated by Contractor and the CTRMA from time to time in writing:

Caseta Technologies, Inc.
2 Broadway, 24th Floor
New York, NY 10004
Attn: Glenn Deitker
Phone: (212) 878-7115
Fax: (212) 878-0186

Central Texas Regional Mobility CTRMA
13640 Briarwick Drive
Suite 200
Austin, Texas 78729
Attn: Project Engineer
Phone: (512) 996-9778
Fax: (512) 996-9784

In addition, copies of all notices to proceed and suspension, termination and default notices forwarded by either Party shall be delivered to the following Persons:

Locke Liddell & Sapp LLP
100 Congress
Suite 300
Attn: Mr. Brian Cassidy
Phone: (512) 305-4855
Fax: (512) 391-4855
Email: bcassidy@lockeliddell.com

And

Central Texas Regional Mobility CTRMA
13640 Briarwick Drive
Suite 200
Austin, Texas 78729
Attn: Executive Director
Phone: (512) 996-9778
Fax: (512) 996-9784
Email: mstein@CTRMA.org

All communications to the CTRMA shall be clearly marked with the contract number to identify this Contract.

12. MEASUREMENT AND PAYMENT. The Contractor is required to submit price proposals using the forms provided in Schedule 4A of the Request For Proposals (such Schedule 4A has been attached to the Contract as the

"Price Schedule"), which are based on the method of measurement and basis of payment for each item. The detailed descriptions of the Method of Measurement and the Basis of Payment for the bid items necessary to complete the work under this Contract, as generally described in the Attachment B - Scope of Work and in accordance with the requirements in Attachment E - Technical Requirements, are included as a part of the Price Schedule.

A. Measurement of Quantities

All work completed under this Contract will be measured by the CTRMA according to United States standard measure. The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the Contract will be those methods generally recognized as conforming to good engineering practice.

The term "Lump Sum" when used as an item of payment will mean complete payment for the work item described in the Contract Documents. When a complete item or item unit (in effect, "Lump Sum" work) is specified as the unit of measurement the unit will be construed to include all necessary tools and accessories required to make that specified unit complete and operational.

Prior to the issuance of a Work Authorization, a Segment Price Schedule for the associated segment or segments shall be developed to reflect the actual scope of work as defined at the time of issuance, based on the prices contained in the Price Schedule. It is expressly understood that no measurement or payment will be made for work performed and/or materials incorporated in the completed work in excess of those specified, when such additional labor and materials are furnished for the Contractor's own convenience or to correct deficient, non-compliant, or faulty work. Any material furnished and work performed in excess of the Contract requirements shall, unless such use is specifically ordered in writing by the CTRMA, be deemed to be furnished by the Contractor for their own convenience at their own risk. Failure to take exception taken by the CTRMA for excess materials and work proposed for use by the Contractor during the review and examination of shop and working drawings shall not constitute an order for a change in the Contract requirements. Any changes to the Segment Price Schedule shall be accomplished through the Change Order process which if approved will result in an updated Price Schedule.

B. Payment

Payment under the aggregate of the items listed in the Price Schedule, at the prices indicated in the Proposal, for the quantities as determined herein, is to provide for the construction, development, testing and completion in every detail of the work described in the Contract Documents. The

Contractor shall furnish all labor, materials, equipment, tools, software, documentation, transportation, supplies, and all else necessary and incidental thereto to complete the work.

- 1) Payment for work which is not specifically covered by a pay item in the Price Schedule, but is required to complete work in an item for which payment is to be made, will be considered to be included in the price bid for that pay item in the Proposal. The cost of work which is not specifically covered by a pay item and is not directly related to any of the pay items in the Contract will be considered to be included in the prices bid for the various pay items scheduled in the Proposal.
- 2) Payment for each pay item in the Proposal will be made for the quantity as determined in accordance with the Contract at the price per unit bid in the Proposal. No separate payment will be made for costs incurred by the Contractor in complying with the requirements specified by the Contract but the cost thereof shall be included in the bid prices for the various pay items scheduled in the Proposal.
- 3) The CTRMA shall have the right to retain out of monies due any amounts claimed by the CTRMA to be due to it from the Contractor, which retainage shall be in addition to any retainage set forth elsewhere.
- 4) In the event the CTRMA, in good faith, disputes any invoiced amount, the CTRMA shall have the right to withhold or deduct payment of such disputed amount without incurring any interest provided that the CTRMA has provided the Contractor with written notice of the amount in dispute and the reason therefore. No greater than thirty (30) days after Contractor's receipt of written notice of the amount and reason for withholding or deducting payment, the parties will work together in good faith to settle the invoice dispute.
- 5) The CTRMA shall not be joined as a party to any lawsuit between the Contractor and its Subcontractors and/or suppliers by reason of holding said fund and any party suing the CTRMA in contravention of this provision shall be responsible and liable for attorneys fees and legal costs incurred by the CTRMA in defending said claim.
- 6) The CTRMA shall have the right to withhold from monies due the Contractor an amount sufficient to completely indemnify the CTRMA against liability resulting from any claim against the Contractor.

C. Partial Payments

At monthly intervals when the work accomplished amounts to a minimum of \$100,000 or 25 percent of the total price bid for the authorized Segment, the Contractor shall submit an invoice for payment to the CTRMA, showing the approximate quantities of work done and all permanent materials and equipment furnished but not incorporated in the work, up to the date of such

certificate, and the value of such materials and equipment as security for the fulfillment of this Contract by the Contractor until the completion of the Contract. The CTRMA shall pay monthly to the Contractor while carrying on the work, the balance not retained after deducting therefrom all previous payments. The total amount retained in connection with the work done shall be five (5) percent of the total value of the Contract.

Lump Sum items may be partially paid based upon a percent complete for the work contemplated by the Lump Sum item. The CTRMA reserves the right to verify the completion as certified by the Contractor prior to making any payments.

D. Payments for Change Orders

Change orders that cost less than \$100,000 may not result in an update to the Price Schedule and shall be invoiced after the completion and approval by CTRMA of the change order task. Payments will be made per the same terms as other Price Schedule payments.

E. Full Payment per Segment

Upon Acceptance of each Segment, an invoice shall be submitted by the Contractor to the CTRMA based on the actual quantities of authorized work done under each scheduled item of work under the specific Segment. When this invoice is approved by the CTRMA, the balance due to the Contractor for the performance of the specific Segment will be paid the Contractor, less any amounts of liquidated damages that may be imposed by the CTRMA.

Upon successful completion and full payment of each Segment, the Performance Bond amount shall be decreased by the cost of the specific Segment that is considered complete per the Price Schedule.

F. Final Project Payment

Upon final Project Acceptance of the Toll Collection System, a final invoice shall be submitted by the Contractor to the CTRMA, based on the actual quantities of authorized work done under each scheduled item of work. When this final invoice is approved by the CTRMA, the balance due to the Contractor for the performance of the Project will be paid the Contractor, less any amounts of liquidated damages that may be imposed by the CTRMA, provided however, that before final payment is made the following shall be satisfied:

- 1) The Contractor and Subcontractors shall file affidavits certifying the amounts due and identity of any and all workmen owed wages due on account of the project work.

- 2) The Contractor shall execute and deliver the final invoice, which includes a full release of the CTRMA and its agents from any claims or actions on this Contract and a certification by the Contractor that there are no outstanding liens or claims for work performed or materials supplied under this Contract.

G. As-Built Quantities

The CTRMA will prepare as-built quantities for all scheduled items of work, which have been authorized and incorporated into the Project. When such as-built quantities are completed, they will be incorporated into the Contractor's final invoice. The Contractor assumes the positive obligation of assisting the CTRMA wherever possible in the preparation of such as-built quantities.

The CTRMA may from time to time prepare adjusted quantities and incorporate these quantities into monthly payments through an appropriate Change Order. Such adjusted quantities shall be subject to recalculation. However, nothing contained in these specifications shall be construed to place on the CTRMA the obligation of providing the Contractor with as-built quantities for the work performed prior to the issuance of the proposed final invoice nor to provide more than rough approximate quantities of the work done for use in the preparation of monthly estimates.

Where the final invoice reveals that an overpayment has been made, the Contractor shall immediately return the amount of the overpayment. If the Contractor fails to remit the overpayment, the CTRMA shall be entitled to proceed against the Contractor or its surety.

H. Releases

Appropriate final release forms and other required documentation shall be completed by the Contractor and approved by the CTRMA. The acceptance by the Contractor of payment of the final invoice shall operate as and be a release to the CTRMA and its agents from all claims of or liability to the Contractor for anything done or furnished or omitted to be done or furnished for or relating to the Project, or any act or neglect of the CTRMA to the Contractor or any Corporation or person arising from the Contract.

13. TERM OF CONTRACT. Unless otherwise terminated pursuant to Section 15 of Attachment A, the initial term of this Toll Systems Implementation Contract shall be for five (5) years, with the option to renew, upon mutual consent of both parties for one additional three (3) year period upon the same terms and conditions stated in the Contract Documents.

14. ASSIGNMENT BY CTRMA. CTRMA may, at its sole option, assign all or a portion of its rights and obligations under this Contract to any developer or general contractor chosen by CTRMA to construct any segment of the Turnpike System, including but not limited to the assignment of certain of CTRMA's rights and obligations hereunder to Hill Country Constructors, the Developer under that certain Comprehensive Development Agreement dated November 29, 2004 for the 183-A Turnpike Project, in connection with the issuance by CTRMA of one or more Work Authorizations to Contractor hereunder for development and construction of the Toll Collection System for the 183-A Project.
15. FINANCIAL COMMITMENT. The CTRMA may, but shall not be obligated to, terminate this Contract for cause, without penalty and without any compensation to Contractor pursuant to Article 15C of Appendix A or otherwise, in the event that the Contractor has not obtained either equity financing or project debt financing in the minimum amount of \$3,000,000 within thirty (30) days of the date of this Contract. No Work Authorization will be issued under the terms of this Contract unless and until CTRMA is satisfied that Contractor has satisfied this financial commitment.
16. FEDERAL LAW COMPLIANCE. Contractor covenants at all times to perform its duties and obligations hereunder in compliance with all applicable federal laws and regulations necessary for the Project and this Contract to be eligible for TIFIA funding.

IN WITNESS WHEREOF, the parties hereto have executed this Contract as of the date first above written.

CENTRAL TEXAS REGIONAL MOBILITY
AUTHORITY

By: _____
Mike Heiligenstein,
Executive Director

Contractor:

CASETA TECHNOLOGIES, INC.

By: _____
Name: _____
Title: _____

SCHEDULES:

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GENERAL PROVISIONS

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GENERAL PROVISIONS

ARTICLE 1. WORK AUTHORIZATIONS

A. Use. The Contractor shall not begin any work until the Authority and the Contractor have signed a Work Authorization. Costs incurred by the Contractor before a work authorization is fully executed or after the completion date specified in the Work Authorization are not eligible for reimbursement. All work must be completed on or before the completion date specified in the Work Authorization, and no Work Authorization completion date shall extend beyond the Contract Time set forth in the Contract.

B. Contents. Each Work Authorization will designate the specific Toll Road Segment or Segments and the types of services to be performed and will include (1) a period of performance with a beginning and ending date; (2) a full description of the work to be performed; (3) a work schedule with milestones; (4) a cost not to exceed amount, (5) the basis of payment using the Price Schedule attached to the Contract. Except as agreed to by the Authority, the Contractor is not to include additional contract terms and conditions in the Work Authorization. Except with respect to revisions to *Attachment B – SCOPE OF WORK* in the work authorization that revises the Price Schedule, in the event of any conflicting terms and conditions between the Work Authorization and the Contract, the terms and conditions of the Contract Documents shall prevail and govern the work and costs incurred.

C. No Guaranteed Work. Work Authorizations are issued at the discretion of the Authority. While it is the Authority's intent to issue Work Authorizations hereunder, the Contractor shall have no cause of action conditioned upon the lack or number of Work Authorizations issued.

D. Incorporation into Contract. Each Work Authorization shall be signed by both parties and become a part of the Contract Documents. No Work Authorization will waive the Authority's or the Contractor's responsibilities and obligations established in this Contract. The Contractor shall promptly notify the Authority of any event that will affect completion of the Work Authorization.

E. Supplemental Work Authorizations / Change Orders. Before additional work may be performed or additional costs incurred, a change in a Work Authorization shall be enacted by a written Change Order or Change Directive in accordance with the terms of the Contract. The Authority shall not be responsible for actions by the Contractor or any costs incurred by the Contractor relating to additional work not directly associated with the performance or prior to the execution of the Change Order or Change Directive.

E-1. More Time Needed. If the Contractor determines or reasonably anticipates that the work authorized in a Work Authorization cannot be completed before the specified completion date, the Contractor shall promptly notify the Authority. The Authority may, at its sole discretion, extend the Work Authorization period by execution of a Change Order.

E-2. Changes in Scope. Changes that would modify the scope of the work authorized in a Work Authorization must be enacted by a written Change Order.

F. New Work Authorization. If the Contractor does not complete the services authorized in a Work Authorization before the specified completion date and has not requested a Change Order, the Work Authorization shall terminate on the completion date. At the sole discretion of the Authority, it may issue a new Work Authorization to the Contractor for the incomplete work using the unexpended balance of the

Attachment A

preceding Work Authorization for the Project. If approved by the Authority, the Contractor may calculate any additional cost for the incomplete work using the rates set forth in the preceding Work Authorization.

G. Emergency Work Authorizations. The Authority, at its sole discretion, may accept the Contractor's signature on a faxed copy of the Work Authorization as satisfying the requirements for executing the work authorization, provided that the signed original is received by the Authority within five business days from the date on the faxed copy.

H. Deliverables. Upon satisfactory completion of the Work Authorization, the Contractor shall submit the deliverables as specified in the executed Work Authorization to the Authority for review and acceptance.

ARTICLE 2. PROGRESS

A. Progress Meetings. The Contractor shall, during the progress of the work, periodically confer with the Authority. The Contractor shall prepare and present such information as may be pertinent and necessary or as may be requested by the Authority in order to evaluate features of the work.

B. Conferences. At the request of the Authority or the Contractor, conferences shall be provided at the Contractor's office, the office of the Authority, or at other locations designated by the Authority. These conferences shall also include evaluation of the Contractor's services and work when requested by the Authority.

C. Inspections. The work and all reimbursements will be subject to periodic review by the Authority and associated government agencies, including the Texas Department of Transportation (TxDOT) and the Federal Highway Administration (FHWA).-

D. Reports. The Contractor shall promptly advise the Authority in writing of events that have a significant impact upon the progress of a Work Authorization, including:

1. problems, delays, adverse conditions that will materially affect the ability to meet the time schedules and goals, or preclude the attainment of project work units by established time periods; this disclosure will be accompanied by statement of the action taken or contemplated, and any Authority or federal assistance needed to resolve the situation; and
2. favorable developments or events which enable meeting the work schedule goals sooner than anticipated.

E. Corrective Action. Should the Authority determine that the progress of work does not satisfy the milestone schedule set forth in a Work Authorization, the Authority shall review the Time Schedule with the Contractor to determine the nature of corrective action needed.

ARTICLE 3. SUSPENSION OF WORK AUTHORIZATION

A. Notice. Should the Authority desire to suspend a Work Authorization but not terminate the Contract, the Authority may verbally notify the Contractor followed by written confirmation, giving (30) thirty days notice. Both parties may waive the thirty-day notice in writing.

B. Reinstatement. A Work Authorization may be reinstated and shall be resumed in full force and effect within sixty (60) days of receipt of written notice from the Authority to resume the work. Both parties may waive the sixty-day notice in writing.

Attachment A

C. Effect of Suspension of Work on Contract Time. If the Authority suspends a Work Authorization for reasons related to its own convenience and not due to the actions or fault of Contractor, then the Contract Time as determined in the Contract shall be extended for the same number of days that the Work Authorization is suspended and the period of the Contract Time shall begin to run again whenever the Work Authorization is reinstated.

D. Limitation of Liability. The Authority shall have no liability for work performed or costs incurred prior to the date authorized by the Authority to begin work, during periods when work is suspended, or after the completion date of the Contract or the Work Authorization.

ARTICLE 4. ADDITIONAL WORK

A. Notice. If the Contractor is of the opinion that any assigned work is beyond the scope of the Contract Documents and constitutes additional work, it shall promptly notify the Authority in writing, presenting the facts of the Work Authorization and showing how the Work Authorization constitutes additional work.

B. Supplemental Agreement. If the Authority finds that the work does constitute additional work, the Authority shall so advise the Contractor and a written Change Order will be prepared and executed as provided in the Contract.

C. Limitation of Liability. The Authority shall not be responsible for actions by the Contractor or any costs incurred by the Contractor relating to additional work not directly associated with or prior to the execution of a Change Order.

ARTICLE 5. CHANGES IN WORK

A. Work Previously Submitted as Satisfactory. If the Contractor has submitted work in accordance with the terms of the Contract Documents but the Authority requests changes to the completed work or parts thereof which involve changes to the original scope of services or character of work under the Contract Documents, the Contractor shall make such revisions as requested and as directed by the Authority. This will be considered as additional work and paid for as specified under Article 4, Additional Work.

B. Work Does Not Comply with Contract. If the Contractor submits work that does not comply with the terms of the Contract Documents, the Authority shall instruct the Contractor to make such revision as is necessary to bring the work into compliance with the Contract Documents. No additional compensation shall be paid for this work and no schedule extensions will be allowed. If such revisions do affect the Contractor's ability to meet the schedule milestones as identified in the applicable Work Authorization, the Contractor is liable for all additional cost to the Authority and other contractors who may be affected.

C. Errors/Omissions. The Contractor shall make revisions to the work authorized in the Contract Documents, which are necessary to correct errors or omissions appearing therein, when required to do so by the Authority. No additional compensation shall be paid for this work and no schedule extensions will be allowed. If such corrections do affect the Contractor's ability to meet the schedule milestones as identified in the applicable Work Authorization, the Contractor is liable for all additional cost to the Authority and other contractors who may be affected.

ARTICLE 6. [RESERVED]

ARTICLE 7. OWNERSHIP OF DATA AND DELIVERABLES

A. Ownership of Material. Ownership of all data, materials and documentation originated and prepared for the Authority pursuant to the RFP shall belong exclusively to the Authority and be subject to public inspection in accordance with applicable law. Trade secrets or proprietary information submitted by the Contractor may not be subject to public disclosure; however, the Contractor must invoke the protections of applicable statute, in writing, either before or at the time the data are submitted. The written notice must specifically identify the data or materials to be protected and state the reasons why protection is necessary. The proprietary or trade secret material submitted must be identified by some distinct method such as highlighting or underlining and must indicate only the specific words, figures, or paragraphs that constitute trade secret or proprietary information. The classification of any entire bid document, line item prices or prices as proprietary or trade secrets is not acceptable.

B. Works for Hire. All services and products provided under the Contract Documents are considered works for hire, except as otherwise specified in the applicable Work Authorizations and in Paragraph C. of this article, and as such all data, basic sketches, charts, calculations, plans, specifications, deliverables, and other documents created or collected incident to such work for hire under the terms of the Contract Documents are the property of the Authority. The Authority shall have all rights, title and interest in or to all products, work plans, designs, programs, data bases, documentation, manuals and other work developed or generated under the Contract Documents, including, without limitation, unlimited rights to use, sell, make or duplicate, modify or disclose any part thereof, in any manner and for any purpose, and the right to permit or prohibit any other person, including the Contractor, from doing so. To the extent the Contractor may be deemed at anytime to have any of the foregoing rights, the Contractor agrees to assign and does hereby assign such rights to the Authority.

C. Disposition of Documents. All documents prepared by the Contractor as part of its services provided under the Contract Documents and all documents furnished to the Contractor by the Authority shall be delivered to the Authority upon request by the Authority. The Contractor, at its own expense, may retain copies of such documents or any other data which it has furnished the Authority under the Contract Documents, but may only further use that data to the extent expressly authorized in the Contract Documents.

D. Release of Design Plans. The Contractor (1) will not release any plans created or collected under the Contract Documents except to its subproviders as necessary to complete the Contract; (2) shall include a provision in all subcontracts which acknowledges the Authority's ownership of the plans and prohibits their use for any use other than on behalf of the Authority under the Contract Documents; and (3) is responsible for any improper use of the plans by its employees, officers, or subproviders, including costs, damages, or other liability resulting from improper use. Neither the Contractor nor any subprovider may charge a fee for the portion of the plans created by the Authority.

ARTICLE 8. PUBLIC INFORMATION

The Authority will comply with Government Code, Chapter 552, the Public Information Act, and 43 Texas Administrative Code §3.10 et seq. in the release of information produced under this Contract. Subject to compliance with such laws, the Authority acknowledges that the certain proprietary software and all related software documentation furnished under the Contract Documents may constitute valuable assets of the Contractor and, as between the Authority and the Contractor, is proprietary information and property of the Contractor, and that, by virtue of the Contract Documents, the Authority shall acquire only the right to use the proprietary software and related software documentation under the terms and conditions set forth in the

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Contract Documents and that the Authority shall not acquire any rights of ownership in or title to the proprietary software and any source codes or related software documentation.

Proprietary software and related software documentation shall be used only by employees of the Authority and any third parties whose services are necessary to the Authority's exercise of its rights hereunder and as expressly permitted hereunder. The Authority will notify the Contractor of any request (pursuant to the Public Information Act or other applicable laws) for disclosure or release of any proprietary software and related documentation so as to allow the Contractor the opportunity to protect such materials from disclosure.

ARTICLE 9. PERSONNEL, EQUIPMENT AND MATERIAL

A. Contractor Resources. The Contractor shall furnish and maintain quarters for the performance of all services, in addition to providing adequate and sufficient personnel and equipment to perform the services required under the Contract. The Contractor certifies that it presently has adequate qualified personnel in its employment for performance of the services required under the Contract Documents, or it will be able to obtain such personnel from sources other than the Authority.

B. Removal of Contractor Employee. All employees of the Contractor assigned to this Contract shall have such knowledge and experience as will enable them to perform the duties assigned to them. The Authority may instruct the Contractor to remove any employee from association with work authorized in the Contract Documents if, in the sole opinion of the Authority, the work of that employee does not comply with the terms of the Contract Documents or if the conduct of that employee becomes detrimental to the successful completion of the work.

C. Replacement of Key Personnel. The Contractor must notify the Authority in writing as soon as possible, but no later than three business days after a Manager or other key personnel is removed from association with this Contract, giving the reason for removal.

D. Authority Approval of Replacement Personnel. The Contractor may not replace (1) key personnel providing licensed engineering services without substituting in their positions licensed engineers having equivalent qualifications and notifying the Authority of such replacements which notice shall include the qualifications of the successors, or (2) the Project Manager, Design Manager, Software Manager or Installation Manager without the prior consent of the Authority. The Authority must be satisfied that the new Project Manager or other key personnel subject to this Paragraph 9.D is qualified to provide the authorized services. If the Authority determines that the new Project Manager or other key personnel subject to this Paragraph 9.D is not acceptable, the Contractor may not use that person in that capacity and shall replace him or her with one satisfactory to the Authority within forty-five (45) days.

ARTICLE 10. SOLICITATION FOR EMPLOYMENT

The Authority hereby agrees that, during the term of this Contract, the Authority shall not recruit for employment any person or entity who or which is an employee of the Contractor.

ARTICLE 11. SUBCONTRACTING

A. Prior Approval. The Contractor shall not assign, subcontract or transfer any portion of the services related to the work under the Contract Documents without prior written approval from the Authority; provided, however, that this does not limit Contractor's subcontracting to other firms to furnish specialized technology components and services that the Contractor does not manufacture or produce in-house.

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B. DBE/HUB Compliance. It is the policy of the CTRMA to encourage the participation of Disadvantaged Business Enterprises ("DBE") and Historically Underutilized Businesses ("HUB's"), minorities, and women in all facets of its activities. To this end, the Contractor's subcontracting program shall take into consideration the extent to which DBE/HUB's, minorities, and women participate in the ownership, management and professional work force of a firm. The Contractor shall comply with a DBE Subcontracting Plan as presented by the Contractor and approved by the Authority prior to the issuance of Work Authorization No. 1. Such DBE Subcontracting Plan must meet all federal requirements for TIFIA funding.

C. Required Provisions. All subcontracts for services shall include the provisions included in this Attachment A, General Provisions, and any provisions required by law. The Contractor is authorized to pay the subproviders in accordance with the terms of the subcontract, and the basis of payment may differ from the basis of payment by the Authority to the Contractor.

D. Prior Review. Subcontracts for services in excess of \$25,000 shall be reviewed by the Authority prior to performance of work thereunder.

E. Contractor Responsibilities. No subcontract relieves the Contractor of any responsibilities under the Contract Documents.

ARTICLE 12. INSPECTION OF WORK

The Contractor shall furnish the Authority, and its Representatives, with every reasonable opportunity and facility for inspection and making certain that the work under this Contract is performed and the materials are furnished in accordance with the requirements and intent of the Contract Documents. Such inspection may include plant and/or shop visits and extensive field inspection during the toll equipment installation and testing phases. The Authority and its Representatives reserve the right to perform a plant or shop visit, as long as they provide two (2) working days notice prior to the actual visit.

ARTICLE 13. AUTHORITY RESPONSES

The Authority agrees to respond in a timely manner to all submittals made by Contractor and to all of Contractor's written requests for input, interpretation, clarification, confirmation or information in sufficient detail to permit Contractor to proceed with its work without delay.

ARTICLE 14. OBLIGATION TO PERFORM FUNCTIONS

Any failure or neglect on the part of the Authority to enforce provisions provided in the Contract dealing with supervision, control, inspection, testing, or acceptance and approval of the work shall not relieve the Contractor from full compliance with the Contract Documents, nor render the Authority liable to the Contractor for money damages, extensions of time or increased compensation of any kind. The Contractor shall not be held responsible for any time extensions which are initiated by the Authority.

ARTICLE 15. TERMINATION

A. Causes. The Contract may be terminated before the stated completion date due to any of the following conditions.

1. By mutual agreement and consent, in writing from both parties.
2. By the Authority by notice in writing to the Contractor as a consequence of failure by the Contractor to perform the services set forth herein in a satisfactory manner.

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3. By either party, upon the failure of the other party to fulfill its material obligations as set forth herein.
4. By the Authority for reasons of its own, not subject to the mutual consent of the Contractor, by giving thirty (30) days notice of termination in writing to the Contractor.
5. By the Authority, without consent or advance notice to Contractor in the event this contract is declared void or unenforceable by a court or tribunal of competent jurisdiction.
6. By satisfactory completion of all services and obligations described herein.

B. Measurement. Should the Authority terminate this Contract as herein provided, no fees other than fees due and payable at the time of termination shall thereafter be paid to the Contractor. The value of the work performed by the Contractor prior to termination shall be determined in accordance with Paragraph D of this Article. Compensation for work at termination will be based on a percentage of the work completed at that time. Should the Authority terminate the Contract under paragraph (4) above, the Contractor shall not incur costs during the thirty-day notice period in excess of the amount incurred during the preceding thirty days.

C. Value of Completed Work. If the Contractor defaults in the performance of this Contract or if the Authority terminates this Contract for fault on the part of the Contractor, the Authority will give consideration to the following when calculating the value of the completed work: (1) the actual costs incurred (not to exceed the rates set forth in the Price Schedule attached to the Contract by the Contractor in performing the work to the date of default; (2) the amount of work required which was satisfactorily completed to date of default; (3) the value of the work which is usable to the Authority; (4) the cost to the Authority of employing another firm to complete the required work; (5) the time required to employ another firm to complete the work; and (6) other factors which affect the value to the Authority of the work performed. If the Authority terminates the Contract for reasons of its own, not subject to the mutual consent of the Contractor, in accordance with paragraph 15.A.4 above, or the Authority terminates the Contract in response to a court decision in accordance with paragraph 15.A.5 above, then the Authority will pay to the Contractor the fair and reasonable value of the work completed in accordance with the Contract up to the termination date. In such event, the Authority will give consideration to the following when calculating the value of the completed work: (1) the actual cost incurred (not to exceed the rates set forth in the Price Schedule attached to the Contract) by the Contractor in performing the work to the date of termination; (2) the amount of work required which was satisfactorily completed to the date of termination; (3) the value of the work which is useable to the Authority; and (4) other factors which affect the value to the Authority of the work performed.

D. Calculation of Payments. The Authority shall use the Price Schedule attached to the Contract in determining the value of the work performed up to the time of termination. The sum of the overhead percentage rate for payroll additives and for general and administrative overhead costs during the years in which work was performed shall be used to calculate partial payments. Any portion of the fixed fee not previously paid in the partial payments shall not be included in the final payment.

E. Excusable Delays. Except with respect to defaults of subproviders, the Contractor shall not be in default by reason of any failure in performance of the Contract in accordance with its terms (including any failure to progress in the performance of the work) if such failure arises out of causes beyond the control and without the default or negligence of the Contractor and meeting the definition of Force Majeure Events as set forth and qualified in Article 30 hereof.

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F. Surviving Requirements. The termination of this Contract and payment of an amount in settlement as prescribed above shall extinguish the rights, duties, and obligations of the Authority and the Contractor under the Contract Documents, except for those provisions that establish responsibilities that extend beyond the Contract Time specified in the Time Period Schedule or applicable Work Authorization.

ARTICLE 16. COMPLIANCE WITH LAWS

The Contractor shall comply with all applicable federal, state, and local laws, statutes, codes, ordinances, rules and regulations, and the orders and decrees of any court, or administrative bodies or tribunals in any manner affecting the performance of the Contract, including, without limitation, worker's compensation laws, minimum and maximum salary and wage statutes and regulations, nondiscrimination, and licensing laws and regulations. When required, the Contractor shall furnish the Authority with satisfactory proof of its compliance therewith.

ARTICLE 17. INDEMNIFICATION

A. Errors, Omissions, Negligent Acts. The Contractor shall save harmless the Authority and its officers and employees from all claims and liability due to activities of itself, its agents, or employees, performed under the Contract Documents and which are caused by or result from error, omission, or negligent act of the Contractor, any subcontractor, or of any person employed by the Contractor.

B. Attorney Fees. Each party shall, to the extent allowed by law, save harmless the prevailing party from any and all expense, including, but not limited to, attorney fees which may be incurred by the prevailing party in litigation or otherwise resisting claims or liabilities which may be imposed on the other party as a result of activities by the other party, its agents, or employees.

ARTICLE 18. CONTRACTOR'S RESPONSIBILITY

A. Accuracy. The Contractor shall be responsible for the accuracy of work and shall promptly make necessary revisions or corrections resulting from its errors, omissions, or negligent acts without compensation.

B. Errors and Omissions. The Contractor's responsibility for all questions arising from design errors and/or omissions will be determined by the Authority. The Contractor will not be relieved of the responsibility for subsequent correction of any such errors or omissions or for clarification of any ambiguities until after the construction and installation phase of the project has been completed.

C. Seal. The Contractor shall cause the responsible licensed engineer to sign, seal and date all appropriate engineering submissions to the Authority in accordance with the Texas Engineering Practice Act and the rules of the Texas Board of Professional Engineers.

D. Resealing of Documents. Once engineering work has been sealed and accepted by the Authority, the Authority, as the owner, will notify the Contractor in writing of the possibility that an Authority engineer, as a second engineer, may find it necessary to alter, complete, correct, revise or add to the work. If necessary, the second engineer will affix his seal to any work altered, completed, corrected, revised or added. The second engineer will then become responsible for any alterations, additions or deletions to the original design including any effect or impacts of those changes on the original engineer's design.

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ARTICLE 19. PERMITS, LICENSES, FEES AND TAXES

The Contractor shall be responsible for obtaining all permits and licenses which are not provided by the Authority and also pay all charges and fees and give all notices necessary and incidental to the due and lawful prosecution of the work under the Contract Documents.

ARTICLE 20. COOPERATION BETWEEN CONTRACTORS

The Contractor shall work closely with any other contractors who will be working for the CTRMA and for TxDOT for the purpose of coordinating any activity which may affect both contractors. This would include the CTRMA's contractors for construction of its toll roads, and contractors performing toll equipment installation, equipment testing, power requirements, conduit requirements, etc. It will be critical that close coordination between the Contractor and other contractors is maintained during the toll equipment installation and testing phases of the Contract.

ARTICLE 21. NONCOLLUSION

A. Warranty. The Contractor warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for the Contractor, to solicit or secure the Contract and that it has not paid or agreed to pay any company or Contractor any fee, commission, percentage, brokerage fee, gifts, or any other consideration, contingent upon or resulting from the award or making of the Contract.

B. Liability. For breach or violation of this warranty, the Authority shall have the right to annul the Contract without liability or, in its discretion, to deduct from the contract price or compensation, or otherwise recover, the full amount of such fee, commission, percentage, brokerage fee, gift or contingent fee.

ARTICLE 22. INSURANCE

The Contractor shall secure and maintain insurance in its own name and at its own expense with insurance companies satisfactory to the Authority. The Contractor shall not commence work under the Contract Documents until it has provided insurance of such character and in such amounts shown below as will provide adequate protection for Authority employees, its Representatives, and others lawfully on its property and for the Contractor, against all liabilities, damages and accidents, or has provided equivalent protection by some approved method. The Contractor shall maintain such insurance or equivalent protection in force during the life of this Contract. The Contractor shall furnish the Authority with satisfactory proof of carriage of insurance prior to Contract award, and no modification or change or insurance carriage and provisions shall be made without thirty (30) days written advance notice to the Authority. Neither approval by the Authority, nor a failure to disapprove insurance furnished by the Contractor, shall release the Contractor of full responsibility for liability, damages and accidents, as set forth herein.

If any operations shall be performed on the construction site by a subcontractor, the Contractor shall carry in its own behalf Contractor's protective Liability and Property Damages Insurance at the same limits set forth for its own operations.

All insurance policies shall be submitted to the Authority for final approval. Upon approval, certificates of issuance thereof shall be delivered to the Authority. If at any time any of the said policies shall be, or become, unsatisfactory to the Authority, the Contractor shall promptly obtain new and satisfactory policies and furnish certificates therefore as required above. All policies shall contain a valid provision or endorsement providing that the insurance company will notify the Authority, in writing, at least thirty (30) days prior to the termination of any policy or before any changes are made in any policies.

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Before the Contractor, or any subcontractor, will be permitted to enter upon the right-of-way of the CTRMA Turnpike System, the policies for the foregoing insurance shall have been approved by the Authority and certificates therefore filed, as above required. The Contractor shall determine all the kinds and cost of insurance that may be required prior to submittal of their Proposals.

The minimum acceptable limits of coverage are:

- Comprehensive General Liability (each occurrence) \$1,000,000
- Comprehensive General Liability (Aggregate) \$3,000,000
- Employee Liability \$ 500,000
- Workers Compensation Statutory
- Comprehensive Auto Liability, Bodily Injury and Property Damage including all owned, hired and non-owned vehicles. \$1,000,000

ARTICLE 23. MAINTENANCE, RETENTION AND AUDIT OF RECORDS

A. Retention Period. The Contractor shall maintain all books, documents, papers, accounting records and other evidence pertaining to costs incurred and services provided (hereinafter called the Records). The Contractor shall make the records available at its office during the contract period and for four years from the date of final payment under the Contract, until completion of all audits, or until pending litigation has been completely and fully resolved, whichever occurs last.

B. Availability. The Authority or any of its duly authorized representatives shall have access to the Contractor's Records which are directly pertinent to this Contract for the purpose of making audits, examinations, excerpts and transcriptions.

ARTICLE 24. DISPUTES

A. Disputes Not Related to Contract Services. The Contractor shall be responsible for the settlement of all contractual and administrative issues arising out of any procurement made by the Contractor in support of the services authorized herein.

B. Disputes Concerning Work or Cost. Any dispute concerning the work hereunder or additional costs, or any non-procurement issues shall be settled by the CTRMA Executive Director, in his sole discretion.

ARTICLE 25. SUCCESSORS AND ASSIGNS

The Contractor and the Authority do each hereby bind themselves, their successors, executors, administrators and assigns to each other party of this agreement and to the successors, executors, administrators and assigns of such other party in respect to all covenants of this Contract. The Contractor shall not assign, subcontract or transfer its interest in the Contract without the prior written consent of the Authority.

ARTICLE 26. SEVERABILITY

In the event any one or more of the provisions contained in the Contract Documents shall for any reason, be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision thereof and this contract shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein.

ARTICLE 27. CONFLICT OF INTEREST

The undersigned represents that its firm has no conflict of interest that would in any way interfere with its or its employees' performance of services for the Authority or which in any way conflicts with the interests of the Authority. The firm shall exercise reasonable care and diligence to prevent any actions or conditions that could result in a conflict with the Authority's interests.

ARTICLE 28. LIQUIDATED DAMAGES

It is important that the toll collection system be delivered, installed and placed into operation on the CTRMA Turnpike System within the time frame set forth in the final, approved Time Period Schedule.

Failure to meet the final, approved Time Period Schedule for any segment as specified in the applicable Work Authorization shall result in liquidated damages being assessed by the Authority at a rate of \$20,000 per calendar day, unless specific time extensions have been requested by the Contractor and approved by the Authority, at its sole discretion. The Authority reserves the right to deduct the amount of liquidated damages from any funds due the Contractor. If retained funds or other funds due the Contractor are not sufficient to cover the liquidated damages, the Contractor or Surety shall promptly pay the amount due.

Nothing contained in this section shall be construed as limiting the rights of the Authority to additionally recover from the Contractor any or all payments which become due to the Authority for other reasons such as improper performance, failure to perform or breach of contract in any other respect, including, but not limited to, defective workmanship, equipment or materials.

In no event shall Contractor's liability to the Authority (including liability for liquidated damages or any other damages for breach of contract or failure to perform) with respect to any Work Authorization exceed the Contract Price for the particular segment of the Project as specified in the Work Authorization for that segment.

ARTICLE 29. BOND REQUIREMENTS

Within fifteen (15) days of the execution of the Contract, the Contractor shall provide to the Authority as obligee a Payment Bond and a separate Performance Bond (collectively, the "Bonds") issued by a responsible surety company reasonably acceptable to the Authority and legally authorized to do business in the State of Texas. The Bonds shall be in a form reasonably acceptable to the Authority. The penal sum of each Bond shall not be less than estimated amount of the Contract for all proposed segments (the "Initial Amount"). If the Bonds that are reasonably acceptable to the Authority are not delivered to the Authority prior to the expiration of the fifteen (15) day period, the Authority shall have the right to terminate, with no penalties assessed against the Contractor, at which time the Contract shall be of no further force and effect, and the Authority shall not be obligated to the Contractor for any work that the Contractor may have performed to and including the date of such termination, provided that the Authority shall reimburse the Contractor for equipment purchased by the Contractor, with the Authority's prior written consent (which consent must be separate and apart from the Contract), for purposes of meeting its obligations under the Contract Documents during this fifteen (15) day period, thirty (30) days after delivery to the Authority of

Attachment A

such equipment in good order. The Contractor shall have failed to satisfy its obligations under this Article 29 if the surety company requests modifications or changes to the Contract Documents, or requests other separate agreements from the Authority, that the Authority, in its sole discretion, deems unacceptable. The premium for the Bonds shall be borne by the Contractor.

ARTICLE 30. FORCE MAJEURE

Contractor shall be entitled to an extension of the Contract Time for completion of a specified segment of the Project due to certain specified Force Majeure Events that are outside the control of Contractor. Such Force Majeure Events shall be limited to the following: any earthquake, tornado, hurricane, flood or other natural disaster, fire, epidemic, freight embargo, strike, blockade, rebellion, war, riot, act of sabotage or civil commotion. Contractor shall only be entitled to an extension of the Contract Time, however, if any such Force Majeure Event materially and adversely affects Contractor's obligations, and provided such Force Majeure Event is beyond the control of the Contractor and is not due to an act, omission, negligence, recklessness, willful misconduct, breach of contract or law by Contractor and further provided that such Force Majeure Event (or the affects of such Force Majeure Event) could not have been avoided by the exercise of caution, due diligence, or reasonable efforts by Contractor.

[END OF SECTION]

Attachment B

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

TOLL COLLECTION SYSTEMS IMPLEMENTATION

SCOPE OF WORK

B1.0 General

B1.01. Background

The Central Texas Regional Mobility Authority (CTRMA) designated the 183-A Turnpike Project as the first priority for implementation in conjunction with the TxDOT plans for development of the Central Texas Turnpike Project (CTTP). Subsequent to the implementation of the design/build process for the 183-A Turnpike Project, the Capital Area Metropolitan Planning Organization (CAMPO) approved the implementation of the proposed Toll Implementation Plan to construct additional capacity on various segments of highway network in the CAMPO Long-Range Plan as toll road facilities as part of the CTRMA Turnpike System. Several of the toll road segments are in various stages of project development, in design or construction by TxDOT, and it is intended that these proposed segments as identified in *Attachment D* also will be implemented by the CTRMA as parts of its Turnpike System. The Toll Collection System for the various segments of the CTRMA Turnpike System as shown in Attachment D includes various combinations of Electronic Toll Collection (ETC), Automatic Coin Machine (ACM), Express ETC, and attended Manual Toll Lanes. The first segments of the Project are currently expected to open in 2007.

B1.02. Summary Scope of Work

The project shall consist of a toll collection, transaction processing, video enforcement, reconciliation, and a reporting system with an established interface to the Customer Service Center / Violation Processing Center (CSC/VPC) system. The work generally will include, but not be limited to: design, development, testing, and installation of a complete and fully functioning electronic toll collection system, with associated infrastructure, that shall include attended manual toll lanes and lane-based electronic toll collection equipment that will process tolls and violations. Plaza/Host and Lane Computers and all associated hardware and software, as well as software for reporting, reconciliation and other audit functions, also are included. Maintenance of the Toll Collection System, after Segment Acceptance of completed portions of the Turnpike System are put into operation, will be accomplished by the Contractor under a separate Maintenance Contract.

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A detailed tabulation of the elements of the Toll Collection System, indicating locations and basic components is attached as "*Detailed Lane Configurations*", and the basic requirements and components of the various types of toll lanes are indicated on the attached "*Typical Toll Lane Configurations*". The general locations and layouts for the proposed toll facilities on the various segments of the CTRMA Turnpike System are indicated on the schematic diagrams in *Attachment D*. These diagrams are based on the best information currently available and are intended for information only for the purpose of this Toll System Implementation Contract. These locations are subject to change, and it should be anticipated that refinements and adjustment to the locations and layouts indicated will be required as designs for the Toll Collection System are developed further. The basic Technical Requirements for the implementation of the Toll Collection System are included as *Attachment E*.

B1.03. Basic Objective

The objective of this Project is to implement the CTRMA's Toll Collection System successfully designed, developed, tested and operational in time to meet the designated "Subject to Tolling" Date for the initial segment(s) of the CTRMA Turnpike System.

B2.0 General Description – Toll Road Segment Infrastructure and Sites (see Attachment D for Turnpike System Plan)

B2.01. 183-A Turnpike: San Gabriel to SH 45 North

The proposed 183-A Turnpike is located in Williamson County, extending from RM 620/SH 45, south of the City of Cedar Park, to the San Gabriel River approximately three miles north of the City of Leander. The corridor is approximately 11.6 miles in length and includes connections to RM 620/SH 45, local road networks, and the existing U.S. Route 183. The southern terminus for the Project coincides with the improvements to upgrade the U.S. Route 183 and RM 620/SH45 interchange currently being implemented by TxDOT and referred to as Section 9.

The 183-A Project will be developed in two separate phases, the Interim Build Phase and the Ultimate Build Phase. The Interim Build Phase, which is being constructed under a Comprehensive Development Agreement (CDA) design/build process, will consist of the construction of a six-lane mainline roadway (3 NB and 3 SB) and ramps from the southern terminus of the Project at RM 620/SH45 to just north of FM 1431; and from north of FM 1431 to the San Gabriel River only the frontage roads will be constructed. A conventional (combination) mainline toll plaza, consisting of a minimum twelve (12) toll lanes will be constructed in

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the vicinity of Park Street, and two, 3-lane ramp plazas will be constructed on the ramps at Brushy Creek Road.

The Ultimate Build Phase, which will be constructed in the future under a separate agreement, will add mainline roadways, ramps, and toll facilities from FM1431 to the San Gabriel River. Construction of the full build-out of the Ultimate Build Phase will be implemented as traffic conditions warrant and funding becomes available. This full build-out is not expected to occur during the term of this Toll System Implementation Contract.

B2.02. US 290 W Phase of the "Y" in Oak Hill

This Project consists of the reconstruction of approximately 2.7 miles of US290 West to a 6-lane mainline roadway with 3-lane frontage roads (4-lane mainline and 2-lane frontage roads west of SH71) from west of RM 1826 to east of Williamson Creek. A mainline toll gantry (ETC only) would be located east of, but west of the ramps to, William Cannon Drive and ramp gantries (ETC only) would be located on the entrance and exit ramps between RM 1826 and Convict Hill Road.

B2.03. US 183 / SH 71: IH 35 to the Airport

o IH-35 TO RIVERSIDE

This Project segment on SH 71 consists of six main lanes and six frontage road lanes, approximately 2.1 miles long, from IH-35 to west of Riverside Drive. This construction begins west of Woodward Street and ends west of Riverside Drive. ETC only tolling facilities are anticipated.

o RIVERSIDE TO THORNBERRY

This Project segment on SH 71 consists of six main lanes and six frontage road lanes approximately 1.5 miles long on SH 71 from Riverside Drive to Thornberry Road and approximately 1.1 miles long on US 183 from Patton Lane to 3,000 feet south of the interchange with SH 71. The SH 71 construction begins west of Riverside Drive and ends east of Thornberry Road, and the US 183 construction begins north of Patton Lane and ends south of the interchange. The construction will include the multilevel interchange with the SH71 eastbound and westbound direct connectors to US 183 north of the proposed interchange. ETC only tolling facilities are anticipated.

o IH-35 TO SPRINGDALE

This Project segment on US183 South consists of six main lanes and six frontage road lanes approximately 2.2 miles long from IH-35 to Springdale Road. This construction begins west of Cameron Road and ends at Springdale Road. ETC only tolling facilities are anticipated.

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- **SPRINGDALE TO BOLM**

This Project segment on US183 South consists of six main lanes and four frontage road lanes approximately 5.1 miles long from Springdale Road to Bolm Road. The construction begins at Springdale Road and ends north of Bolm Road. ETC only tolling facilities are anticipated.

- **BOLM TO PATTON**

This project segment consists of six main lanes and four frontage road lanes approximately 2.0 miles long from Bolm Road to Patton Lane. This construction begins at Bolm Road and ends north of Patton Lane. ETC only tolling facilities are anticipated.

B2.04. SH 45 SW Loop 1 to FM 1626 (4 lanes)

This Project consists of six main lanes, approximately 3.6 miles long, from Loop 1 South to FM 1626. This construction begins at Loop 1 South/ SH 45 and ends at FM 1626. ETC only tolling facilities on 4 of the 6 lanes are anticipated. These facilities will be located in Travis County.

B2.05. SH 71 W Phase of the "Y" in Oak Hill

This Project consists of a two-lane direct connector to be constructed for westbound US 290W traffic to westbound SH 71; and a two-lane direct connector to be constructed for the eastbound SH 71 to eastbound US 290W. These direct connectors will begin east of Williamson Creek and end east of Old Bee Cave Road. The tolling facilities associated with this segment are included with the toll collection system elements that are part of the US 290 W Phase of the "Y" in Oak Hill Project and the toll collection system work within the two separate segments must be coordinated by the Contractor.

B2.06. LP 360 RM 2244 to south of Walsh Tarlton

[Pending Environmental Re-evaluation]

B2.07. US 290 E: US 183 to SH 130

This Project on US290 East consists of the construction of six main lanes and four frontage road lanes approximately 5.7 miles long from US 183 to SH 130. This construction begins at US 183 and ends east of SH 130. ETC and Cash tolling facilities are anticipated.

B2.08. LP 360: LP 1 to US 290

[Pending Environmental Re-evaluation]

B3.0 Toll Collection Systems Elements

B3.01. General Requirements

The Toll Collection System for the CTRMA Turnpike System, generally, will be similar in composition and functionality to those used on other toll roads in Texas, using automatic vehicle identification and classification technology, a Violation Enforcement System (VES) with an integrated camera and triggering system to capture referenced digital images of license plates, and a Maintenance Online Management System (MOMS).

It is required that the System be interoperable with the other Texas ETC systems so that ETC customers from other cities such as Dallas and Houston can use the facility without multiple transponders in their vehicles.

The Customer Service Center (CSC) and the Violation Processing Center (VPC) will be co-located in a new facility which is being developed and will be administrated by the TTA Division of TxDOT. The CTRMA will contract with TTA for CSC and VPC services for its customers. Development of CTRMA toll collection systems will include extensive coordination and design of appropriate interfaces with the CSC/VPC. Appropriate communications links between the various toll facilities on the CTRMA Turnpike System and the CTRMA Administrative Offices, the Field Operations Building(s) and the CSC/VPC are part of the requirements of this Work.

B3.02. 183-A: Turnpike: San Gabriel to SH 45 North

The 183-A Turnpike Project initially will be operated with a combination of manual, automated coin collection, and electronic (ETC) modes of toll collection. Automatic coin machine (ACM) lanes will be restricted to 2 axle vehicles, whereas manual and dedicated ETC lanes will be open to all traffic. Violation enforcement equipment will be installed in all lanes, and toll evaders will be pursued in accordance with established CTRMA Policies, as well as Chapter 370 of the Texas Transportation Code.

There will be two main toll collection areas on the 183-A Turnpike. An all ETC system will be installed on the mainline roadways in Section 9. A conventional mainline barrier toll plaza, together with a Field Operations Building, will be constructed at Park Street. Offices with adequate parking facilities for administrative, management, and supervisory personnel will be located in a Field Operations Building adjacent to the mainline toll plaza at Park Street.

The mainline barrier toll plaza, at Park Street, will be configured to transition from the typical section to ETC/AVI lanes and cash collection lanes. The ETC only lanes will be located in the center of the plaza and will provide express toll collection at high speeds. Cash customers will exit from the right lane when approaching the toll plaza to use conventional toll lanes equipped with both

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electronic and manually operated toll equipment. The all ETC system will consist of only a gantry over the mainline roadways. The ramp toll plazas will utilize a combination of both cash (attended lanes and/or automatic coin machines) and ETC options or ETC only, depending on their location.

B3.03. Toll Implementation Plan Segments

Toll collection for the various segments of the Toll Implementation Plan will be an electronic toll collection (ETC) system similar in composition and functionality to those used on other toll roads in Texas, using automatic vehicle identification and classification technology, a Violation Enforcement System (VES) with an integrated camera and triggering system to capture digital images of license plates, and a Maintenance Online Management System (MOMS).

Typically, at the remote Express Toll Locations, there will be no means to pay cash in the lanes. The mainline and ramp toll collection facilities at the designated remote Express Toll Locations will be configured for normal highway/ramp-speed lanes, equipped with ETC equipment for cashless nonstop toll collection, except on the US290 East Project, where a conventional mainline toll plaza, with a combination of ETC Express lanes, and attended manual cash lanes currently is proposed.

B4.0 Gantries and Roadside Equipment for ETC Systems

For all toll collection system field installations at the remote Express Toll Locations on the various roadway segments of the Turnpike System, the Contractor shall provide and install the toll equipment systems and hardware for complete operating toll collection systems. The principle items of work and primary components of the Toll Collection System at each remote Express Toll Location shall include, but are not limited to:

- Lane Controllers
- Express ETC Lane components, including VES and AVI systems and hardware
- All ETC Lane Equipment hardware, brackets, and fasteners required to attach the equipment to the gantries
- Provision for Uninterruptible Power Source
- Emergency Generators

Construction and installation of all ETC Toll Collection Equipment and Systems generally shall be in accordance with the applicable requirements as specified in *Attachment E*.

The procurement, fabrication and installation of gantries for the toll collection system to be located on designated segments of the CTRMA Turnpike System as

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indicated on the Detailed Lane Configuration will be by others. The CTRMA shall provide the basic design criteria and standard detailing for the roadside gantry structures. A generic gantry configuration has been developed by TxDOT to accommodate the toll systems lane equipment. Subsequent to selection, the Contractor will be required to provide a toll gantry design concept specific to its particular toll system to the Authority for consideration. The costs for concept designs for the toll gantries will be incidental to the Lump Sum price for Project Management. Should the Authority elect to utilize the Contractor's proposed gantry design concept, design of the toll gantries if designed by the Authority will be accomplished under separate Work Authorization. It will be the responsibility of the Contractor, nevertheless, to establish the precise locations for each of the gantry structures and to provide the Roadway Contractor(s) with detailed information of the installation of the toll collection system equipment at each location.

All toll system infrastructure facilities at the remote Express Toll Locations on the various segments of the CTRMA Turnpike System will be provided by others as indicated in Section B7.02. It will be the responsibility of the Contractor to fully coordinate the designs for the toll collection system with others and provide the required details and technical requirements to ensure that the construction of the toll system infrastructure facilities will be fully compatible and meet the requirements for the toll collection system.

B5.0 Toll Collection Systems Maintenance Services

B5.01. Introduction

The Contractor is required to provide maintenance services for the Toll Collection System Hardware and Software and will be responsible for all aspects of maintenance for the following Systems:

- Lane Systems
- Plaza Systems
- Host Systems, including Maintenance On-line Management System and Security Access System
- Communications Equipment

Details of the requirements for the services to be provided under a separate Maintenance Contract are described in *Attachment M-1* to the Maintenance Contract.

B5.02. Project Implementation

Due to the opening of the various toll road segments of the CTRMA Turnpike System at different times, it is anticipated that implementation of the Toll Collection System also will occur in phases. The Initial Term of the Maintenance

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Services shall commence with the acceptance of the initial segment of Toll Collection System that is put in operation.

B6.0 Coordination with Other Vendors

The Contractor will be responsible for establishing relationships with a wide variety of third parties. In this role, the Contractor will work closely with CTRMA in developing the required network.

B7.0 Work by Others

B7.01. Customer Service Center (CSC)

There will be one CSC/VPC System located in the Austin area. The Contractor shall develop an interface to communicate to the CSC system using available communication infrastructure (T-1 line or fiber back bone) for network communication links. The CSC will be located in a facility in Austin, Texas to be identified and provided by the Texas Department of Transportation (TxDOT).

B7.02. Civil/Roadway Construction

The CTRMA shall provide for a minimum of 120 linear feet of continuously reinforced concrete pavement in the area designated for toll collection. The pavement will be reinforced with fiber reinforced polymer bars (FRPB). No transverse joints and longitudinal joints will be placed at positions equal to lane widths. Power and communication lines will be provided by CTRMA and terminated in an area within 150 feet of the designated tolling location.

Except as may be expressly indicated elsewhere, all toll system infrastructure required for the toll collection systems at the designated remote Express Toll Locations will be provided and installed by others. The principle items of work and primary components of the Toll Collection System infrastructure at each remote Express Toll Location shall include, but are not limited to:

- All toll gantry installations, including foundations and gantry structures;
- Control Cabinets, including concrete foundation slab. The cabinets are to be provided with appropriate environmental protection and climate controls for housing the electronic equipment;
- Conduit and ground boxes providing connections between the control cabinets and the BTC Lane equipment installations.
NOTE: It is the responsibility of the Contractor to coordinate with the Roadway Contractor(s) for the placement and installation of these elements to ensure that the construction is acceptable for the toll collection system as designed.
- Power and communications services up to the location of the proposed Control Cabinets.

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- All signing, pavement markings, traffic barriers and other roadway appurtenances required at each remote Express Toll Location.

It is the responsibility of the Contractor, nevertheless, to coordinate with others and provide all necessary details, system requirements, and reviews of construction documents to ensure that the gantries are located and configured properly to accommodate the Contractor's own particular system components as required to meet the CTRMA Toll Collection System performance and accuracy requirements.

B7.03. Toll Plaza Elements

At the designated locations for toll plazas, both on the mainline roadways and on ramps, toll plaza elements, including toll booths, toll islands, canopies, equipment bases, pavement, pavements markings, signing, and toll systems elements, including counters, equipment brackets, conduit, electrical and mechanical systems, uninterruptible power supplies, and emergency generators will be provided by others, unless specifically provided for otherwise. It is the responsibility of the Contractor, nevertheless, to coordinate with others and to provide all necessary details, system requirements, and reviews of construction documents to ensure that the toll plaza elements are located and configured properly to accommodate the Contractor's own particular system components as required to meet the CTRMA Toll Collection System performance and accuracy requirements.

Installation of all toll collection system components, and all electrical and communications and termination work will be the responsibility of the Contractor. Installation of the Security Access System components and all equipment at the plaza and at the Host also will be the responsibility of the Contractor.

B8.0 Project Schedule

The Project Schedule which is to be prepared by the Contractor shall be based on anticipated dates of completion of the roadway construction (by others) of the various toll road segments as indicated in *Attachment D*. The dates as presented in *Attachment D* are based on current estimated information on the Toll Implementation Plan segments and are provided for information only for the purposes of preparing the Proposals. The Systems Integrator will be provided with a Notice to Proceed of Work Authorization for each of the individual Toll Road Segments NO LATER THAN six (6) months prior to the "Subject to Tolling" Date. All dates are subject to change. The proposed schedule dates by which the Contractor plans to make submittals and dates for completion shall be coordinated with the construction contracts for the various toll

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road segments by others, and it will be subject to the review and approval by TxDOT and the CTRMA.

The anticipated milestones and submittals for the Common Items and the individual toll road segments shall be as set forth (all days shown as work days) in the format of Table 2, Milestone and Submittal Schedule. The end date for the Project may change, and the Contractor shall revise other submittal and milestones dates it becomes apparent that changes will improve work or progress. Target dates should be in calendar days.

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Table 2- Initial Milestones and Submittal Schedule

Milestones	Target Dates
Program Management Plan	
Project Schedule	
Quality Assurance Plan	
Disaster Recovery Plan	
Equipment Acquisition	
Detailed Design Review Documentation	
Installation Plan	
Interoperability Testing	
Test Plan	
Maintenance Plan	
Interfaces Development	
Factory Acceptance Test Scripts	
Factor Acceptance Testing Approve	
Field Test Scripts	
Field Testing Approved	
User Manuals	
Training	
Toll Equipment Installation	
Commissioning	
Parts List and Catalogues	
Software Source Code	
Software Licenses	
As-Built Drawings	
Final Acceptance Testing Completed	

[END OF SECTION]

SOFTWARE LICENSES AND TERMS

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Software Licenses And Terms

C1.0 General

This document describes the definition of all Software provided under the Toll System Implementation Contract and the CTRMA rights to such software. It also details the Contractor's obligations under this Contract and the terms and conditions of the Software Escrow.

C2.0 Software Definitions

With respect to software provided under the Toll System Implementation Contract, the following terminology shall be used to define the various delivered software:

C2.01 Third-Party Intellectual Property

Third-Party Intellectual Property shall be all software and hardware that is Commercially-Off-The-Shelf (COTS) and shall include all documentation provided by the supplier along with all appropriate licenses.

C2.02 Proprietary Software

Proprietary Software shall be the Contractor's Standard Software Package that is normally delivered to Toll Collection Systems clients and shall include all documentation along with all appropriate licenses. It is understood that in order to meet the CTRMA Toll Collection requirements, modifications to the Contractor's Standard Software Package will be necessary.

C2.03 CTRMA System Software

CTRMA System Software shall be all software specifically developed and created under the Toll System Implementation Contract to provide the functionality required to meet the CTRMA operational requirements that is not part of the Contractor's Standard Software Package.

C2.04 Freeware

Freeware shall be all software that is readily available on the internet at no cost that is required by the Toll Collection System for various standards functions. It is possible that the Contractor may have modified the freeware to meet the CTRMA Toll System Implementation Contract requirements, but regardless of these modifications by the Contractor, such software will be defined as "freeware".

C3.0 Software Provisions

C3.01 Third-Party Intellectual Property

All Licenses, Warranties and Maintenance Agreements for Third-Party Intellectual Property shall be in the name of the CTRMA. Upon Acceptance of the first Segment, as defined in *Attachment E – Technical Requirements*, all related Third-Party Intellectual Property shall be submitted to the CTRMA.

C3.02 Proprietary Software

The CTRMA shall have a license to use the Proprietary Software provided under the Toll System Implementation Contract and as modified thereof to meet the particular requirements of the Contract. The Contractor shall deposit all Source Code documentation and other relevant software for the Proprietary Software with the escrow agent as described in Section C5.0.

C3.03 CTRMA System Software

All software defined as CTRMA System Software (including source and object code) and associated software manuals and documentation developed under the Toll System Implementation Contract shall be deemed to be provided as a work for hire, and title to and exclusive ownership of all such items shall be by the CTRMA. The CTRMA shall own all property rights, including intellectual property rights, in the CTRMA System Software and all associated documentation developed under the Toll System Implementation Contract. The CTRMA shall grant a license to the Contractor to use the CTRMA System Software that is owned by the CTRMA at a fee. The Contractor agrees that it shall execute any and all documentation necessary to confirm ownership of such items by the CTRMA. The Contractor shall deliver all source code related to the CTRMA System Software to the CTRMA as set forth in Section C6.0.

C3.04 Freeware

All "freeware" shall be provided to the CTRMA and there shall be no terms and conditions on the part of either the CTRMA or the Contractor with respect to software that qualifies as "freeware".

C3.05 Documentation

All drawings, technical manuals, other technical data and other material created pursuant to the Toll System Implementation Contract either by the Contractor or its subcontractors that is eligible for copyright shall be deemed to be a work for hire, and the title to and exclusive ownership of all such items shall be in the CTRMA.

C4.0 Joint Work

Neither party intends any CTRMA System Software or Copyrightable Material created pursuant to the Toll System Implementation Contract, together with any other copyrightable material with which it may be combined or used, to be a "joint work" under the copyright laws.

C5.0 Software Escrow Agreement

The Contractor shall enter into a Software Escrow Agreement with a Software Escrow company (Escrow Agent) for the purpose of depositing the Software at specific periods of the Toll System Implementation Contract as will be detailed in the Software Escrow Agreement and described herein. The CTRMA shall be a party to this Agreement as the Preferred Beneficiary.

C5.01 Need for Software Escrow Agreement

The Contractor shall enter into the Software Escrow Agreement to fulfill the Contractor and the CTRMA needs listed below:

- The Contractor will be providing Proprietary Software under the CTRMA Toll Collection System Contract which will be licensed to the CTRMA.
- The Contractor may not want to release the Source Code for the Proprietary Software to the CTRMA, except under certain limited circumstances.
- The availability of the Proprietary Software Source Code is critical to the CTRMA in the conduct of its electronic toll collection operations and, therefore, the CTRMA needs access to the source code for the Proprietary Software under certain limited circumstances.
- The Escrow Agent will accept, retain, administer and control access of the Proprietary Software until its release.

C5.02 Software Escrow Terms

This section describes the responsibilities of the Contractor, the Escrow Agent and the CTRMA as it pertains to the deposit of the Software.

C5.02.01 Software Escrow Timeline

The Contractor is required to make Software Escrow Deposits under the conditions identified below:

- Within ten (10) days following the Notice to Proceed for the Toll System Implementation Contract, the Contractor shall deposit the then current version of the Proprietary Software demonstrated to be working with the Escrow Agent.

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- If any modification is made to the Proprietary Software to comply with CTRMA Toll System Implementation Contract requirements, the Contractor shall deposit with the Escrow Agent the updated and tested version of the Proprietary Software either (i) in accordance with the schedule set forth in Section C5.02.02.06 or (ii) within ten (10) days of a written request from the CTRMA to make such deposit.

C5.02.02 Software Escrow Requirements

C5.02.02.01. Software Escrow Deposit Media

Media utilized for the Escrow Deposit shall be standard media that is clearly labeled. All media deposited with the Escrow Agent shall be identified and its contents described, and the Contractor shall acknowledge the submitted media list and transmit a copy of such acknowledgement to the Escrow Agent and the CTRMA.

C5.02.02.02. Deposit Verification

When the Escrow Agent receives the Escrow Deposit media and the Contractor acknowledged list, the Escrow Agent will verify the labeled media to the list. In addition to the deposit verification, CTRMA may elect to cause an inspection of the Proprietary Software in accordance with Section C5.02.02.05.

C5.02.02.03. Acceptance of Deposit

Upon completion of the verification process, the Escrow Agent will certify the deposit, and copies of this certification will be sent to the Contractor and the CTRMA. If any discrepancies are identified, they will be noted and the Contractor will be required to rectify the error.

C5.02.02.04. Contractor's Guarantee

The CTRMA is relying on the Contractor's Good Faith to ensure that:

- The Contractor is in possession of the Proprietary Software that is being deposited.
- The Proprietary Software deposited with the Escrow Agent is accurate, complete and operational, and all tools required to use the Proprietary Software are included in the deposit.
- The Proprietary Software is not subject to any lien or other encumbrance and the Proprietary Software is legally owned by the Contractor.

C5.02.02.05. Inspection

The CTRMA shall have the right to inspect the Software Escrow at anytime, either at the Contractor's offices or at the Escrow Agent's offices. This inspection determines, in different levels of detail, the accuracy,

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completeness, sufficiency and quality of the Proprietary Software deposited with Escrow Agent.

C5.02.02.06. Deposit Updates

At no charge to the CTRMA, the Contractor shall make a deposit of the Proprietary Software in accordance with the Agreement within twenty (20) days of conditional approval of the following Milestones:

- Factory Acceptance Test
- Acceptance of the First Segment
- Acceptance of Each Subsequent Segment
- Project Acceptance Test
- Project Acceptance

C5.02.02.07. Additional Updates

The CTRMA shall have the right to request the Contractor to make escrow deposits of the Proprietary Software at any time at the CTRMA expense on a time and material basis. The Contractor shall make any such requested Proprietary Software deposit within twenty (20) days of the CTRMA request. The Contractor will deposit in escrow the latest tested version of the Proprietary Software at the time of the deposit.

C5.02.02.08. Removal of Escrow Deposit

Any activity on the escrow deposit requires authorized instructions of the CTRMA and the Contractor, or as otherwise provided in the Agreement.

C5.03 Escrow Deposit Administration

During the administration of the escrow deposit, the Agent will abide by the terms and conditions detailed below.

C5.03.01 Confidentiality

The Escrow Agent has the responsibility to protect the Proprietary Software and prevent any damage to the media. The Escrow Agent shall have the obligation to protect the confidentiality of the Proprietary Software. The Escrow Agent shall not take any action on the escrow deposit except per the conditions described in this document. If the Escrow Agent is required to disclose the contents of the escrow deposit for legal reasons, then the Escrow Agent will immediately notify the CTRMA and the Contractor unless prohibited by law.

C5.03.02 Status Reports

The Escrow Agent shall submit status reports to the CTRMA and the Contractor every six months or upon request detailing the history of the deposits.

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C5.03.03 Agent Audit

During the term of the Software Escrow Agreement, the Contractor and the CTRMA shall each have the right to inspect the written records of the Escrow Agent pertaining to the Escrow Software Agreement with reasonable notice. Each party shall notify the other if such an audit is scheduled.

C5.04 Release of Deposit

The section below details the terms and conditions that will result in the release of the Proprietary Software to the CTRMA.

C5.04.01 Release Event

A "Release Event" shall mean the following:

- 1) If the Contractor ceases its business operations or becomes subject to any bankruptcy (other than a bankruptcy under Chapter 11 of the United States Code, or any successor statute (hereinafter, "Chapter 11")), reorganization, liquidation or insolvency proceeding, whether voluntary or involuntary, or makes an assignment for the benefit of creditors, or files any debtor proceeding, or for the appointment of a receiver or trustee of all or any portion of Contractor's property; or
- 2) If Contractor becomes subject to any bankruptcy proceedings under Chapter 11, whether voluntary or involuntary, and the Contractor is in breach of its obligations under the Toll System Implementation Contract and the CTRMA sends a notice of termination to the Contractor for such breach, whether or not any court allows such termination; or
- 3) If any of the Contractor's Contracts with the CTRMA is terminated for default; or
- 4) If the Proprietary Software fails to operate according to the documentation delivered as part of the Toll Collection System Contract and the Contractor does not correct the error or defect within thirty (30) days of receipt of written notification from the CTRMA stating the nature and type of defect error to be repaired; or
- 5) Upon the expiration of the Initial Term of the Maintenance Contract, if the Maintenance Contract is not extended; or
- 6) Five years after the Acceptance of the first Segment of the Toll Collection System provided by the Contractor.

C5.04.02 Filing For Release

The Contractor and the CTRMA shall mutually agree that a Release Event has occurred and an authorization signed by both parties shall be sent to the Escrow Agent. Upon the receipt of this authorization, if the Escrow Agent has been paid

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for all services provided, the Escrow Agent will release all escrowed software and pertinent documentation to the CTRMA.

C5.04.03 Right to Use Following Release

The CTRMA shall be obligated to maintain the confidentiality of the released deposited materials in accordance with the License Agreements. Unless otherwise provided in the License Agreement, upon release of the Proprietary Software the CTRMA shall have the right to use the Proprietary Software Source Code for the sole purpose of continuing the benefits afforded to the CTRMA.

C5.05 Term and Termination

The CTRMA and the Contractor shall enter into a Software Escrow Agreement with the Escrow Agent with the terms described below.

C5.05.01 Term of Agreement

The initial term of the Escrow Agreement shall be for a period of one year. Thereafter, the Agreement shall automatically renew from year-to-year unless:

- (a) The Contractor and the CTRMA jointly instruct the Escrow Agent in writing that the Escrow Agreement is terminated;
- (b) The Escrow Agent instructs the Contractor and the CTRMA in writing that the Escrow Agreement is terminated for nonpayment in accordance with Section C5.05.02;
- (c) By resignation of the Escrow Agent in accordance with Section C5.05.03.

Notwithstanding any other provisions contained herein, the Escrow Agreement shall automatically terminate if the CTRMA determines that the useful life of the Proprietary Software is concluded and that the need for the Proprietary Software no longer exists, as evidenced by written notice from the Contractor as if the Escrow Agreement period had naturally expired.

C5.05.02 Termination for Nonpayment

In the event the Contractor is delinquent in paying the Escrow Agent, the Escrow Agent shall provide written notice of delinquency to all parties to the Escrow Agreement. Any party to the Escrow Agreement shall have the right to make the payment to the Escrow Agent to cure the default. If the past due payment is not received in full by the Escrow Agent within one month of the date of such notice, then the Escrow Agent shall have the right to terminate the Escrow Agreement at any time thereafter by sending written notice of termination to all parties.

C5.05.03 Termination by Resignation

The Escrow Agent has the right to terminate the Escrow Agreement, for any reason, by providing all parties with 60-days' written notice of its intent to terminate the Escrow Agreement. Within the 60-day period the Escrow Agent shall receive

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written authorization from the Contractor and the CTRMA with instructions to forward the Proprietary Software to another escrow company and/or agent or other designated recipient. In the event such instructions are not received within the time frame for termination, then the Escrow Agent shall deliver the Proprietary Software and all related materials to the Contractor.

Upon the receipt of the termination notice from the first Escrow Agent, the Contractor shall, within 60 days, enter into an Escrow Agreement with a new Escrow Agent with a similar Escrow Agreement as the first Escrow Agent.

C5.05.04 Survival of Terms Following Termination

Upon termination of the Escrow Agreement, the following provisions of the Escrow Agreement shall survive:

- (a) Contractor's Representations;
- (b) The obligations of confidentiality with respect to the Proprietary Software;
- (c) The rights granted in the sections entitled Right to Transfer Upon Release and Right to Use Following Release, if a release of the Proprietary Software has occurred prior to termination;
- (d) The obligation to pay the Escrow Agent any fees and expenses due; and
- (e) Any provisions in the Escrow Agreement which specifically state they survive the termination of the Escrow Agreement.

C5.06 Agent Fees

C5.06.01 Fee Schedule

Prior to the execution of the Software Escrow Agreement, the Contractor and the Escrow Agent shall have agreed to the service fees and the fee structure. The Escrow Agent is entitled to be paid its standard fees and expenses applicable to the services provided. For any service not listed on the Escrow Agent's standard fee schedule, the Escrow Agent will provide a quote prior to rendering the service, if requested. The Escrow Agent shall notify the party responsible for payment of the Escrow Agent fees at least 60 days prior to any increase in fees.

C5.06.02 Payment Terms

The Escrow Agent shall not be required to perform any service unless the payment for such service and any outstanding balances owed to the Escrow Agent are paid in full. Fees are due upon receipt of a signed contract or receipt of the Proprietary Software whichever is earliest. If invoiced fees are not paid, the Escrow Agent may terminate the Escrow Agreement in accordance with established conditions.

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C5.06.03 Responsible Party

Except for the Escrow Agent's inspection charges made at the request of the CTRMA, the Contractor is responsible for all fees and expenses incurred by the Escrow Agent under the Escrow Agreement.

C5.07 Liability and Disputes

C5.07.01 Right to Rely on Instructions

The Escrow Agent may execute instructions based on authorization reasonably believed to be genuine. The Escrow Agent is not responsible for authenticating the validity of the document if it bears the signatures of the parties named in the Escrow Agreement.

C5.07.02 Indemnification

The Contractor and the CTRMA shall agree to indemnify, defend and hold harmless the Escrow Agent from any and all claims, actions, damages, reasonable arbitration fees and expenses, reasonable costs, reasonable attorney's fees and other liabilities ("Liabilities") incurred by the Escrow Agent relating to the execution of the Escrow Agreement unless such Liabilities were caused solely by the negligence or willful misconduct of the Escrow Agent.

C5.07.03 Controlling Law

The Escrow Agreement is to be governed and construed in accordance with the laws of the State of Texas, without regard to its conflict of law provisions.

C6.0 CTRMA System Software

The Source Code for the CTRMA System Software and the utilities required to compile the software (or a listing thereof) shall be given to the CTRMA upon the conditional approval of:

- 1) Factory Acceptance Test (FAT)
- 2) Operational Test of the First Segment
- 3) Project Acceptance Test
- 4) Project Acceptance

This submission shall also include all freeware required by the CTRMA Toll Collection System Software.

[END OF SECTION]

CTRMA TURNPIKE SYSTEM

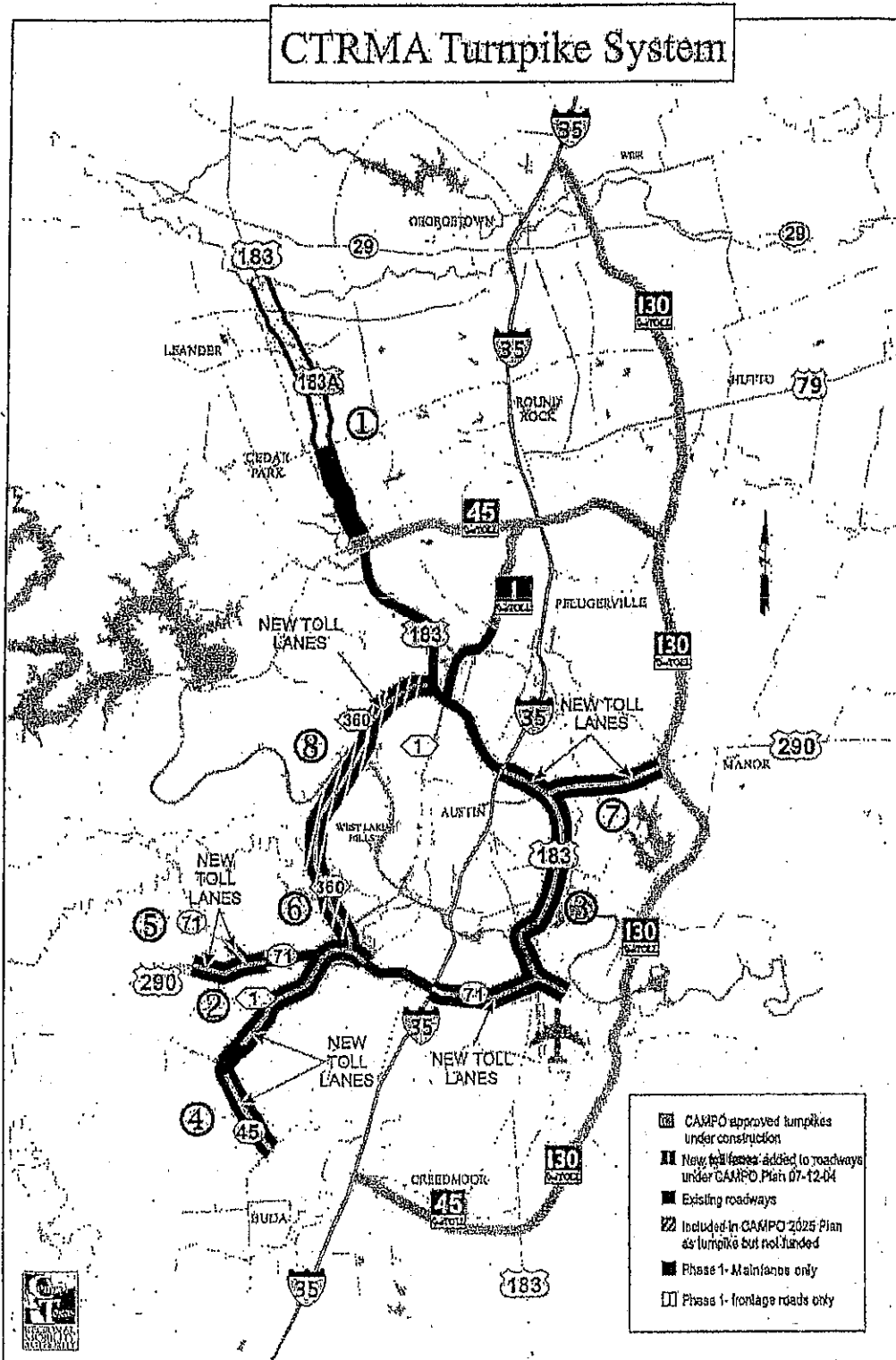
CTRMA TOLL ROAD SEGMENTS

<u>Segment No.</u>	<u>Description</u>	<u>Systems Installation³</u>	<u>Open to Traffic¹</u>	<u>Subject to Tolling²</u>
1	US 183A: San Gabriel to SH 45 North	12/2006	02/2007	02/2007
2	US 290 W phase of the "Y" in Oak Hill	02/2009	04/2009	04/2009
3	US 183 / SH 71: IH 35 to the Airport			
	US 183 S: IH 35 to Springdale	08/2008	03/2006	12/2008
	US 183 S: Springdale to Bolm	08/2008	12/2008	12/2008
	US 183 S: Bolm to Patton	08/2008	12/2008	12/2008
	SH 71 E: IH 35 to Riverside	07/2010	01/2007	09/2010
	SH 71 E: Riverside to US 183	07/2010	09/2010	09/2010
4	SH 45: SW: Loop 1 to FM 1626 (4 lanes)	01/2008	03/2008	03/2008
5	SH 71 W phase of the "Y" in Oak Hill	03/2011	05/2011	05/2011
6	LP 360 RM 2244 to south of Walsh Tarlton	Pending	Pending	Pending
7	US 290 East: US 183 to SH 130	T.B.D.	T.B.D.	T.B.D.
8	LP 360: LP 1 to US 290	Pending	Pending	Pending

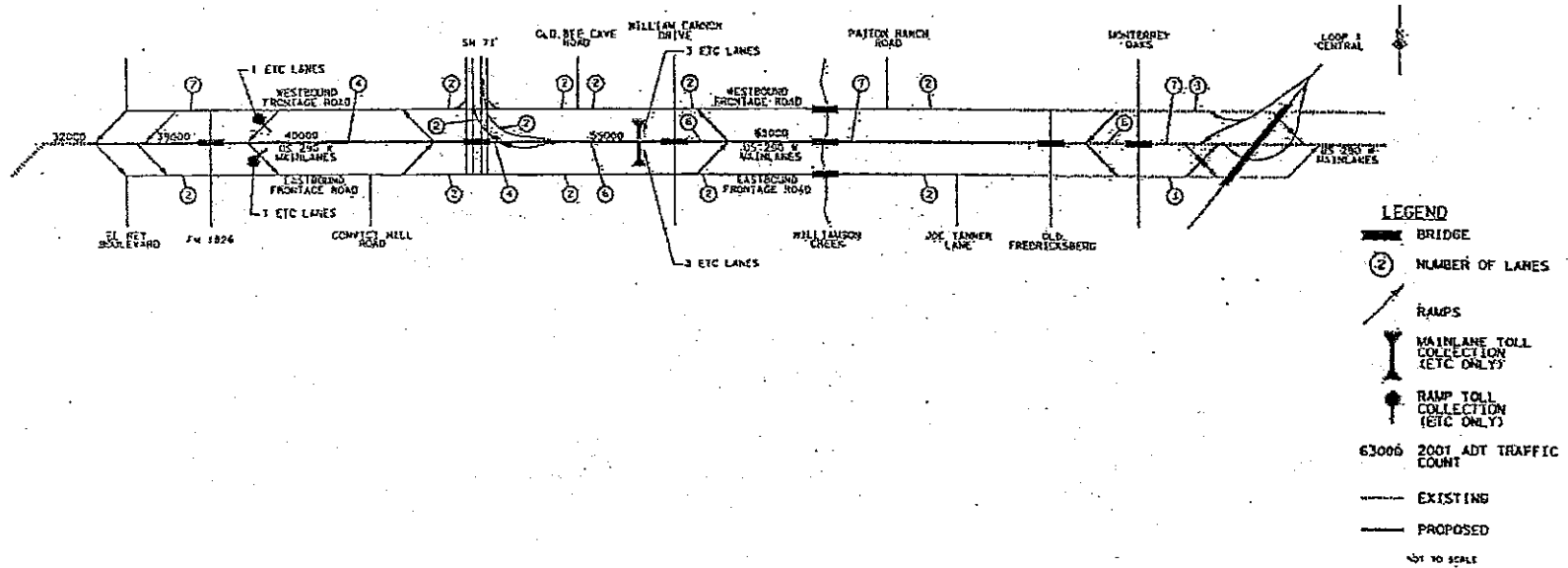
NOTES:

The dates presented are based on information available as of the date of this RFP. The information on the Toll Implementation Plan segments is provided only for the purposes of preparing the Proposals. The Systems Integrator will be provided with a Notice to Proceed for each of the individual Toll Road Segments NO LATER THAN six (6) months prior to the actual "Subject to Tolling" date. All dates are subject to change.

- ¹ The "Open to Traffic" date is the estimated completion date for construction of the particular toll road segment, at which time the segment may be opened to traffic prior to tolling.
- ² The "Subject to Tolling" date is the date that the Toll Road Segment will be opened to tolled traffic with the Toll Collection System installed, tested and fully operational.
- ³ The "Systems Installation" date is based on the anticipated access to the roadway and toll systems infrastructure provided by others, which is scheduled to be a minimum of sixty (60) days prior to the "Subject to Tolling" date.



US290W / SH71W



- LEGEND**
- BRIDGE
 - NUMBER OF LANES
 - RAMPS
 - MAINLANE TOLL COLLECTION (ETC ONLY)
 - RAMP TOLL COLLECTION (ETC ONLY)
 - 63000 2001 ADT TRAFFIC COUNT
 - EXISTING
 - PROPOSED
 - NOT TO SCALE

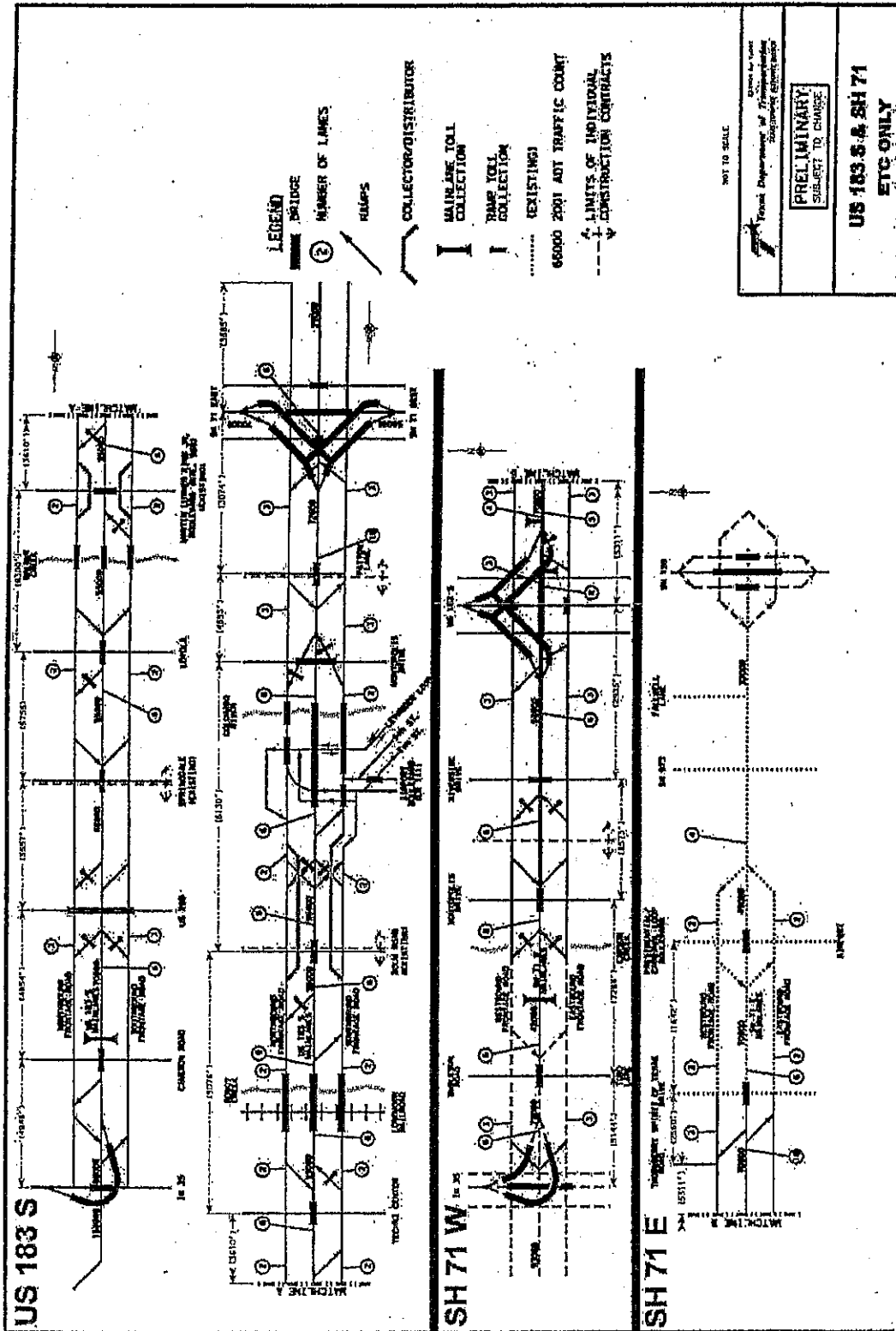
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Texas Department of Transportation
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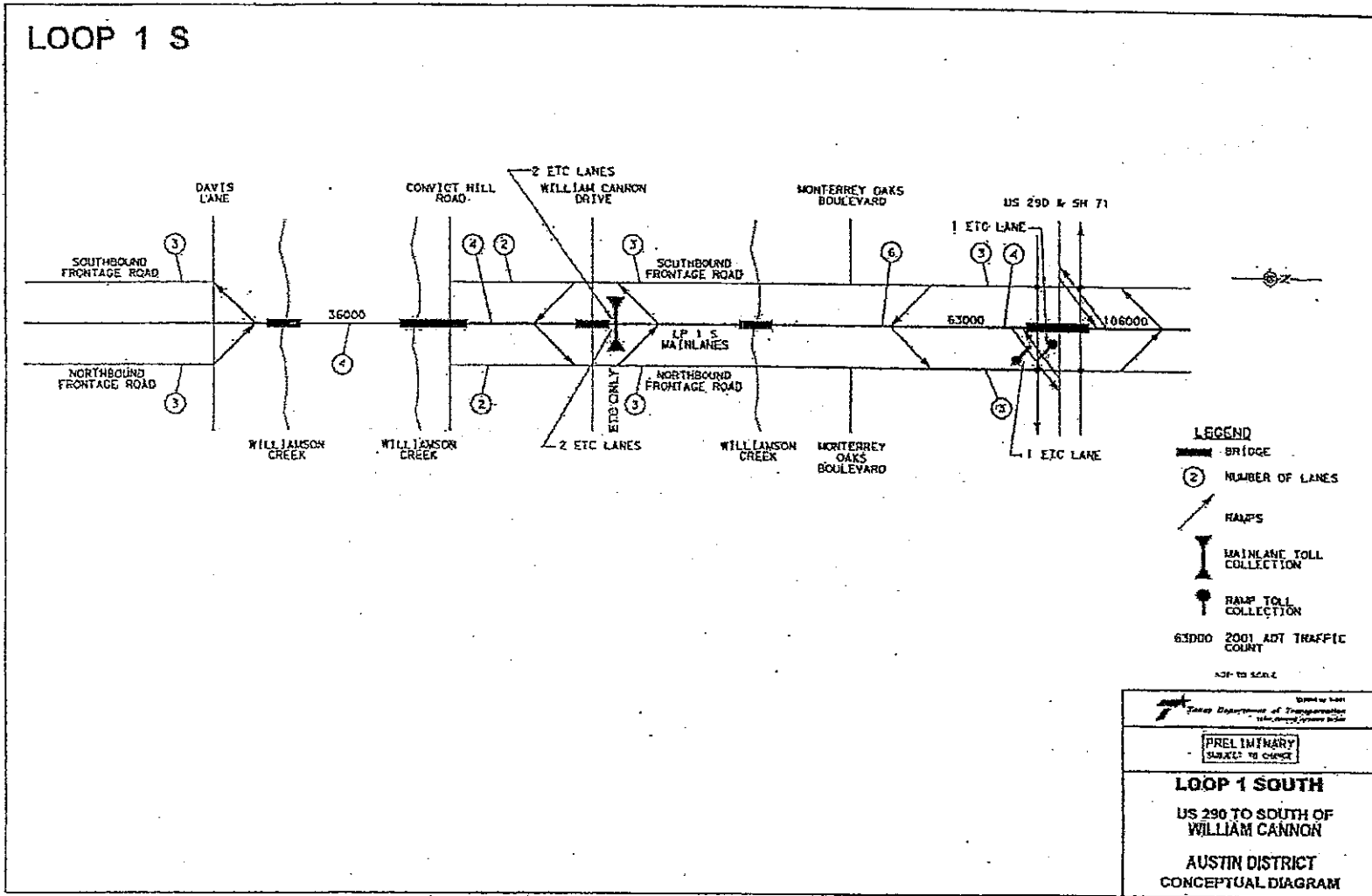
PRELIMINARY
SUBJECT TO CHANGE

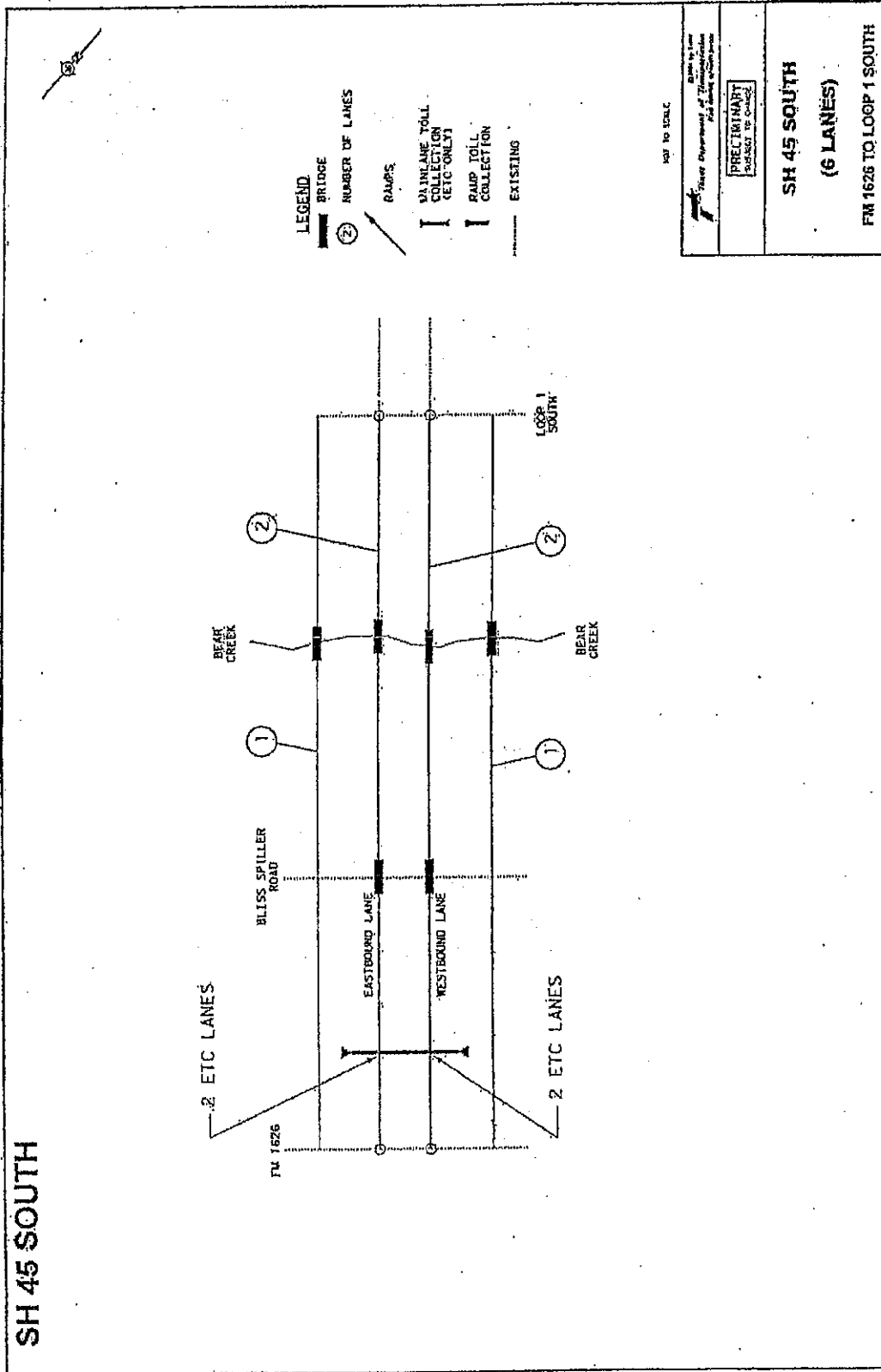
US 290 W
WEST OF RM 1826 TO
EAST OF WILLIAMSON CREEK
AUSTIN DISTRICT
CONCEPTUAL DIAGRAM

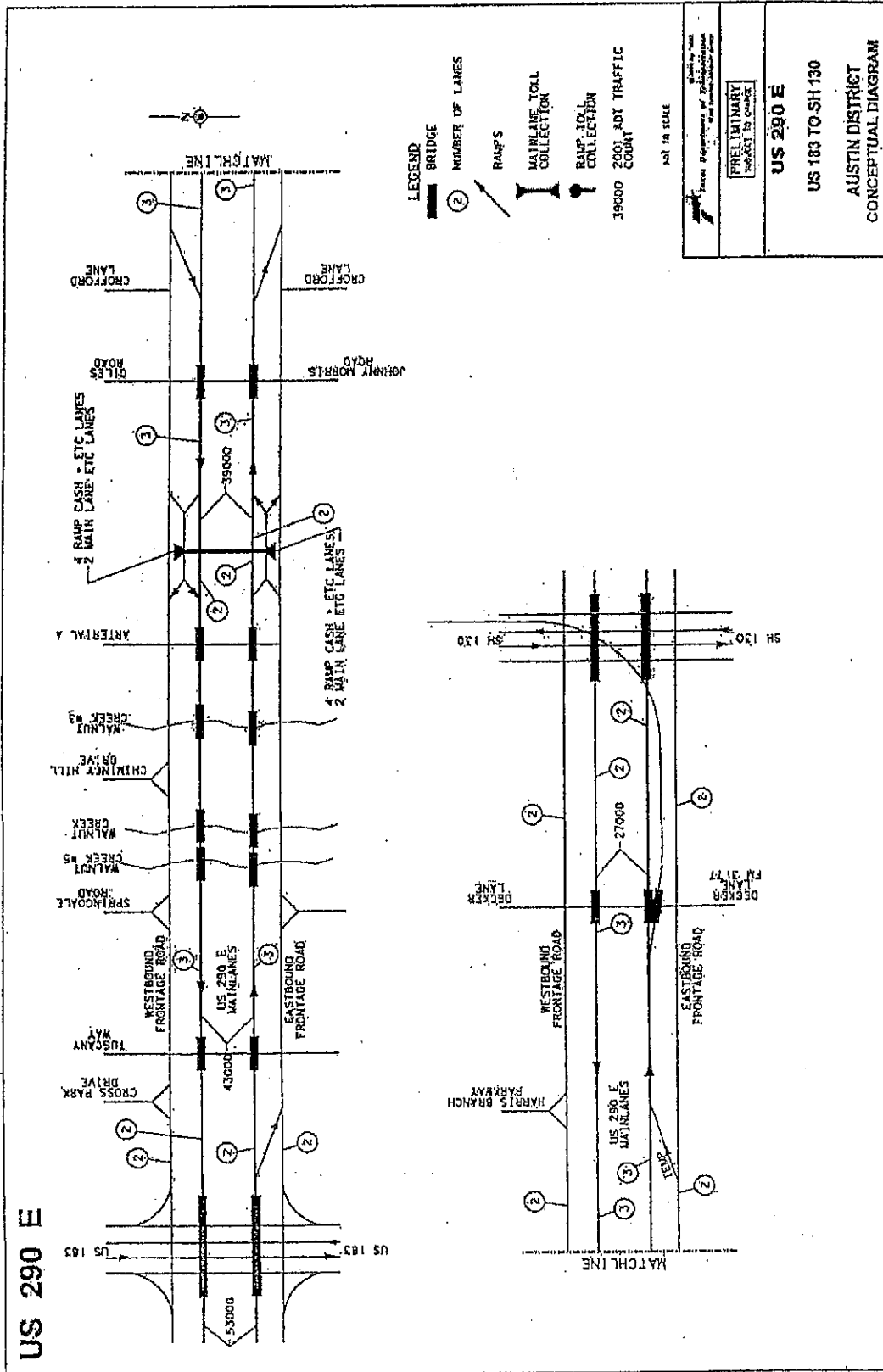
SUBJECT TO CHANGE

CONFIGURATION AND
TOLL PLAZA LOCATIONS









Attachment E

TECHNICAL REQUIREMENTS

Technical Requirements

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Technical Requirements

Chapter I

I. DEFINED TERMS

- **ACM (Automatic Coin Machine):** a device located in a toll lane that accepts and collects US coins as toll payments without manual operation or intervention.
- **As-Built Drawings:** shall mean the documents and other items referred to in Section V.07.05 of Chapters V to these technical requirements.
- **Authority:** The Central Texas Regional Mobility Authority (CTRMA).
- **Authority Designated Representatives:** person or persons authorized by the CTRMA to represent the CTRMA in all dealings with the Contractor.
- **AVC:** shall mean a System for automatic vehicle detection, separation and classification as defined in Chapter II.03.02.06.
- **AVI (Automatic Vehicle Identification):** a System consisting of an antenna and reader, that meets the Texas Interoperability Specifications, installed in a toll lane and a transponder mounted on a vehicle for automatic identification of the transponder as it passes through the lane.
- **Business Day:** the 24 hour toll collection day from 00:00 AM to 24:00 AM.
- **Business Rules:** a set of rules proposed by Contractor and approved by the CTRMA that defines how the Toll Collection System should respond to various situations that occur in the toll lanes during the toll collection process based on business rules and policy decisions made by the Authority, as the same may be amended from time to time by written agreement of the Authority and Contractor.
- **Business Rules Test:** a test that is conducted as part of the Prototype On-site Test that verifies the CTRMA Business Rules.
- **Communication Plan:** shall mean the plan developed by the Contractor under Section V.05 of Chapter V to these technical requirements and approved by the CTRMA, as the same may be amended from time to time by written agreement of the CTRMA and Contractor.
- **COTS:** Commercially Off-the-Self hardware and software supplied by the Contractor under this Contract.
- **Customized Hardware:** The toll collection hardware provided by the Contractor under this Contract that is designed and certified by the Contractor.
- **Dedicated ETC Lane:** A lane at a toll plaza used only for ETC transactions.
- **Developer:** The Joint Venture that is contracted to design and build the CTRMA's US183A Turnpike Project, including the communications backbone.
- **Design Documentation:** System design documentation required under Chapter V, including the Software Development Plan, and System Detailed Design Document.

Attachment E

Technical Requirements

- **Electronic Toll Collection (ETC):** A system of integrated devices and components that permit the automatic recording of vehicle transactions through electronic media in a toll revenue collection system.
- **Express ETC Lane:** A lane equipped with ETC equipment for cashless nonstop toll collection of vehicles operating at normal highway/ramp speeds.
- **Factory Acceptance Test:** shall mean the testing performed by the Contractor in accordance with Section IV.03 of Chapter IV.
- **GUI:** Graphical User Interface.
- **Host:** the Host Computer for the CTRMA Toll Collection System located in the computer room in the Administrative Headquarters Building of the CTRMA that acts as the central depository of all toll collection data.
- **ITL:** Island Traffic Light.
- **Manual Lane Terminal (or MLT):** A device consisting of an array of touch screen buttons and associated electronics for processing toll transactions in the attended toll booths, as described in Section II.03.02.02 of Chapter II
- **Operational Testing:** the testing conducted after the entire CTRMA Toll Collection System is deployed to ensure to verify System reliability, accuracy, performance and auditability.
- **Project Acceptance Test:** the final testing performed on the Toll Collection System before it is approved and considered acceptable to the CTRMA.
- **Toll Operations and Toll Audit Departments:** shall mean the CTRMA departments that oversee the toll collection operations and perform the audit functions of the CTRMA Toll Collection System.
- **TeamTx:** a consortium of toll agencies and authorities, principally in Texas that uses a reciprocal TransCore based AVI System with the service mark *TxTAG*.
- **TransCore:** Third party supplier of AVI equipment.
- **TxDOT:** The Texas Department of Transportation, including the Texas Turnpike Authority Division.
- **UPS:** Uninterruptible Power Supply.
- **Violation Enforcement System (VES):** Video based System located at toll lanes used to record license plate images of selected vehicles (to be defined in the Business Rules) in video form, as more particularly described in Section II.03.02.07 of Chapter II.

Technical Requirements

Chapter II

II. FUNCTIONAL REQUIREMENTS

II.01. General Requirements

The requirements described in this section include the System concepts, operational requirements, technical requirements and various procedures for the design, development, fabrication, programming, integration, testing, installation, implementation, and maintenance of the CTRMA Toll Collection System, including, without limitation, toll collection, and violation enforcement for the CTRMA toll facilities as described in *Attachment D*.

The requirements are being specified on a functional level. It is the intent of these requirements to permit the Contractor flexibility in the design and development of the Toll Collection System to reflect innovation and state-of-the-art technology for an on-line Toll Collection System fully capable of meeting the CTRMA operational and contractual requirements.

The Contractor shall furnish and mobilize all required plant, equipment, and resources necessary for initiating and concluding the Contract and may include such portions of the following as are required at the beginning and end of the Project:

- Setting up at the various worksites the Contractor's general plant, offices, shops, storage areas, sanitary and other facilities as required by the Specifications, by local or state law, or by regulation, the subsequent demobilization and removal from the site of said equipment, appurtenances and the like upon completion of the work
- Providing access to the Project site for the Contractor's operations
- Obtaining necessary permits and licenses, and payment of fees
- Coordinating design and installation activities with the CDA Developer
- Coordinating design and installation activities for all the CTRMA Toll Locations with TxDOT and other contractors on the various toll road segments of the CTRMA Turnpike System.
- Lighting work area
- Sampling and testing of materials
- Providing required insurance and bonds

All equipment, supplies and materials furnished under this Contract for the Toll Collection System shall be new. Materials and products that have been previously used for development work, purchased systems or items that have been salvaged or rebuilt will not be permitted to be used in connection with this Contract or Project. The Contractor shall be responsible for purchasing and maintaining all equipment required by the Contractor for development and testing. All equipment provided by the Contractor shall be multi-sourced and readily available to the CTRMA.

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Technical Requirements

The work to be performed under this Contract shall include, but not be limited to, the development and implementation of Lane Systems, Plaza Systems, Host System, and other subsystems and infrastructure as may be required to meet the requirements set forth herein.

The AVI System equipment shall be compliant with the Texas Interoperability Specifications and the purchase of the AVI equipment (AVI readers and antennas) shall be coordinated with the approved AVI vendor. The CSC/VPC System shall be developed and operated by others. The Contractor is responsible for interfacing with the CSC/VPC for the transfer of violation and ETC information.

The Project will include, but is not limited to, the following:

- Development, configuration, customization, procurement, manufacturing, testing and installation of new Lane Systems, Plaza Systems, and Host System including the Security Access Systems and the Maintenance On-line Management System (MOMS) hardware and software. The System provided shall meet the specification in these technical requirements.
- Detailed Lane Configurations lists the number of lane equipment and peripherals that shall be installed under this Contract. The Contractor is responsible for providing, installing and testing all equipment.
- Coordination with the Developer on the location and placement of the Contractor equipment and peripherals, and any other design specification needs.
- A conduit backbone for the US183-A Turnpike will be installed by the Developer. The Contractor is responsible for designing, purchasing, implementing and testing all fiber optic cable and communication equipment associated with WAN and LAN that is applicable to the Toll Collection System.
- The physical System will consist of the following primary subsystems:
 - Autonomous Lane Controllers with violation enforcement capability and real time network connection to a Plaza Computer.
 - Plaza Computers with real time lane monitoring, data management and toll collection management capabilities, and connection to the Host Computer Systems.
 - Host Computer System that provides transaction and revenue reconciliation, audit and financial reporting capabilities, and connection to the CSC/VPC.
 - Security Access System to control and record access to toll collection related areas
 - Maintenance On-line Management System to manage equipment, and record and track equipment failures.
 - Required toll system infrastructure at designated locations including exposed conduit, and all cables and fiber between the Control Cabinets and the Lane Equipment, equipment cabinets, and emergency power, etc., at the various remote Express Toll Locations.

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- Upon the completion of this project the CTRMA Toll Collection System shall be fully interoperable with other Texas agencies that are part of the TeamTx.

II.01.01: *Toll Collection System Hardware*

The Customized Hardware design criteria have been broken down into several categories: General & Computer Enclosure, Environmental, and Assembly.

The assumptions listed below provide the framework for development of the Contractor provided Customized Hardware design criteria:

II.01.01.01. Customized Hardware

All Contractor provided lane computers shall be identical with the exception that pluggable modules are not included if not required by the particular lane.

II.01.01.02. General & Computer Enclosure

- The Contractor shall ensure that there is a second source for all parts.
- All replacements shall be plug compatible with no changes required; or may require cable changes to be compatible or may require minor modifications to software to be compatible.
- All electronic components shall be installed in non-corrosive sealed enclosures.
- The Contractor shall ensure that there is adequate space (20-25% extra) within enclosure for added boards and components.
- Where possible all peripherals shall use a network architecture to communicate with the Lane Controller. If needed network convertors shall be used.
- The Contractor shall ensure that industry standard I/O interface modules are used in the design.
- Spare slots shall be available to support the addition of sensors as needed.
- All field wiring shall be terminated on screw lugs or connectors
- Surge suppression shall be provided for all field wiring susceptible to lightning or similar surges
- Speaker shall be provided for POST messages and other status
- Power supply shall be provided for all required internal DC voltages
- Separate grounding shall be provided for DC power supply, safety ground, surge suppression ground, and potentially analog ground and the Contractor shall provide the design details during the design review phase.
- Separate UPS power and unconditioned power (for ITLs, etc.) shall be available.

II.01.01.03. Environmental

- The toll collection equipment to be supplied will be installed in areas exposed to a wide range of climatic conditions. In addition to the climatic conditions, the equipment will also be subjected to harsh environmental factors normally found in the operation of a toll lane, such as, but not limited to, car, truck and bus emissions; industrial exhausts; industrial cleaners; gasoline and car lubricants; Electromagnetic Interference (EMI) and

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Radio Frequency Interference (RFI); and vibrations. The equipment may be placed into operation in lanes that have no provisions for heating or cooling. These conditions shall be taken into account in the design and selection of equipment proposed for use on this project and the Contractor is responsible for ensuring that the proposed System works accurately and reliably in such an environment or is otherwise provided with the necessary equipment and climate controls to ensure proper functioning.

- The Lane Controllers should be able to operate in a sealed environment and able to support all lane hardware/software specifications of these technical requirements.
- The Contractor shall use all reasonable efforts in the design phase to ensure that the Lane Controller design shall operate in the following ambient (atmosphere surrounding the Lane Controller enclosure) temperature range if placed in the toll booth or tunnel:

(negative)-20 degrees F to (positive)+145 degrees F with a relative humidity of 5 to 100 percent.

- During the design phase the Contractor shall provide thermal calculations that prove the Lane Controller and other lane electronics enclosures meet the temperature specifications given above.
- All Lane Controllers should be mounted in a NEMA 4X enclosure if placed in the tollbooth or tunnel. With the use of the network architecture for peripheral interface, the Lane Controllers can be located in a plaza environment.
- All lane equipment installed in remote toll locations shall be housed in environmentally protected housing.

II.01.01.04. Assembly

- The Customized Hardware shall be assembled and tested in the fabrication shop before being installed in the lane.
- All Customized Hardware shall undergo a 72-hour burn in test before they are installed in the lanes.
- Customized Hardware assembly shall facilitate easy replacement (use of standard maintenance tools) of failed components.

II.01.01.05. Bill of Materials

The Contractor shall include the Bill of Materials (BOM) for all equipment and hardware supplied by the Contractor to meet the specifications of these technical requirements. During the design phase the BOM shall be finalized.

II.01.01.06. Spare Parts

General Customized Hardware design criteria are established to require the use of off-the-shelf products and support the need for the CTRMA to maintain and replace parts for the next ten (10) years. The Contractor shall provide a spare parts list and recommended

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quantities for all spare parts for all hardware supplied for the Toll Collection System. The Contractor shall also provide the suppliers and second sources for all parts and spare equipment. The Contractor shall purchase under this Contract an initial stock of spare parts that will be made available to the maintenance staff upon acceptance of Segment 1.

II.01.02. Toll Collection System Software

The operating system and application software provided by the Contractor shall support real time operations of the lane and shall be the latest industry standard. Where applicable a browser based Graphical User Interface (GUI) design shall be employed. Proposals utilizing only GUI based design will be considered, however, browser based GUI design will be given credit. The application software shall be configurable and provide flexibility to the user to make changes. The Toll Collection System software shall have debug features that will assist in the troubleshooting of the System in the event of problems. All Toll Collection System software provided under this Contract shall have a five (5) year warranty against software defects and deficiencies.

II.01.03. Toll Collection Operational Design

The Contractor shall implement a Toll Collection System that meets the CTRMA operational requirements detailed in *Chapter VI*.

II.01.03.01. Toll Collection Lane Configurations

The System provided by the Contractor shall support the CTRMA toll collection lane configurations detailed in the Detailed Lane Configuration tabulation.

II.01.03.02. CSC/VPC Interface

The Contractor shall coordinate and cooperate with the CSC/VPC provider and provide the interface to the CSC/VPC as specified in Section II.07.03.12. The Contractor is responsible for scheduling the necessary meetings and conducting the required testing to ensure the interface meets the CTRMA and TxDOT Specifications.

II.02. Toll System Security and Access Control Requirements

Identification and control of all individuals designated to access the Toll Collection System data within the toll collection or CTRMA administrative computer network shall be maintained. The Contractor shall not provide a backdoor access to the Toll Collection System, which will allow circumvention of the toll security system. Additionally, access to any cabinet or housing shall be restricted to key/lock access.

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II.02.01. Toll System Software Security

Access to all information on the Toll Collection System computer network shall be limited to designated CTRMA and Contractor personnel and shall be password controlled. User access security including sign-on facilities, permission control, and different levels of access shall be provided for the files and directories. Specific requirements shall be developed during System design.

II.02.02. Cabinet and Housing Access

Access to all toll collection cabinets and housings shall be key/lock controlled. All new cabinets and housings installed under this Contract shall be access controlled using keys/locks. All rooms that house System Servers shall be connected to the Security Access System and every access shall be recorded.

II.02.03. Toll System Lock Requirements

All equipment and cabinet locks for the Toll Collection System shall be removable and replaceable cylinder lock types. The Contractor shall supply all locks, establish the keying index system for all toll collection equipment and install these locks on all toll collection equipment before installation.

The CTRMA shall issue all keys for all toll collection equipment locks. Contractor personnel shall utilize only assigned, individual keys, and shall not share keys with any other individuals, or make copies of any assigned keys. Contractor personnel shall immediately return all assigned keys to the CTRMA upon request.

II.03. Lane Controller

II.03.01. Hardware

Each toll lane shall have a Lane Controller except Express ETC Lanes where a Lane Controller can be shared across lanes in a fully redundant configuration. All Lane Controllers shall be identical with the exception that pluggable modules are not included if not required by the lane. If non-identical lane controllers are proposed, the Proposal shall clearly explain the exception. Proprietary hardware will be accepted if drawings that enable construction, repair, and modification of the hardware and rights sufficient to use the drawings for these purposes are transferred to the CTRMA. Credit will be given for designs that utilize a network architecture for communication to the peripherals which allow greater flexibility for the location of the Lane Controller thus affecting its maintainability.

II.03.02. Software

The Lane Controller application software shall interface with all associated lane equipment and shall be designed to support all lane operational activities. The Contractor software shall be configurable and able to support the CTRMA operational needs without requiring changes to software. The proposal shall clearly identify the configurable nature of the System software.

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The proposed operating system should have a future upgrade path and must be supported for up to ten (10) years. The Contractor shall ensure that the risk of obsolescence to the hardware is minimized through the selection of the operating system software and the peripheral hardware. Should any changes to drivers be required, the Contractor shall be compensated.

The Contractor shall propose appropriate protocols and data structures to accomplish the communications required between various peripherals. These protocols and data structures shall be fully detailed by the Contractor during the design process and approved by the CTRMA before being implemented in the System.

The Lane Systems shall support Manual, ACM, Dedicated ETC, and Express ETC Lanes as described in *Attachment D*. The Lane Controller application software shall enable the lane to receive and transmit data to all lane devices, Plaza and MOMS. All messages between the Lane Controllers, Plaza Computer, and Host Computer, including the Security Access System and MOMS shall utilize a guaranteed transmission protocol. The Proposal shall clearly identify how message transmissions between Toll Collection System components are guaranteed.

The Lane Controller shall provide Automatic Vehicle Classification and Violation Enforcement capabilities. The Violation Enforcement System can be a separate computer that manages all the image capture and processing functions, camera and light controllers and communicates with Lane Controller. The Lane Controller application software shall be designed, programmed and delivered to meet the CTRMA's lane operational procedures as described in *Chapter VI*.

The Lane Controller application software shall support all lane functions required to meet the CTRMA lane operation requirements. Those functions include the following:

II.03.02.01. Lane Controller Start-Up

Upon start-up or initialization, the Lane Controller shall perform a self diagnostics test to ensure full system operations. Alarm messages shall be reported for all failure conditions and a notification of the diagnostic check completion shall be displayed on the Manual Lane Terminal and the Real Time screen. If a critical device required for the mode of operation for the lane has failed, the lane shall not open, however, a manual over-ride shall be supported.

Upon boot-up, the Lane Controller shall verify with the Plaza Computer that it has the latest configuration files, application software, transponder validation file, employee identification list, toll rate and toll schedule tables and any other files required to support the lane operations. If the latest files are not present on the Lane Controller, it shall request the latest data from the Plaza Computer. The Lane Controller upon boot-up shall also synchronize its time with the Plaza Computer and verify that the messages are synchronized.

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II.03.02.02. Manual Lane Terminal

All lanes capable of processing manual transactions shall be equipped with a Manual Lane Terminal (MLT) controlled via the Lane Controller. The MLT shall be networked to the Lane Controller and shall meet the environmental conditions of the Austin area. The MLT screens shall support the CTRMA toll operations and the screen configuration and layout shall be finalized during the design phase. The objective of the MLT design is to reduce the button pushes for each vehicular transaction. Button responses shall be immediate, and where possible, default criteria shall be used to help speed traffic through the lanes.

II.03.02.03. Patron Feedback

In all lanes other than Express ETC, some form of patron feedback shall be provided to enable patrons traveling at stop and go up to 35 mph to see the patron feedback. The feedback can be lights or a display; however, the notification response should be immediate and the feedback shall be visible in all light conditions. The hardware shall meet the environmental conditions of the Austin area, and the Lane Controller shall interface with these device(s). The patron feedback device(s) shall be capable of responding to diagnostic messages and be able to provide health status to the Lane Controller. The messages displayed/light configuration shall be finalized during the design phase and shall be configurable.

II.03.02.04. Receipt Printer

All Manual Lanes shall have a receipt printer capable of generating receipts to patrons. The format and the generation of the receipts shall be finalized at the design phase and shall be configurable. Normal cash receipts shall be issued within three (3) seconds of initiating the receipt print. The receipt printers shall support commonly available receipt paper and toll collectors shall be able to change the paper without the assistance of maintenance technicians. The receipt printers shall be capable of operating in a toll environment where vehicle exhaust and dust are prevalent. The hardware shall meet the environmental conditions of the Austin area, and the Lane Controller shall interface with this device. The receipt printer shall be capable of responding to diagnostic messages and be able to generate alarm and paper status conditions.

II.03.02.05. Automatic Vehicle Identification (AVI) System

The Contractor shall provide an AVI System that meets the requirements of the Texas Interoperability Specifications. The AVI System shall be capable of buffering at minimum 1,200 transponder reads per lane in non-express lanes if the communication to the Lane Controller is not operational. Buffered reads shall be processed the same as real time reads, however, such a transaction will be flagged. The Lane Controller shall interface with the AVI System and transmit all data received from the AVI System. The AVI System shall be capable of reporting its health to the Lane Controller and shall provide status when polled. The Lane Controller shall synchronize the AVI System time to a 100th of a second (configurable). The Contractor shall be responsible for working with the AVI vendor on this interface. The Lane Controller shall report all tag reads; the details of the data format shall

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be finalized during the design phase. The Contractor shall be responsible for ensuring that all data elements required by the CSC/VPC to meet their operational requirements are provided.

II.03.02.06. Automatic Vehicle Classification (AVC) System

The Contractor shall be responsible for installing the required sensors and hardware as part of the AVC System that will accurately detect vehicles traveling at stop and go up to 100 mph, and separate vehicles spaced at 1 foot apart. The CTRMA will employ an axle-based classification for toll determination, and as such, reporting of axles counts (forward, reverse and net) shall be deemed sufficient. The AVC System provided shall have the ability to detect hitches and ensure that vehicles with a tow are reported as one unit. The AVC System can be a part of the Lane Controller, however, if it is a separate unit, then the Lane Controller shall interface with it as a seamless System. The AVC System components shall be capable of responding to diagnostic messages and be capable of providing health status to the Lane Controller.

II.03.02.07. Violation Enforcement System (VES)

The Contractor shall provide all the necessary hardware required to support the Violation Enforcement System (VES) that meets the CTRMA operational requirements and is fully compatible with the CSC/VPC operations. Images shall be captured and processed per the Business Rules established by the CTRMA. The VES shall capture and process vehicles traveling at stop and go up to 100 mph and vehicles that are spaced at 2 feet apart. The VES can be an integral part of the Lane Controller, however, if it is a separate System, then it shall be a seamless System, and the Contractor is responsible for the interface. If the VES is an integral part of the Lane Controller, then the Contractor shall clearly detail how such a configuration will not degrade the performance of the Lane Controller, specifically in the Express ETC Lanes.

The VES shall be capable of buffering images (retaining an image until its disposition is known) to reasonable level to support multiple vehicles in the lane and the CTRMA Business Rules. The Contractor is responsible for providing the Optical Character Recognition (OCR) software so the image quality shall be good enough to meet the VES accuracy and performance requirements. All equipment required to support OCR shall be the responsibility of the Contractor. The VES components shall be capable of responding to diagnostic messages and be capable of providing health status to the Lane Controller.

II.03.02.08. Automatic Coin Machine (ACM)

The Contractor shall provide Automatic Coin Machines (ACMs) that interface with the Lane Controller in a slave mode. The Lane Controller shall control the ACM, and the ACM shall be capable of reporting the ACM related information along with the coin counts. Depending on the facility, the ACM shall support two vaults or four vaults. Only authorized employees with an approved PIN shall have access to the ACM vaults. The ACM shall be capable of reporting its health to the Lane Controller.

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II.03.02.09. Canopy Light Controls at Toll Plazas

Canopy lights shall be provided that display GREEN↓/RED X depending on the OPEN/STANDBY/CLOSE condition of the lane. A canopy over-ride switch shall be provided that will allow a user to manually change the status of the canopy lights. The color of the canopy light shall be displayed on the Real Time screen.

II.03.02.010. Changeable Message Sign (CMS) at Toll Plazas

Lane Controllers shall be designed to interface with a lane CMS that will be located on the canopy above the lane, facing approaching traffic. The message displayed shall be finalized during the design phase and shall be configurable.

II.03.02.010.01 LED Changeable Message Sign for Toll Lane-Use

The sign shall have an amber (100,000-hour Agilent/HP LEDs wavelength-592nm) matrix of at least 16 rows and 192 columns with the ability to produce single line text at a height of at least 14", or dual line text at a height of at least 7". The center to center pixel pitch shall be no greater than 0.45" and the display shall be viewable to 50% brightness over a range of 70° Horizontal and 30° Vertical. The operating temperature shall be -40° to 122° F. The case shall be approximately 20" x 92" x 12". The sign shall contain an internal controller that shall accept commands by multi-wire contact closure to display a particular pre-stored message. Each sign shall have sufficient storage to retain a minimum of 8 unique user programmed messages. Each message shall consist of characters that will be pre-programmed, and may be changed by RS-422 serial communication with a personal computer (PC) that is running a manufacturer supplied display design program. The stored messages shall be retained when power to the sign is lost for as long as one year. The serial communication connector to the sign shall be installed within the lane controller enclosure to enable changes to the stored messages when such requirements are necessary.

The sign shall be securely mounted to the canopy, centered over each lane designated to have a lane-use sign. Each sign shall weigh less than 200 pounds and be able to withstand winds of 120 MPH. The Contractor shall furnish and install the Variable Message Sign (VMS), sign support hardware, cables between the sign controller and sign including all connectors, and perform all testing for the complete operation of the system, as approved by the Engineer.

II.03.02.010.02 Display Design and Storage PC:

The display design program shall be furnished with and installed on a portable standard portable laptop PC. The program shall permit the user to access the required sign display capabilities. These capabilities shall include message text, font selection, character height, illumination of characters or background, graphics capabilities, and number of lines to be used in display. The PC shall be equipped with a rechargeable battery capable of at least six hours of operation without recharge. A battery charger and power supply to recharge the

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battery and operate the PC from standard 120-Volt power shall be included with the PC. The PC shall also include the latest supported version of Microsoft Windows OS. A serial communication adapter shall be furnished and installed to enable RS-422 communication with any sign that has been connected to the serial port. A serial extension cable shall be furnished with the PC so that a user will be able to see the display (if desired) while it is being programmed. The Contractor shall furnish and install the portable laptop PC, operating system, VMS control software, cabling, and supporting documentation. A fixed total of two (2) PC's shall be provided. This item is incidental to and will be measured and paid for under the item Lane Changeable Message Sign.

II.03.02.011. Transaction Processing

The Contractor shall provide complete timing diagrams depicting vehicles passing through the lane for each type of lane configuration and for each payment method type. The timing diagrams shall identify every event that occurs within the lane from the beginning of a transaction to the end. If the Contractor software uses a queuing logic, this shall be described in detail. The detailed transaction processing rules shall be defined and finalized during the design phase; however, the following basic rules apply:

- At least one transaction shall be created for each vehicle and the Lane Controller will ensure that the transaction is complete prior to transmitting it.
- The Lane Controller shall be able to handle multiple vehicles in the toll zone and track each one accurately.
- The Lane Controller shall be able to handle vehicles backing up after having passed the toll lane without creating extra vehicles.
- The Lane Controller should be able to automatically synchronize the System with the vehicles in the lane and/or the Toll Collector to ensure the events in the lane correspond to the transaction generated.
- All AVI reads transmitted by the AVI System shall be reported to the Plaza Computer.
- All coin counts reported by the ACM shall be reported to the Plaza Computer.
- The Lane Controller shall have the ability to flag transactions that are considered unusual.

II.03.02.012. Lane Operations

The Toll Collection System as proposed by the Contractor shall support the CTRMA Lane Operations as defined in *Chapter VI*.

II.03.02.013. Communications with the Plaza Computer

All messages generated at the Lane Controllers shall be transmitted to the Plaza Computer in real-time and shall be guaranteed. All messages shall be uniquely identified and validation shall be performed at the Plaza Computer to ensure that there are no missing or duplicate messages. The Contractor shall provide automated means of synchronizing the lane and plaza messages in the event the Lane Controllers are replaced, or if communications are down or if

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data on the Lane Controller is not retrievable due to a catastrophic failure. The Business Day process shall not be considered successful if there is missing or duplicate data in the System.

II.03.02.014. Time Synchronization

All Lane Controllers shall be synchronized either to the Plaza Computer or to a common time synchronization source. There shall be a second source for time synchronization if communications to the primary source is down. The Lane Controller shall synchronize or transmit time synchronization message with every device capable of maintaining time.

II.03.02.015. Transponder Validation List

The Lane Controller shall be capable of supporting the TeamTx Transponder Validation List (TVL) and shall have the capability to support up to 16 million transponders per Agency. The Lane Controller shall be capable of accepting comprehensive (complete list once a day) and incremental (changes at least on an hourly basis) TVL and shall activate the list upon receipt. The Contractor shall use the effective design to transmit the files (compress, encode, etc), store the files and use the file. Transponder validation shall occur in 50 milliseconds and the proposal shall contain the proposed logic and all exceptions to this requirement, is shall be clearly explained. The format of the file shall be finalized during the design phase.

II.03.02.016. Employee Identification List

The Employee Identification List is generated at the Host Computer and transmitted to the Lane Controllers via the Plaza Computer. It shall at a minimum contain the employee ID, PIN and access level. All access to the Toll Collection System shall be validated against this list. The Employee Identification List shall become active upon receipt. The format of the file shall be finalized during the design phase.

II.03.02.017. Toll Rate and Toll Schedules

The toll rate and toll schedule file is generated at the Host Computer and transmitted to the Lane Controllers via the Plaza Computer. The Lane Controller shall activate the new rates and schedule automatically on the effective day and time as identified in the file. The toll rate and toll schedules shall support the CTRMA toll collection operations. The Lane Controller shall close the current Segment of Duty (SOD) and open a new SOD automatically when the new toll rate goes into affect. The format of the files shall be finalized during the design phase. The System shall have the capability to support up to 10 different toll rates and toll schedules.

II.03.02.018. Configuration Files

All parameters and settings required to run the lane application shall be maintained in configuration files. Access to configuration files required to support the Lane Controller operations shall be controlled. The configuration files can be maintained on the Plaza Computer or downloaded along with the Lane Controller application file however authorized personnel shall be able to make changes to the configuration files in the field. All Lane Controllers shall have default configuration files that will allow the lane to boot-up

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automatically. Authorized personnel shall be able to make change to parameters and settings that are defined as configurable elsewhere in these technical requirements and the approved design documents.

II.03.02.019. Monitor All Lane Equipment for Device Status

Each Lane Controller shall monitor itself and associated lane equipment devices for status. Serial devices, such as the ACM and AVI reader, shall be polled for status. The health of some digital devices shall be inferred from events. If a device recovers after reporting a failure, then a recovery message shall be generated. The Plaza Computer shall determine if it has lost communication with the appropriate Lane Controller, and generate an alarm message. All alarm, health and recovery message shall be reported to MOMS and the Real Time screen.

II.03.02.020. Diagnostics and Equipment Malfunction

The Lane Controller software shall execute periodic diagnostic checks on in-lane equipment. Intelligent peripheral devices shall be interrogated for device status on a regular basis. A device's failure to respond to a status inquiry, after a configurable number of retries shall be regarded by the Lane Controller software as an equipment failure. Such tests shall take place in all modes of lane operation, and the results shall be placed in each Lane Controller's event log.

Degraded modes of operation shall be supported based on Business Rules developed during the design process. The Contractor shall ensure the proposed Toll Collection System continues to operate without loss of revenue or visible impact to the patron even if some components of the System fail.

II.03.02.021. Stand-alone Mode of Operation

The Lane Controller shall be capable of operating in a stand-alone mode for a minimum of thirty (30) days if communications to the Plaza Computer are down. When operating in this mode, the last files downloaded from the Plaza Computer shall be used while processing vehicles. Upon re-establishing communications with the Plaza Computer all messages shall be transmitted to the Plaza Computer without affecting the real time operations or degrading the lane operations. If any downloads were initiated while the communications was down, then these shall be re-transmitted to the Lane Controller to bring it up to-date.

II.03.03. Availability

The Lane Controller hardware shall be designed to operate without requiring any maintenance services for a minimum average time of one (1) year. The average shall be calculated over the entire Toll Collection System. If the VES is a separate unit, the VES hardware and software combined shall operate continuously without requiring any maintenance services for a minimum average time of one (1) year.

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II.03.04. Mean Time Between Failures (MTBF)

The Lane Controller shall operate continuously without any manual intervention or maintenance services for a minimum average time of ninety (90) days. The average shall be calculated over the entire Toll Collection System. If the VES is a separate unit, the VES hardware shall be designed to operate without requiring any maintenance services for a minimum average time of one-hundred and eighty (180) days.

II.03.05. Express ETC Lanes

The Contractor Toll Collection System shall support Express ETC Lane operations. The CTRMA will have toll facilities that have only Express ETC Lanes, either two lanes or three lanes in each direction. In the Express ETC Lane configuration there are no toll booths and patrons will have to pay their toll by establishing an account at the CSC using a transponder or a license plate. If a vehicle drives through the toll lane without a valid account, then it is considered a non-payment and will be pursued per the established CTRMA Customer Contact Policy and Procedures.

The Express ETC Lanes shall be designed in a redundant configuration where they are managed by a single Primary Lane Controller System with a "hot standby" Secondary Lane Controller System operating in parallel and able to take over in the event the primary unit should fail (automatic failover). When the secondary unit detects that the primary is off-line, the secondary will assume the functions of the primary unit. Alarms messages shall be generated when such an event occurs. The Contractor's failover design shall ensure that there is no loss of revenue or transactions when one of the Lane Controllers fails. Only one Lane Controller at a time shall generate revenue transactions. The switchover from the Primary Lane Controller to the Secondary Lane Controller shall be transparent to the rest of the Systems.

The Toll Collection System shall be installed overhead and/or on the ground and traffic will travel through these lanes at normal highway speed. Express ETC Lanes shall have front and rear cameras and the System shall associate the front and rear images captured to the correct non-paying vehicle. Capability shall exist to turn off front image capture if required and the image shall not contain the images of the vehicle occupants. The vehicle tracking system shall be accurate in associating tag reads to the correct vehicles and ensuring the correct images are captured. The proposed system shall have the capability to support pay by plate or plate tolling (PTOL).

There shall be a high level of redundancy in the System that is proposed for the Express ETC Lanes. The Lane Controller(s) that support the Express ETC Lanes shall communicate to the Mainline Plaza Computer or the Host Computer. The same Business Day processing shall apply for transactions generated in Express ETC Lanes.

II.03.05.01. Express ETC Lane Signage

Since patrons do not have an alternate means of paying the toll, early notification of the upcoming toll facility is critical thus giving them the opportunity to exit the Turnpike. The

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Express ETC Lane System shall have the ability to accommodate Value-Based pricing, and as such the patrons need to be notified of the toll they will pay if they choose to use the Turnpike.

II.03.05.02. Express ETC Lane Operations

When not shut down for services, the Express ETC Lanes shall be open at all times. If the System is rebooted, then it shall automatically come up in OPEN mode. Express ETC Lanes shall be opened and closed remotely by authorized person using the Toll Collection System application running on the workstations. In order to maintain the Shift and Business Day structure to Express ETC Lanes, the Express ETC Lane(s) shall close the current Shift and open a new Shift automatically three times a day per the three Shifts.

In the event of a communication failure to the Lane Controller, it is very critical that the AVI System and VES have sufficient buffering capability so that transponder reads and images are saved locally until communications with the Lane Controller are re-established. In Express ETC Lanes, the AVI System buffering capability shall be 5,000 transponders per travel lane. Transponders read and images saved during this condition will be flagged. For the VES, images of every vehicle will be saved if Lane Controller communications is down and the VES shall be capable of buffering at least a day's worth of images. Processing at the back office will ensure that patrons are tolled appropriately.

II.03.05.03. Value-Based Pricing

Although there are no current plans for implementation at this time, the CTRMA Express ETC Lanes shall be capable of supporting Value-Based Pricing based on time-of-day, and day-of-week; and these parameters shall be configurable.

II.03.05.04. Determination of Fare

Fare determination shall be performed at the lane and later adjusted at the CSC based on the transaction categorization. The ETC toll will be applied only to transponder transactions at the lane. The following rules will be applied for fare determination on Express ETC Lanes:

- If the AVC is operational, then the toll is based on number of axles for all vehicle types
- If AVC is degraded, then
 - o Fare is based on the tag class for transponder equipped vehicles that have a transponder class
 - o Fare is based on default of 2 axles for all other transactions

II.03.05.05. Saving of Images

In an Express ETC Lane, images are critical and any loss in the images will result in lost revenue. The System shall be designed such that the VES shall be able to capture and save images even if the AVC and the Lane Controller are not operational. Images will be saved for the following conditions:

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- In all cases where there is no valid transponder read, the front and rear image of all vehicles shall be saved. It is desirable that in case of front images, only images of vehicles with axles greater than two (2) be saved.
- Front and rear images of vehicles traversing the shoulder lane shall be captured, saved and flagged.
- If the VES loses communications with the Lane Controller, the image of every vehicle shall be saved. Images saved during this condition shall be flagged.
- Images shall be saved even in a degraded mode of operation and such transactions shall be flagged.

II.03.05.06. Express ETC Lane Transaction Processing

These general rules shall apply when generating and processing transactions.

- At least one transaction shall be created for each vehicle and the Lane Controller shall ensure that the transaction is complete prior to transmitting it.
- All non-ETC transactions shall contain the cash toll and the ETC toll amount.
- It is not required to identify the lane; however, all vehicle transactions should be assigned to a lane/plaza.

II.04. **Plaza System**

Plaza operations provide for the collection, processing and reporting of all toll revenue and management of all toll collection activities. Operations at the plaza include Plaza Supervisor activities, Toll Collector Management, Vault Management and Bank Deposits and Services. Toll collection operations at the plaza consist of the collection of the correct toll amounts from patrons in accordance with the established toll rate schedule, accounting of the toll revenue, transfer of the funds into the bank, and documentation of the toll collection activities. Ramp toll plazas shall report to a Mainline toll plaza and all ramp toll plaza activities will be managed from the Mainline toll plaza. Express Toll Locations can either report to a Mainline toll plaza or directly to the host, but all processing rules shall apply to all transactions.

II.04.01. *Plaza Computer Hardware*

The work under this section shall include all labor, materials and support services to complete the design, fabrication, integration, packaging, delivery, testing and acceptance of the Plaza System hardware in accordance with these technical requirements. All Plaza Computer Hardware provided under this Contract shall have a three (3) year warranty from the Acceptance of Segment 1 and all hardware shall be supported for ten (10) years after Acceptance of Segment 1.

II.04.01.01. Plaza Server

The Contractor shall furnish and install a complete Plaza Server at each specified plaza location and shall include all cabinets and ancillary equipment as may be necessary to provide a complete and acceptable Plaza Server System. The Plaza Server System shall be capable of performing all functions specified in these technical requirements. If the

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Contractor does not see the need for a Plaza Server, then detailed analysis shall be provided to support this decision. A single server configuration should meet these technical requirements.

The Plaza Server, including all major hardware elements, shall be of the latest design and incorporate standard commercial products currently in production and shall be manufactured by the same computer company, except as specified. Contractor shall use proven server configurations that support future upgrades to processors, memory, storage, operating system, database etc and the Contractor shall plan for ten (10) year growth in traffic volumes. It is desirable for the Plaza Computers, Host Computer, and peripheral hardware to be supplied from the same manufacturer. The intention is to increase compatibility and reduce maintainability problems.

The Contractor is responsible for ensuring the Plaza Server is sized appropriately and will meet the CTRMA operational and traffic growth projections for the next ten (10) years. Users of the System shall see no obvious delays while generating reports or accessing the System for data. The Plaza Server shall have redundancy wherein disk failure does not bring down the System.

II.04.01.01.01. Data Back-up and Retention

Capability shall be provided to backup the data on a daily basis without manual intervention using tape/disk libraries. Notification on the status of the backup process shall be sent to the MOMS. If there is a catastrophic failure that results in the loss of data, means shall be provided to retrieve the data without disruption to the plaza operations.

All data on the Plaza Server shall be available for thirty (30) days with a fifteen (15) day archive cycle (total forty-five (45) days). When the disk space utilization reaches 80% capacity, a message shall be transmitted to the MOMS. Data older than thirty (30) days can be deleted from the Plaza Server since the data is available on the Host Server. All deletion of data shall be automatic, without user intervention, and shall generate a message to be transmitted to the MOMS.

II.04.01.02. Plaza Workstations

There are offices in the Mainline toll plaza Field Operations Building for toll operations personnel. Plaza workstations shall be installed in each designated office and be interfaced to the Plaza Server. The plaza workstations shall be the latest technology available and shall have flat panel monitors. Toll Collectors shall have access to the System from the counting area. The plaza workstations shall also be used to access the MOMS and Security Access System application software.

II.04.01.03. Plaza Printers

Laser printers shall be provided at the Mainline toll plaza Field Operations Building. The printer provided shall also support the printing of the Toll Collector schedule.

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II.04.01.04. Bar Code Scanners

In order to reduce data entry errors, money bags, etc. will have barcodes that shall be scanned by the bar code scanner. The plaza workstations shall support the interface to these units.

II.04.01.05. UPS

All equipment critical to life safety and operation of the toll collection system shall be on UPS to ensure uninterrupted toll operations and prevention of loss of revenue. Additionally, capability shall be provided at the Host Computer to monitor the UPS performance at all locations within the CTRMA Turnpike System. Software drivers shall be provided to acquire, display, store and report all parameters provided as outputs from the UPS. The UPS shall support the equipment for 2 hours and before total shutdown shall send a message to the Plaza Computer that will allow for a graceful shutdown of the Plaza Server. When the System is on the UPS, a notification shall be sent to the MOMS.

II.04.01.06. Emergency Generators

At toll plaza locations, emergency generators will be provided by others. The Contractor shall furnish and install an electronic interface between the Plaza Computer and the emergency generator to monitor its performance. At remote Express Toll Locations, the Contractor shall furnish and install emergency generators to support each remote location. Software drivers shall be provided to acquire, display, store and report all parameters provided as outputs from the emergency generator. When the System is on the emergency generator, a notification shall be sent to the MOMS.

II.04.01.07. Communications Equipment

The CTRMA Toll Collection Systems shall be interconnected by fiber and dedicated lines. The Contractor shall work with the Developer in designing the overall network architecture for the US183-A Turnpike Project. All LAN and WAN communications equipment shall be the state-of-the-art and shall be provided, as necessary, to support the Plaza Computer equipment installations. Where possible, fiber connections shall be used to connect remote computers to the Plaza System.

II.04.01.08. Equipment Cabinets

Cabinets for the various components of the Toll Collection System shall be provided with appropriate access doors, closure panels, face panels, stabilizer kit, casters, mounting and installation hardware as may be necessary to provide a complete and operational installation. All interconnection and power cabling shall be provided as necessary and shall be installed to provide a professional look. Each cabinet front shall be enclosed with a smoke, tempered glass door and key lock to shield the Systems from dust. The cabinet designs shall consider the allowable space in the locations where the Plaza Computers are to be installed. The cabinet, cabinet panels, and hardware shall be submitted to the CTRMA for approval. Control Cabinets housings at the various remote Express Toll Locations will be provided by others.

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The Plaza Computer room that houses the plaza equipment shall be air-conditioned and access doors shall be security controlled. All access to the computer room will be recorded. Control cabinets at remote sites that house the toll collection equipment shall be air conditioned and access doors shall be security controlled.

II.04.02. *Plaza Computer Systems Software*

The Plaza Computer System Software comprises of the Plaza Operating System, the Plaza Database, the Toll Collection Application Software and the Plaza Computer Software.

II.04.02.01.01. Plaza Operating System

The operating system for the Plaza Computers shall consist of a multi-user, multi-tasking operating system. The operating system shall fully utilize the Plaza Computer architecture and shall support all peripherals defined in these specifications. The operating system shall also support the proposed communications topology and Contractor's application software. The Contractor is responsible for obtaining all licenses as required in the name of the CTRMA. All licenses shall be provided to the CTRMA for all off-the-shelf operating system software. The proposed operating system should have a future upgrade path and must be supported for up to ten (10) years. The proposed operating system should have a warranty for three (3) years after the Acceptance of Segment 1.

The operating system shall be a proven system used widely throughout the United States for intensive database operations and should be compatible with the database and other web-based tools.

II.04.02.01.02. Plaza Database

The CTRMA requires a high level of reliability and security from the database used for the storage of transaction data and all other data, as applicable, for the CTRMA Toll Collection System. The Contractor shall use the latest database that is field-proven to operate in a transaction intensive environment. The database software shall be compatible with the operating system and the application software. The database used on the Plaza Server and the Host Server should be the same. Appropriate licenses shall be provided to the CTRMA for all off-the-shelf database software. The database software should have a warranty for three (3) years after the Acceptance of Segment 1. The selected database should have an upgrade path and should support upgrades to operating system, application, memory, processors, etc. for up to ten (10) years.

The Contractor may propose not including database software on the Plaza Server, if the Contractor deems the database software can reside solely on the Host Computer. However, the System shall meet all the technical requirements specified herein, and provide all the required data integrity and security required. Complete documentation describing the proposed data transfer and storage concepts shall be provided in the Proposal, sufficient to allow the CTRMA to review and determine compliance with these technical requirements.

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II.04.02.01.03. System Administration

Operation and monitoring of Plaza Computer operations shall be accomplished by means of Remote System Management techniques. All processes shall be automatic and failure of any process shall result in a notification to the System Administrator. Alarm messages shall be created for process failures that will be routed through the MOMS. System logs shall be maintained for all processes and the logs shall have sufficient information to help analyze the problem. The System Administrator shall have the ability to manage user access security including sign-on facilities, permission control, and different levels of access for the files and directories

II.04.03. General Software Functional Requirements

The Plaza Server collects and stores all transaction and status data from the lanes, processes the data to create summary data, and transfers all detail and summary data to the Host Server. Data is also created during normal plaza operations (e.g., bank deposit manifests, vault information, etc.). This data is also transferred to the Host Server for auditing and reporting. In addition to data storage and transferring, the Plaza System is also responsible for downloading configuration and status information to the lanes to ensure their proper operation.

It is desirable to have a single application for all subsystems of the CTRMA Toll Collection System. Depending on the access privileges and authorization levels, the required application/functions will be made available. The application software shall provide functionality required by the Supervisor, Collectors, Auditors and other authorized users. All applications shall use the latest state of the art technology to allow for flexibility, configurability and ease of use. A web-based design shall be used and authorized users can access the application from anywhere on the network. The System shall have the ability to automate all of the toll collection related activities.

Screen designs shall use Graphical User Interface (GUI), and self-help features shall be provided to assist the users with data enter and retrieval, and navigate through the screens. The software shall institute established data validation and user notification process to ensure correct and accurate data is entered. Where possible, drop-downs and automated entry of data shall be made available.

The operational procedures and requirements are described here to allow the Contractor to understand the CTRMA's proposed operations. If the Contractor has Standard Toll Collection System application, the Contractor is allowed to propose such application if it provides toll management, audit and reporting functionality similar to what is described below. The Proposal shall include the list of toll agencies where such a Standard application is used. The Proposal shall also clearly identify functionality that is not in the Contractor's Standard application and how such functionality will be provided. It is anticipated that during the design review phase, the Contractor's Standard application will be reviewed and modifications/additions to it discussed at that time. The Contractor shall consider this approach while pricing the Proposal and describe innovative plans for achieving the CTRMA

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needs. The screen designs and report formats will be discussed, reviewed and finalized during the design phase.

II.04.03.01. Data Communications and Interface Requirements

The Plaza Server shall interface with various peripherals as detailed in these technical requirements. All messages between the Lane Controllers, Plaza Servers, and the Host Server, including the Security Access System and MOMS shall utilize a guaranteed transmission protocol. The Contractor shall identify how message transmissions between System components are guaranteed. The application software, at a minimum, shall provide the following functionality at the plaza.

- Acknowledgement and confirmation of all data sent to and received from each Lane Controller and the Host Computer as to be defined in the CTRMA approved design document.
- All messages and data received and recorded at the Plaza Computer must be available at the Host Computer immediately or within one hour of occurrence.
- Data that depends on the completion of the Business Day is transferred after the successful assignment of the Business Day.
- Receive transponder validation list (comprehensive and incremental), employee list, toll rate and toll schedules, lane configuration files and lane executables from the Host Computer, and distribute them to the individual Lane Controllers under its jurisdiction within 30 minutes of receipt of each file. The Plaza Computer shall monitor and confirm their proper receipt in each Lane Controller. If not properly received and subsequently put on line by the Lane Controller, re-initiate the transfer and notify the MOMS and Host Computer.
- Maintain records of all versions of the transponder validation list, employee list, toll rate and toll schedules, lane configuration files and lane executables that it received from the Host Computer and that were successfully downloaded to the lanes. Reports shall be made available to verify the versions and the download status.
- Provide self-diagnosis functions to detect and report on the status and functioning of the Plaza Computer hardware devices, processes, tasks, and software applications as to be defined in the CTRMA approved design document.
- Provide the capability to automatically identify missing or duplicated data and to manually retrieve such data from its original source.

II.04.03.02. Data Management Requirements

The Plaza Computer shall receive and store all data that it receives from the Lane Controller and the Host Computer. Messages received from the Lane Controller shall also be summarized by various criteria for use by toll operations and audit personnel.

II.04.03.02.01. Receive and Store Data Received from the Lane Controllers

- All transaction messages generated in the lanes
- All alarm and status messages generated in the lanes

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- All Toll Collector and vault activities generated in the lanes
- All Toll Collector and vault summary data generated in the lanes
- All events generated in the lanes that get displayed on the Real Time screen

II.04.03.02.02. Receive and Store Data Received from all Other Peripherals

- All monitoring, status and alarm messages generated from the UPS
- All monitoring, status and alarm message generated from the emergency generator
- All status and alarm messages received from the plaza peripherals
- All status and alarm messages received from processes and tasks running on the Plaza Server

II.04.03.02.03. Data Summarization

The Plaza Server shall summarize the transaction data that it received from the Lane Controller based upon the Segment of Duty (SOD) and Shifts worked by the Toll Collectors. Traffic summaries will also be created every five minutes based on class, payment type and other parameters that are required for toll operations. ACM transaction summaries shall be created for each vault insert/switch/pull activity.

II.04.03.02.04. Business Day Assignment

A Business Day process shall run at the plaza that assigns a Business Day to the transactions, Segment of Duty (SOD), Shift summaries, vault summaries and other plaza related transactions. The System shall assign a Business Day to each Toll Collector Segment of Duty (SOD) and Shift based upon the Shift that was worked. Shifts for Toll Collectors that work across the days shall be assigned based on the day that has the longer length. If the length is equal, then the Business Day assigned shall be the previous Business Day. Business Day for ETC transactions shall be the Transaction Day. Business Day for the ACM transactions and vault summaries shall be the day the vault was pulled. If the Business Day process fails for any reason, failure messages shall be created and reports shall be made available to authorized personnel. The System shall allow for the manual closure of a Business Day and all such manual closures shall be flagged and reported.

II.04.03.02.05. Data Security

The Contractor shall ensure that master data records, once entered into the System, cannot be deleted or changed without proper security and provisions for a complete audit trail. Only authorized users are allowed access to the System and the data, and all logins and modifications shall be recorded.

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II.04.03.03. Toll Collection Management Requirements

The Plaza Computer shall provide the following activities as it relates to toll collection management. During detailed design reviews, the design of the functionality shall be finalized and approved.

II.04.03.03.01. Assignment of Business Day and Shifts

The toll collection process consists of a number of inter-related tasks performed by toll collection personnel. The 24-hour toll collection day shall be called a Business Day and will operate from 00:00 AM to 24:00 AM. The Business Day will be divided into three Shifts, 8 hours each. The System shall use these parameters in all data entry screens.

II.04.03.03.02. Money Bag Assignment

Functionality shall be provided to allow the Supervisor to assign a Money bag to the Toll Collector at the beginning of their Shift. This process shall initiate the start of the Toll Collector's Shift. The System shall institute checks to ensure that bags already assigned to a Toll Collector for the Business Day are not re-used. All activity on the Money bag shall be recorded and shall include but not be limited to deposit, pick-up, transfer etc. If the bag is mutilated, then the entire bag is deposited into a new bag and the System shall allow these details to be entered into the System. Various reports shall be made available to authorized personnel.

II.04.03.03.03. Money Bag Deposit

The System shall allow a Toll Collector to enter deposit data against the Money bag that was assigned to them at the start of the Shift. Choice for summary or detailed data entry shall be allowed. The Supervisor shall be able to acknowledge the receipt and deposit of the Money bag by the Toll Collector. Toll Collectors shall have easy access to the System from the counting area and printers should be easily accessible. Various reports shall be made available to authorized personnel.

II.04.03.03.04. Create Money Bag Manifest

Prior to the Rifkin bag pick up, the Supervisor shall have the ability to generate and print the Money Bag Manifest from the System. The report will identify all Money bags that have been closed and ready for pick up by the banking service. The report will also include the Supervisor Money bag that contains all the Supervisor transactions for the Business Day. If, for some reason, the Money bag noted on the report is not getting transferred, the Supervisor will record this event and add comments against this bag. If additional bags not on the Manifest are been transferred, they shall be entered into the Manifest with the appropriate reasons. All events related to the Money Bag Manifest shall be recorded in the System and various reports shall be made available to authorized personnel.

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II.04.03.03.05. Money Bag Pick-up and Verification

The Supervisor and Bank Service Courier shall utilize the Money Bag Manifest to verify that each bag that should be picked up is accounted for. Once the Supervisor and the Bank Service Courier personnel verify the Money bag transfer, they will both provide signatures to acknowledge the pick up. The Supervisor shall log the pick up event in the Money Bag Manifest database and various reports shall be made available to authorized personnel.

II.04.03.03.06. Lane Assignment

The System shall provide authorized users the ability to assign Toll Collectors lanes for their entire Shift or only for some SODs. The actual Key-In and Key-Out times shall be used by the System while assigning a Business Day to the Toll Collector's SOD's and Shift.

II.04.03.03.07. Change Fund Assignment

The System shall provide authorized users the ability to provide each Toll Collector a change fund upon hire, the details of which shall be entered into the System. When the Toll Collector's employment is terminated, it shall be returned and the System shall reconcile the returns with what was issued. Functionality shall exist to allow authorized users the ability audit the change fund at any time and enter comments.

II.04.03.03.08. Equipment Assignment

The System shall have the ability to record the issue of equipment such as uniform, badges, pins, training manuals, cash trays etc. when a Toll Collector is hired. Upon termination of employment, these items shall be returned and reconciled.

II.04.03.03.09. Real-Time Monitoring

The System shall display the transactions as they occur in real-time on any workstation connected to the Plaza Server. Various colors and symbolic representation shall be used to focus on key items. Various screens shall be made available to display the following:

- Lane activity for all lanes at the plaza and associated ramps along with the Canopy Light Status.
- Detailed transaction activity (configurable) on selected lanes to include Toll Collector data, AVC data, AVI data, etc.
- Detailed transaction activity (configurable) on selected Toll Collector to include Toll Collector data, AVC data, AVI data, etc.

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- Vault information related to inserts, switches, pulls and other ACM activities, percentage full, etc.
- 5-minute and hourly traffic summary for each lane by payment type and totals (configurable).
- Device status information accessible only to authorized users.
- Ability to print and/or save any of the screens as needed.
- Various notifications to the Supervisors to assist in toll collection operations such as vault jam, receipt printer "out of paper" etc.

There shall be a special detailed display of events as they occur in the lane, accessible to authorized personnel, including: sensor ON/OFF, axle activity, transponder reads, Toll Collector classification, coin counts, etc. Authorized users shall have the ability to save images if needed on select lanes for select times and select classes.

Capability shall be provided to allow authorized personnel to remotely open lanes, control canopy lights, switch vaults remotely, clear ACM jams, and change the configuration of the lanes.

II.04.03.04. Supervisory and Management Requirements

II.04.03.04.01. Start of Shift and End of Shift Reconciliation

The System shall allow the Supervisor starting a Shift to reconcile the plaza cash tray with the Supervisor ending the Shift. Summary of all transactions will be entered. The number of transponders sold will be verified and inventory of transponders checked. At the end of the Shift, a similar reconciliation will be conducted to balance the plaza cash tray. All these events shall be recorded in the System, and reports shall be made available to authorized personnel.

II.04.03.04.02. Recording and Resolving Patron Complaints

Sometimes patrons stop-by, mail-in or call-in complaints of various types. Complaints relating to short changing by Toll Collectors shall be investigated and refunds made as necessary. All such events will be recorded into the System, and reports shall be made available to authorized personnel.

II.04.03.04.03. Accepting and Recording No-Fund Payments

No-Fund payments are sometimes dropped in at the plaza, given to the Toll Collectors or mailed in to the plaza. The Supervisor shall have the ability to retrieve the No-Fund transaction based on the information provided and process the payment. If the No-Fund slip

Attachment E

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is not provided, then the license plate information is used to associate the payment. If no association can be made, then an attempt is made to contact the patron after which the check is returned to the sender with an explanation. Reports shall be made available to authorized personnel.

II.04.03.04.04. Supervisor Money Bag Deposit

The Supervisor working the last Shift for the night shall have the ability to make a Supervisory Deposit of all funds collected at the plaza by the Supervisors during their Shifts. If any change funds are required from the Bank, the request shall be included in the deposit and this process is automated. The Supervisory Deposit shall be reported along with the Money Bag Manifest. Reports shall be made available to authorized personnel.

II.04.03.04.05. Change Fund Audit

Periodically, the Supervisor will select a Toll Collector and count their change fund. Any discrepancy shall be entered into the System and reported to audit personnel. Reports shall be made available to authorized personnel.

II.04.03.04.06. Maintain Supervisor Log

The System shall provide the ability to create a Supervisor Log for the Supervisor when a Supervisor logs into the System to open a Supervisor Shift. All unusual events like accidents, lane closure reasons, maintenance calls made, maintenance actions taken etc will be entered into the log. The Supervisor can edit the log before closing the Shift, but once the Shift is closed and the Supervisor has logged out, no more edits to the log are possible. These logs will be accessible to authorized personnel.

II.04.03.04.07. Maintain Employee Schedule

The System shall provide the ability for the Supervisor to generate and maintain the employee schedule for the toll plazas and ramps under their supervision. Off-the-shelf packages normally do not work and packages customized for toll collection is preferred. The employee schedule shall be printed in a viewable form.

II.04.03.04.08. Recording Toll Collector Unusual Occurrences

The System shall provide the ability for the Supervisors to enter Unusual Occurrences into the System that cannot be processed by the Toll Collector in the lane. These will be associated with the Toll Collector Shift and will be accessible to the auditors.

II.04.03.05. Vault Management

The Plaza Supervisor is responsible for managing all vault functions and ensuring their proper operations. At all times there must be an active vault inserted and available for all

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ACM lanes. All removed vaults must be stored in a secure environment until they are picked up by the banking service. Banking services are necessary to transport vaults from the Field Operations Building to the designated bank for counting and deposit. Transport normally occurs with an armored truck.

The vault deposits are verified by the bank and deposit information is transmitted electronically to the CTRMA Administrative Office for reconciliation. Vault pick-ups are typically scheduled on a daily or more frequent basis. Each vault transferred to the banking service must be identified and verified. All data related to the vault activity shall be recorded in the System and various reports shall be made available to authorized personnel. If a vault has not been pulled for more than two (configurable) days, the Supervisor shall be notified via a System message.

II.04.03.05.01. Vault-Pull Operations

The Supervisor or authorized person shall schedule vault-pulls based on the traffic volume at the plaza. The Supervisor shall monitor the status of the vaults through the vault monitor screen that indicates the vault conditions through various colors.

II.04.03.05.02. Creation of Vault Manifest

The System shall allow the user to create a Vault Manifest for the day. A Manifest ID shall be automatically assigned by the System. Vaults that were full and switched or are near full shall be moved to the Vault Manifest automatically. The user can also select the vaults that need to be added to the Vault Manifest. The user can also de-select vaults that should not be part of the manifest. Vaults that need to be pulled should be identified. If an existing Vault Manifest is available, the user can add to it or re-print it. This report is used by the Supervisor or authorized person to identify what vaults need to be pulled and transferred to the Bank Service Courier vehicle. Once a vault is pulled, it will be denoted as such on the Vault Manifest automatically.

Prior to pick-up, the Supervisor in charge shall print the Vault Manifest Report from the System. The report shall identify all vaults that have been pulled since the last pick up. The Vault Manifest data is a combination of events recorded by the System (vault insert time, vault active time, vault inactive time, and vault removal (time and personnel ID), as well as any status logged by the Supervisor (vault in secure area, vault picked up). The Supervisor shall be provided the ability to record all vault-related events in the Vault Manifest. Reports shall be made available to authorized personnel.

II.04.03.05.03. Vault Pick-up Verification

The Supervisor and the Bank Service Courier personnel will utilize the Vault Manifest and verify each vault that is picked up. If a vault was picked up that was not on the Manifest, it will be added to the Manifest. If a vault on the Manifest was not picked up by the Bank

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Service Courier, then it will be noted and comments will be entered against this vault. They will both provide signatures to acknowledge the pick-up. The Supervisor will log the pick up event in the Vault Manifest database. Reports shall be made available to authorized personnel.

II.04.03.05.04. Emergency Vault Switches

The Supervisor will monitor the vault status screen to determine if there is a condition that requires an emergency (unscheduled) vault switch. Such conditions may be coin jams, hardware failure, etc. This vault switch operation can be performed using the plaza Real Time screen or can be done manually at the lane. In addition, it may become necessary to perform an unscheduled vault-pull to ensure proper vault availability. Reports shall be made available to authorized personnel.

II.04.03.06. Toll Collection System Reports

All data entered or generated in the System shall be retrieved through reports and screens. Reports and screens made available through the System and on an adhoc basis and shall have various selection and sort criteria and shall be easily configurable. All reports and screens shall have the capability to be printed, saved in pdf format, html format, Access, and Excel formats. Selected reports shall be automatically generated and made available to authorized personnel at the start of the Business Day. The System shall have the ability to drill down all high-level reports to the next level and to the details. Report designs will be presented and finalized during the design review process. Data may have to be summarized in order to ensure that reports are generated within seconds of a report generation request. Additionally, after the deployment and implementation of the System, there may arise the need to create additional reports, and the Contractor shall support such additions and/or modifications.

II.04.03.07. Time Synchronization

The Host Computer shall be synchronized to the Customer Service Center Computer as stated in the Texas Interoperability Specifications. All Plaza Computers and workstations at the CTRMA Administrative offices shall synchronize time with the Host Computer. All Lane Controllers, Plaza Workstations, Security Access Systems, VES computers, and any other computer that communicates with the Plaza Computer shall synchronize their times with the Plaza Computer using off-the-shelf time synchronization software. If needed synchronization messages shall be sent to devices that do not support off-the-shelf time synchronization software.

II.05. Security Access System

The Contractor shall provide a Security Access System for the entire Mainline toll plaza and all remote toll facilities, and all doors and cabinets that require authorized access. State-of-the-art technology should be used and the System should be integrated into the Toll Collection System. An emergency alert mechanism shall be provided in every toll booth and

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areas where money is stored. An initiation of this alert should be directed to the CTRMA Security Facility at the Field Operations Building on the US183-A Turnpike.

II.06. Maintenance On-line Management System (MOMS)

The Contractor shall provide a Maintenance On-line Management System (MOMS) for reporting and tracking alarm messages and maintaining equipment inventory. The MOMS shall support real-time paging of maintenance staff and shall be configurable to meet the CTRMA operations requirements. Scheduling of all maintenance activities shall be done through the MOMS. All spare equipment tracking and purchasing of all toll related equipment shall be done through MOMS. The MOMS can reside on the Host Computer or a separate server can be provided. If a separate server is provided, it shall meet the Plaza Computer System requirements. The MOMS shall be integrated into the Toll Collection System application software. The Contractor shall work with the CTRMA in configuring the MOMS to meet the CTRMA maintenance needs.

II.07. Host Computer

The Host Computer is the depository of all toll collection data. Manual and ACM transactions stop at the host and ETC transactions and non-payment are transferred to the CSC/VPC for further processing. Manual transactions are summarized at the plaza into Toll Collector Segments-of-Duty (SOD) and Toll Collector Shifts, and these shall be transferred to the host for audit and reconciliation. Summarized data shall be used to generate various reports that help the auditor with the revenue and transaction reporting. The transaction data shall also be summarized by time and this data shall be used for traffic reporting and traffic analysis.

II.07.01. Host Computer Hardware

The work under this section shall include all labor, materials and support services to complete the design, fabrication, integration, packaging, delivery, testing and acceptance of the Host Computer hardware in accordance with the requirements of these specifications. All Host Computer Hardware provided under this Contract shall have a three (3) year warranty from the Acceptance of Segment 1 and all hardware shall be supported for ten (10) years after Acceptance of Segment 1.

II.07.01.01. Host Server

The Contractor shall furnish and install a complete Host Server configuration at the CTRMA Administrative Headquarters and shall include all cabinets and ancillary equipment as may be necessary to provide a complete and acceptable Host Computer System. The Host Server configuration shall have full redundancy wherein the second server is a hot standby that can be brought into service with no disruption to operations. While proposing the Host Computer System, the Contractor shall consider Disaster Recovery Procedures that shall be implemented to ensure data security during a Disaster. The Host Server System shall be

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capable of performing all functions specified in these specifications. The Proposal shall detail the Host Computer redundancy capability.

The Host Server, including all major hardware elements, shall be of the latest design and incorporate standard commercial products currently in production and shall be manufactured by the same computer company, except as specified. Contractor shall use proven server configurations that support future upgrades to processors, memory, storage, operating system, database, etc, and the Contractor shall plan for ten (10) year growth in traffic volumes. It is desirable for the Plaza Computers, Host Computer, and peripheral hardware to be supplied from the same manufacturer. The intent is to increase compatibility and reduce maintainability problems.

The Contractor shall be responsible for ensuring the Host Server is sized appropriately and will meet the CTRMA operational and traffic growth projections for the next ten (10) years. Contractor shall use effective data storage techniques for the management of data. Users of the System shall see no obvious delays while generating reports or accessing the System for data.

II.07.01.01.01. Data Backup and Retention

Capability shall be provided to backup the data on a daily basis without manual intervention using tape/disk libraries. Notification on the status of the backup process shall be sent to MOMS. If there is a catastrophic failure that results in the loss of data, means shall be provided to retrieve the data without disruption to the host operations.

ACM and Manual transactions shall be retained on the Host Server for a period of six months, after which they are archived. ETC transactions shall be retained for one (1) year and then archived. Violations that are either paid or considered closed shall be retained for one (1) year and violations that are considered open shall be retained until they are written off. Summarized data shall be retained on the host for at least two (2) years so that annual reports can be generated. When the disk space utilization reaches 80% capacity, a message shall be transmitted to the MOMS. Any deletion of data shall be automatic, without user intervention, and shall generate a message to be transmitted to the MOMS.

The Host Server shall be sized to accommodate for the restoration of the archived data, if needed. Users shall be able to generate queries from the restored data.

II.07.01.02. Host Workstations

Various administrative staff, auditors and support staff reside at the CTRMA Administrative offices and need access to the Toll Collection System which includes MOMS and the Security Access System. Workstations shall be installed in their offices to provide the required access. The host workstations shall be the latest technology available and shall have flat panel monitors.

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II.07.01.03. Host Printers

Laser printers shall be provided at the CTRMA Administrative Offices to allow user to print reports and screens. Two large printers, that have automatic double-sided printing options, supporting 4 input trays and up to 40 ppm shall be provided.

II.07.01.04. UPS

All equipment at the host shall be on UPS, and the Contractor shall furnish and install an electronic interface between the Host Computer and the UPS to monitor the UPS performance. Software drivers shall be provided to acquire, display, store and report all parameters provided as outputs from the UPS. The UPS shall support the toll collection equipment at the host for 2 hours and before total shutdown shall sent a message to the Host Computer that will allow for a graceful shutdown of the Host Server. When the System is on the UPS, a notification shall be sent to the MOMS.

II.07.01.05. Communications Equipment

The CTRMA Systems will be interconnected by fiber or dedicated lines as required. The Contractor shall work with TxDOT and the Developer on the US183-A Turnpike in designing the overall network architecture. All LAN and WAN communications equipment shall be the state of the art and shall be provided, as necessary, to support the Host Computer equipment installations. Network monitoring software shall be provided at the host to monitor the System network status and communications, including the connection to the CSC/VPC.

II.07.01.06. Equipment Cabinets

Cabinets shall be provided with appropriate access doors, closure panels, face panels, stabilizer-kit, casters, mounting and installation hardware as may be necessary to provide a complete and operational installation. All interconnection and power cabling shall be provided as necessary and shall be installed to provide a professional look. Each cabinet front shall be enclosed with a smoked, tempered glass door and key lock to shield the Systems from dust. The cabinet designs shall consider the allowable space in the locations where the Host Computers are to be installed. The cabinet, cabinet panels, and hardware described in this section shall be submitted to the CTRMA for approval.

The Host Computer Room that houses the host equipment shall be air-conditioned and access doors shall be security controlled. All access to the computer room shall be recorded.

II.07.02. *Host Computer Systems Software*

II.07.02.01.01. Host Computer Operating System

The operating system for the Host Computers shall consist of a multi-user, multi-tasking operating system. The operating system shall fully utilize the redundant Host Computer architecture and shall support all peripherals defined in these specifications. The operating system shall also support the proposed communications topology, redundant configuration,

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and Contractor's application software. The Contractor is responsible for obtaining all licenses, as required in the name of the CTRMA. All licenses shall be provided to the CTRMA for all off-the-shelf operating system software. The proposed operating system should have a future upgrade path and must be supported for up to ten (10) years. The proposed operating system shall have a warranty for three (3) years after Project Acceptance.

The operating system shall be a proven system used widely throughout the United States for intensive database operations and should be compatible with the database and other web-based tools. There shall be no degradation of performance when numerous users access the Host Computer.

II.07.02.01.02. Host Computer Database

The CTRMA requires a high level of reliability and security from the database used for the storage of transaction data and all other data, as applicable, for the CTRMA Toll Collection System. The Contractor shall use the latest database that is field-proven to operate in a transaction intensive environment. The database software shall be compatible with the operating system and application software, and shall support the redundant host architecture. The database used on the Plaza Server and the Host Server shall be the same. Appropriate licenses shall be provided to the CTRMA for all off-the-shelf database software. The database software shall have a warranty for three (3) years after Project Acceptance with maintenance services for up to ten (10) years. The chosen database should have an upgrade path and should support upgrades to operating system, application, memory, processors etc.

II.07.02.01.03. System Administration

Managing and monitoring of Host Computer operations shall be accomplished by means of Remote System Management techniques. All processes shall be automatic and failure of any process shall result in a notification to the System Administrator. Alarm messages shall be created for process failures routed through the MOMS. System logs shall be maintained for all process and the logs shall have sufficient information to help analyze the problem. The System Administrator shall have the ability to manage user access security including sign-on facilities, permission control, and different levels of access for the files and directories.

II.07.03. General Software Functional Requirements

The CTRMA shall own all property rights, including intellectual property rights, in the software and all associated documentation developed and provided under this Contract to meet the requirements specified in this document.

Toll Collector audit and reconciliation, and vault reconciliation are some of the key functions of the auditors at the host. The host will interface with the TxDOT Customer Service Center/Violation Processing Center to transmit and reconcile ETC transactions and violations.

The operational procedures and requirements are described here to allow the Contractor to understand the CTRMA's proposed operations. If the Contractor has Standard Toll

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Collection System application, the Contractor is allowed to propose such application if it provides toll management, audit, reconciliation and reporting functionality similar to what is described below. The Proposal shall include the list of toll agencies where such a Standard application is used. The Proposal shall also clearly identify functionality that is not in the Contractor's Standard application and how such functionality will be provided. It is anticipated that during the design review phase, the Contractor's Standard application will be reviewed and modifications/additions to it discussed at that time. The Contractor shall consider this approach while pricing the Proposal and describe innovative plans for achieving the CTRMA needs. The screen designs and report formats will be discussed, reviewed and finalized during the design phase.

II.07.03.01. Toll Collection Audit Functions

All data entered by the Supervisors at the plaza and money counted by the bank are transferred to the Host Computer. At the System end, each time the Toll Collector logs in and out of lane, SOD records are created by summarizing the transactions for that SOD. At the end of the Shift, a Shift summarization is performed. A Business Day Assignment process that runs at the plaza assigns a Business Day to all pertinent data. All this data is transferred to the host upon the completion of the Business Day Assignment process. The bank information along with the data from the System shall be used to audit the Toll Collector. The main objective of the entire audit process is to ensure that the information is accurate so that revenue and transaction reporting can be correct.

II.07.03.01.01. Verification of Business Day Status

The first step in performing the audit is a confirmation that the Business Day at the plaza has closed. This is a confirmation that all the System data from the lanes and the plazas have reached the host and the audit can start. Business Day status report shall be available that shows the status and indicates if there are any problems and if manual intervention is needed.

II.07.03.01.02. Audit Assignment

The Audit Supervisor shall have the ability to assign each Auditor specific plaza(s) that they need to audit. Only the plaza(s) assigned to an auditor shall be available to the Auditor for audit. Users with higher privileges can audit all Toll Collectors.

II.07.03.01.03. Bank Cash Deposit

The Auditor shall have the ability to generate the Bank Cash Deposit Screen that shows a quick comparison of the Toll Collector Deposit as recorded by the Toll Collector to what was reported by the bank for the selected Business Day and Plaza. Only the plazas assigned to the Auditor shall be made available. Variance (actual - indicated) shall also be shown along with a % variance. Variances of 1% or more are flagged, and variances of 5% or more are flagged for further investigation by the Plaza Supervisor and/or the bank. Capability shall exist to adjust both the deposit amount and the amount reported by the bank. All adjustments shall require the entry of comments and the auditor can choose from a list of common comments or add their own. The adjustment shall be recorded in the System and the record shall be flagged.

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Once the adjustments for individual Toll Collectors are made and the Auditor is satisfied with the data, they shall have the ability to choose or enter comments for this selected day. The System shall recalculate the % variance with the adjustments and this process shall be deemed complete once it is acknowledged as complete by the Auditor. Once this process is complete, this screen shall become *View Only* and all other changes shall be made via an adjustment screen. Most common reasons for variance are the deposit of the change fund and missing bank data. Various reports shall be made available to authorized personnel.

All adjustments shall be made available to the Audit Supervisor for review and approval.

II.07.03.01.04. Plaza Toll Collector Audit

After confirming the Bank Cash Deposit Screen to be complete, the Auditor shall have the ability to generate the Plaza Toll Collector Audit Screen for a selected Business Day and Plaza. Only the plazas assigned to the Auditor shall be made available. The screen displays the following data for each Toll Collector Shift:

- Axles: indicated (by Toll Collector), detected (by treadles/loops) and AVC
- Total Vehicle Count: indicated (by Toll Collector) and AVC
- Revenue: indicated (by Toll Collector) and actual (by bank)
- Variance for each of the above will also be shown

Toll Collectors who have a 5% or more variance in any of the categories above shall be flagged. The Auditor then reviews the details for selected Toll Collectors and/or confirms a Toll Collector audit as approved. If a Toll Collector Shift warrants further investigation, this is noted on the screen. The Auditor shall have the ability to choose or enter comments for each Toll Collector or the entire screen. Upon the completion of this process, the Auditor approves the data on the screen by acknowledging the process as complete. Once this process is complete, this screen shall become *View Only*. Adjustments to the Toll Collector Shift are not made through this screen. Various reports shall be made available to authorized personnel.

II.07.03.01.05. Toll Collector Adjustments

Toll Collectors who were flagged for investigation during the above process are further audited through the Toll Collector Adjustment process. The Auditor shall have the ability to generate the Toll Collector Adjustment screen for the selected Business Day and plaza and the flagged Toll Collectors shall be listed with the summary information as above. The Auditor shall have the ability to bring up the details for the selected Toll Collector and performs the audit. The details for audit include:

- Toll Collector classification summary for each payment type
- AVC summary for each payment type
- Variance between AVC and Toll Collector classification
- Indicated, detected and AVC axles with variances

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- Expected revenue for each payment type with total expected revenue
- Actual revenue and any adjustments made during the audit process
- An alarm message generated during the Toll Collector's Shift
- Any unusual occurrences recorded for the Toll Collector's Shift

The Auditor shall have the ability to review detailed transaction data, alarm or any other details that is available in the System to help with the audit. The necessary adjustments are made, appropriate comments are chosen or entered and the audit is completed. Upon the completion of this process, the same screen shall be made available to the Audit Supervisor for approval. Once approved, no more changes shall be made and the Toll Collector Audit is considered complete for that Business Day. The Toll Collector records that are adjusted shall be flagged and all the audited Toll Collectors are flagged as *Audit Complete*. Upon the completion of the above process the Audit Supervisor is notified that the Toll Collector audits are complete. Various reports shall be made available to authorized personnel.

II.07.03.01.06. Toll Collector Audit Approval

The Audit Supervisor shall have the ability to generate the Toll Collector Audit Approval screen, review the adjustments and the data, and approve the Toll Collector Audit. Once this process is complete, all reports shall display a complete flag denoting the data is final. Any data that arrives either from the bank or the plaza after the completion of this process shall be flagged as exceptions and should not change the reports. If this were to occur, the Audit Supervisor shall be notified and adjustments can be made when closing the month. Various reports shall be made available to authorized personnel.

II.07.03.01.07. Toll Collector Performance Evaluation

Various Toll Collector Performance Reports shall be made available to authorized personnel that help identify problem Toll Collectors. The reports shall display variances from System recorded information and also variances with other Toll Collectors. All unusual occurrences, alarms, and comments entered by the Supervisor and audit personnel shall be displayed to help analyze and investigate any potential problems.

II.07.03.01.08. Toll Collector On-site Audit

Based on the performance of the Toll Collectors, some of them shall be identified by the System for an on-site audit. The Audit Supervisor shall have the ability to generate Toll Collector performance reports that display problematic Toll Collectors identified during the audit process. All information regarding the audit shall be entered into the System and reports shall be made available to authorized personnel.

II.07.03.01.09. Change Fund Audit

On a random basis, the Auditors perform an audit on the Plaza Change Fund and identify discrepancies that are recorded in the System. Various reports shall be made available to authorized personnel.

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II.07.03.01.010. Patron Refunds

Patrons, who are short-changed by the Toll Collector, report the incident to the Supervisor at the plaza, or call in the incident. The details shall be recorded and the request is forwarded to the Auditor automatically for investigation when the Supervisor is unable to identify the discrepancy at the plaza. The Auditor reviews the Toll Collector Shift information to determine if there is a cash discrepancy. Depending on the findings, the patron is refunded the monies or the request is denied. All events related to this incident are recorded in the System. Various reports shall be made available to authorized personnel.

II.07.03.02. Vault Reconciliation

Coins deposited in the ACM are collected in the vaults. At regular intervals, the vaults are pulled and vault-pull message containing the vault contents shall be generated. At specific times the Bank Service Courier picks up the vaults. At the time of pick up, the Vault Manifest is used and the Supervisor and the Bank Service Courier personnel verify the vaults transferred.

II.07.03.02.01. Bank Vault Reporting

The bank sends a vault reconciliation file electronically that contains the details of the vault. The Contractor software shall support all electronic transfer of data with the bank. The System shall process this file and compare the vault-pull message data and the bank data for vault audit purposes. The Auditor shall have the ability to generate the Bank Vault Screen for a selected Business Day and plaza. The screen shall display the expected counts as per the vault-pull message and the actual as counted by the bank. If there is a vault reported by the bank that is not in the System, then it shall be flagged and the Supervisor shall be requested to investigate. If the System shows a vault that is not in the bank file, then the bank and the Supervisor are notified. If the need arises and the vault information has to be entered, then the auditor is given that capability to enter the vault information into the System and the record is flagged. If vault entries are made, the System shall require the entry of comments. Various reports shall be made available to authorized personnel.

II.07.03.02.02. Vault Reconciliation and Adjustment

After the initial verification and adjustments are made, the vaults are reconciled using the Vault Reconciliation Screen. Once the process is complete, the auditor approves the screen. Data shall be made available for reporting the vault information, and they can be printed or saved.

II.07.03.02.03. Vault Status

The System shall be provided with capabilities to generate reports that can display vault history by many formats allowing the auditor to identify problem lanes or problem vaults.

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II.07.03.02.04. Vault Revenue Reporting

The System shall be provided with capabilities to generate reports that can display the vault revenue and other vault details. This report can be generated by various selection criteria and sort options.

II.07.03.03. ETC Reconciliation

Unlike the Manual and ACM transactions, ETC transactions are transmitted to the CSC/VPC for posting to the customer account. ETC transactions shall be batched in files and transmitted every hour (configurable) or every 100,000 (configurable) transactions to ensure that they are posted immediately to the CSC/VPC. The CSC/VPC shall acknowledge the receipt of each file and post the transaction to the customer account. The host shall save all acknowledgements for investigation purposes for at least one month. If the transactions belong to other interoperable agencies, then they are forwarded on to those agencies by the CSC/VPC. Every transaction transmitted to the CSC/VPC shall be reconciled back to the CTRMA host on a file-by-file basis, and those transactions that are transmitted to other agencies shall be identified. All ETC transactions shall be reconciled back to the host until they are considered closed and have reached their final state. The details of the CSC/VPC interface shall be submitted during the design phase through an Interface Control Document (ICD).

II.07.03.03.01. ETC Transmission Reconciliation

Authorized personnel shall have the ability to generate the ETC Transmission Reconciliation report on a daily basis to confirm that all the transactions reported for the Business Day for the CTRMA System have been transmitted to the CSC/VPC and has been acknowledged as received. The CSC/VPC shall be notified if the report shows files that have not been acknowledged by the CSC/VPC. The host maintenance staff shall be notified if the transactions are shown as not transmitted. This is the basic report that is the building block for all other ETC reconciliation reports.

II.07.03.03.02. ETC Transaction and Revenue Reconciliation

Authorized personnel shall have the ability to generate the ETC Transaction and Revenue Reconciliation report for a Business Day to help the CTRMA reconcile the ETC transactions and revenue. It shall detail the posting status and be able to very quickly help identify problems. Transactions that are sent to other agencies normally reconcile back within two (2) days, and this report shall be considered final when all the transactions are reconciled with a posting status. Any variances in the count and revenue are investigated. This report shall also display what is owed by the CSC/VPC for transaction posted to the TxDOT CSC/VPC and what is owed by other agencies. The report shall be generated by the Agency, by plaza (lane or class). Various selection criteria shall be made available, and it can be generated for a range of days, by month, and by a range of months.

The ETC Revenue is booked as revenue as soon as the report is determined to be final for the day the transactions occurred, and will be the amount that is reconciled as payable.

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II.07.03.03.03. PTOL Transaction and Revenue Reconciliation

Non-payments that are posted to the plate account as transactions (PTOL) shall be reported separately and reconciled back at the transactions level very similar to the ETC toll. The Business Day of the transaction is used to report the transactions and revenue. The fees charged to the customer for a PTOL is reported separately at the CSC level only.

II.07.03.03.04. VTOL Transaction and Revenue Reconciliation

Violation that gets converted to toll is posted to the patron account and is considered ETC toll revenue (VTOL). Such transactions shall also be reconciled back at the transaction level and posted a Business Day of the date it was converted to toll. This will ensure that the ETC revenue posted for the date of the transaction does not change. VTOL is reconciled separately but very similar to the ETC toll. Similar reports shall be made available to reconcile the VTOL transactions and revenue.

II.07.03.03.05. ETC, PTOL, and VTOL Deposit Reconciliation

ETC, PTOL, and VTOL revenue that is expected for each Business Day shall be reconciled against the payment made by the CSC/VPC to the CTRMA. ETC, PTOL, and VTOL revenue for the TxDOT customers is usually paid the next Business Day. Payments from other interoperable agencies can be made later but should be made within a week. Reports available at the host shall allow for such reconciliation and shall match the bank wire information.

II.07.03.03.06. ETC, PTOL, and VTOL Adjustments

After the ETC, PTOL and VTOL are posted to the account it is possible that there could be disputes that result in the adjustment of the original toll. Such changes in revenue are considered adjustments for financial reporting purposes, and it reported on the date the adjustment was made. Adjustment information shall be send to the host electronically to reconcile the deposits. Reports shall be available at the host and CSC/VPC that show these adjustments and reconcile the payments made at the CSC/VPC.

II.07.03.04. Violations Reconciliation

Violation revenues are not realized immediately and recovery of the full amount is not possible. For revenue reporting purposes, violation toll revenue and violation fines/fees revenue are reported separately. A violation goes through numerous stages before a toll amount is recovered, and it has various points of closure (*Reject, VTOL, PAID, Waived, Write-Off*, etc). The time-frame for a violation toll to be recovered could be three (3) days to as long as sixty (60) days or more. For ease of tracking the violation through its stages and to ensure the violations are reconciled, violation reconciliation reporting is divided into two stages; Pre-Noticing and Post-Noticing.

Violation transactions are transmitted to the CSC/VPC once a day (configurable). The CSC/VPC shall acknowledge the receipt of each file. The host shall save all

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acknowledgements for investigation purposes for at least one month. Every transaction transmitted to the CSC/VPC shall be reconciled back to the CTRMA host until its closure.

As the violation moves through various critical stages, the information shall be reported back to the host for tracking purposes. The violation reconciliation reports shall be based on Business Day and shall be generated by plaza and by lane. The System shall also have the capability to drill down the high level reports to the class level, providing the details on violation pattern. These reports shall have sufficient data to inform the auditors of how many violations of the total were issued notice, how many violations were rejected, how many violations were converted to customers, etc. This information shall also be used to monitor the performance of the System and the CSC/VPC operations. If many violations are getting rejected due to bad image quality, then the Toll Collection System maintenance staff must be notified.

II.07.03.04.01. Review of Violations Status

Reports will be available at the CSC/VPC to monitor the violations and the VPC operations, and authorized CTRMA personnel shall be provided the ability to access to these reports via the host.

II.07.03.04.02. Reconciliation of Violation Payments

Depending on the CSC/VPC operations, violation payment may be remitted to a lockbox at the bank or could be processed at the CSC/VPC. Regardless, the payments shall be reconciled against the violations on a transaction basis and the amount paid to the CTRMA must match the payment information. Violation tolls, violation administrative fees, and violation fines shall be reported and reconciled separately. Various reports shall be made available to authorized personnel to help reconcile violation transactions and payments and also the VES performance.

II.07.03.05. Traffic Monitoring

For the purposes of traffic reporting and analysis, all transaction data shall be summarized by fifteen (15) minute intervals by payment method and vehicle class. The System shall have the capability to generate traffic reports and graphs based on transaction date so that these reports can be used to help project the traffic patterns for each toll location for a given time period. These reports are used by the Plaza Supervisors and Traffic Engineers when configuring the lanes and therefore needed on a lane basis. The System shall be capable of generating Traffic Statistic and Analysis reports on an hourly basis or in fifteen (15) minute intervals by payment method and by vehicle class showing the traffic volumes for each lane at a toll facility. Various graphical presentations shall be made available showing vehicle travel patterns and projecting various traffic statistics.

II.07.03.06. Toll Collection System Reports

All data entered or generated in the System shall be retrieved through reports and screens. Reports and screens made available through the System and on an ad-hoc basis shall have various selection and sort criteria. All reports and screens shall have the capability to be

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printed, saved in pdf format, html format, Access, and Excel formats. Selected reports shall be automatically generated and made available to authorized personnel at the start of the Business Day. Report requirements and designs shall be presented and finalized during the design review process. Additionally, after the deployment and implementation of the System, there may arise the need to create additional reports, and the Contractor shall support such additions.

II.07.03.07. Problem Reporting

The host personnel shall have access to the MOMS reports and can generate these at any time to observe the performance of the Maintenance Contractor and also observe the overall performance of the System. System problems that require lane closure for more than two (2) hours need to be investigated.

II.07.03.08. Host Management Functions

Various administrative functions related to toll collection operations are performed at the host, and the System shall provide the capability to authorized personnel to create and modify the required information.

II.07.03.08.01. Employee Setup and Maintenance Screen

Employee Setup and Maintenance is a critical task since the employee designations created through the System shall determine what privileges and access rights each employee is granted. The System shall have the capability to create new employees through the System or through data obtained from the other CTRMA systems such as the Payroll System or the Human Resource System. Through this screen, the employees shall be designated various titles based on their roles and responsibilities (job description). As one of the initial tasks, job descriptions shall be created and the job description should identify if the position is required to have access to open the lanes. The System shall allow the input and editing of generic job description/titles.

This screen shall be also used to activate and inactivate employees and also terminate them. The same screen shall be used to assign User ID and PIN for access to applications and authority to open lanes. As soon as the information is saved, the Employee Identification List shall be transmitted to the plaza to be sent down to the lanes. As soon as it is received by the lanes, the new list shall be initiated without rebooting the lane. The same Employee Identification List shall also be used by the Security Access System and the MOMS application.

II.07.03.08.02. Screen and Report Access

Capability shall be provided to assign privileges and access rights by job description to the Toll Collection System application including the security access application and the MOMS application. All application access and privileges shall be controlled through one application. All available screens and reports shall be displayed along with a listing of the job descriptions. For some screens, users are only allowed to view the contents and not allowed to enter any data. For some screens, the user is not allowed any access at all. Access

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privileges can be changed at any time, and are based on job description and are not at an individual level.

II.07.03.08.03. Toll Rate and Schedules

Capability shall be provided to create and manage Toll Rates and Schedules from the Host Computer and transmit the data to all the lanes from the plazas. Since the toll rates are different for each of the toll locations, separate rate tables shall be created for each toll location. The toll rate for cash and ETC transactions shall be defined for each class of vehicle. The CTRMA System shall support Value-Based Pricing and separate rate tables shall be established for the various periods of congestion based upon time of the day and day of the week. The System shall support a Holiday Schedule allowing different rates to be in effect on a holiday. A Default Rate Table is also defined which shall be used when no specific rate table is defined for a specific time. The System shall have the capability to support up to ten (10) different toll rates.

Toll Schedules shall be established that determine when the various rates go into effect and a twenty-four (24) hour period shall be defined. The CTRMA System shall have the ability to define different rates for each day of the week and allow for as many time slots within the day as are needed. Hourly increments are recommended. Toll Schedules shall clearly tell the lane when the new toll rate goes into effect and at that time the new toll rates shall be used. The lane shall close and open automatically when the new toll rate goes into effect. All applicable reports shall display the toll rate and toll schedule ID. The System shall have the capability to support up to ten (10) different Toll Schedules.

II.07.03.08.04. Lane Controller Executable Download

The System shall have the capability to download Lane Controller executable files and all other files required by the lane for its operations. Successful download of the files shall be verified and alarm messages generated if these files did not make it to specific lanes. Where possible all System application updates shall be automated requiring no action by the toll operations personnel.

II.07.03.08.05. Non-Revenue Auditing

The System shall have the capability to allow authorized personnel to generate queries based on transponders and transponder range to obtain the travel details.

II.07.03.08.06. System Maintenance Screen

In order to ensure that all the processes are working and file transfers are successful, the CTRMA System Maintenance person shall access screens that can verify the status of various file transfers including the files transmitted and received from the CSC/VPC. If files have to be transmitted to the lanes, this screen will show if the files were transmitted to all the lanes and what version is in use. Screens shall be available that show all the alarms generated by the various Systems including the operating system and the database.

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II.07.03.09. Finance Reporting

The System shall have the ability to generate a series of financial reports that will assist Finance and Budget with monitoring, tracking and reporting revenue and cash flow for accounting and planning purposes. The data for these reports shall be stored on the System for at least 24-months so that past year analysis can occur. Report capabilities shall allow data to be presented on a monthly or year-to-date basis. As appropriate, data can be generated on an authority, plaza or lane basis. Typically, data is stored and reported on a Business Day/Business Month.

II.07.03.09.01. Revenue Reporting

The following Revenue Reports, at a minimum, shall be available to Finance and Budget to identify the expected revenue from the System for a Business Day.

Lane and Plaza Shift Reports – These reports identify the expected revenue broken down by Cash, ETC and Non-payments. In addition, other types of Unusual Occurrences (e.g., Insufficient Funds) shall be included in the report. For ACM lanes, the vault details shall also be reported.

Money Bag Report – Based on the Money Bag Manifest, this report provides information on the amount reported to be deposited and the bank count for each Money bag associated with a Business Day.

Vault Report – Based on the Vault Manifest, this report provides information on the expected (reported by ACM) and bank count for each vault associated with a Business Day.

II.07.03.09.02. Transaction and Revenue Analysis

The following reports, at a minimum, are required by Finance and Budget to identify Transaction and Revenue totals for each Month. This information shall be used to analyze total expected revenue. Finance personnel shall be provided screens that show the various revenues and transactions for a month. Through this screen various adjustments shall be made to finalize the transaction and revenue reporting for a month. Adjustments against ETC and Violation revenue are also made through this screen. Screens shall be available by plaza and for the entire Turnpike System.

Transaction/Revenue Summary Report – This report identifies, on a Monthly basis, the total number of Cash, ACM, ETC and non-payment transactions for each location on the Turnpike System. Also included for each category are Fare Axles and Revenue. Similar reports for Year to Date and Monthly comparisons to last year's data are also required.

Non-payment Trend: Since the Finance and Budget is responsible for all of the CTRMA revenue, they shall have the ability to review Non-payment Trend reports to identify the

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lanes with high non-payment rates. Non-payment Trend reports by plaza by lane for a Business Day/Month shall be available to assist Finance and Budget in this endeavor.

Image Analysis: Loss of revenue due to bad image is also an issue that will be monitored by Finance and Budget. Reports showing the details of the image rejects by plaza by lane for a Business Day/Month shall be available to provide Finance and Budget the pertinent information.

II.07.03.09.03. Financial Audit

At a minimum, the Transaction/Revenue Reconciliation Report shall be available to Finance and Budget to identify the Transaction and Revenue for each location on the Turnpike System on a Monthly basis. This report identifies Total Transactions/Revenue including any System and operational adjustments. The ETC data includes total and reconciled counts for the Customer Service Center /Violation Processing Center. This report shall be the final report generated by the System considering all the adjustments made for the Business Day/Month.

II.07.03.09.04. Financial Revenue Reporting

Once the Business Day is closed, the final revenue reported by the System shall be entered into the General Ledger for the appropriate accounts. Since Non-payment and Violation Revenue are collected months after the non-payment transaction occurred, Finance and Budget shall have the ability to make the appropriate adjustments. Daily, Monthly and Yearly reports shall be available.

II.07.03.010. System Administrative Functions

System Administrative staff at the host shall have the ability to monitor the Plaza and Host Servers and perform day-to-day System maintenance functions to ensure that the System is performing efficiently. Various tools shall be provided to automate the necessary activities and all failures shall result in the notification to the MOMS.

II.07.03.011. Plaza Host Communications

The System shall be capable of allowing authorized plaza and host personnel to communicate with each other electronically very similar to messaging. This tool shall allow for files and screens to be transmitted among authorized personnel. Such a feature will streamline the communication process and expedite the inquiry and investigation process.

II.07.03.012. Interface to TxDOT CSC/VPC Systems

The Contractor shall design and develop an interface with the TxDOT CSC/VPC Systems for the transfer of the ETC and Violation data as specified in the Interface Control Document (ICD). The ICD will be finalized during the design process. The host shall also transmit the Toll Rate and Toll Schedules electronically to the CSC/VPC.

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The host shall also receive the incremental (changes on at least an hourly basis) and comprehensive (complete list once a day) Transponder Validation List from the CSC/VPC and forward the information to the Lane Controllers. The Contractor shall work with the CSC/VPC System provider to implement an interface between the CTRMA host and CSC/VPC in accordance with the agreed to ICD.

II.07.03.013. Interface to the Banking Services

The Contractor shall design and develop an interface with the designated banking services to receive the Toll Collector and vault money counts. The transfer and notification of the funds from the CSC/VPC to the bank shall be automated.

II.08. Performance Requirements

The Contractor shall provide a Toll Collection System that is designed to meet the accuracy and throughput requirements listed below at the speeds specified below for each lane type. These requirements apply to all lane types.

It is recognized that, to some extent, performance of the ETC portion of the toll collection system will be dependent on the performance achieved by the TransCore tags and readers, as well as the quality of the tags and batteries being used from cooperating agencies. The Contractor is required to design the ETC portions of the toll collection system with the functionality and performance capabilities equal to or better than the documented performance characteristics achieved by the TransCore elements of the system.

The Contractor shall provide a Toll Collection System that is designed with the objective of meeting the accuracy and throughput requirements listed below at the speeds specified below for each lane type which may be adjusted to reflect the performance achievable with the toll tag technology. These requirements apply to all lane types.

II.08.01. Accuracy Requirements

The Contractor shall provide a Toll Collection System that meets the accuracy requirements described below. During the Operational Test, the System compliance with these requirements, as modified to reflect toll tag characteristics, must be verified before Project Acceptance.

II.08.01.01. Vehicle Detection and Association Accuracy

The System shall without exception detect vehicles and accurately associate axles and other sensor information to the vehicle with an accuracy of 99.9%.

II.08.01.02. Vehicle Classification Accuracy

The System shall without exception classify vehicles with an accuracy of 99.9%.

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II.08.01.03. Tag Read and Association Accuracy

The System shall read the TxTag that is properly mounted with an accuracy of 99.9% and shall correctly associate the tag reads with the correct vehicle with an accuracy of 99.9%.

II.08.01.04. Image Capture Reporting Accuracy

The VES shall capture, report and correctly associate an image to the correct vehicle as defined in the Business Rules with an accuracy of 99.9%.

II.08.01.05. Image Capture Quality

The quality of image capture shall allow for the license plate numbers to be identified through the use of Optical Character Recognition (OCR) software and the Contractor shall work with the VPC vendor in meeting the VPC requirements. The image quality shall allow for the identification of the jurisdiction. The field of view of the image captured shall allow the vehicle type and the location of the vehicle to be determined from the image.

II.08.01.06. Transaction Reporting Accuracy

All transactions generated by the Lane Controllers in accordance with the above accuracy requirements shall be reported at the associated Plaza Computer and the Host Computer with an accuracy of 100%.

II.08.01.07. ACM Coin Detection and Counting Accuracy

The ACM shall be capable of detecting and measuring all American coins currently in circulation in the U.S. The coin counting accuracy shall be 99.96% for valid coins. Valid coins will be defined as the programmed coins in the ACM coin detection table.

II.08.02. *Transaction Throughput Requirements*

The Toll Collection System shall be designed to have the capability to process vehicular transactions at the rates defined below for the given lane configurations.

- ACM/ETC Lanes – Coins and AVI 900 vph
- Manual/ETC Lanes – Toll Collector and AVI 800 vph
- Dedicated ETC Lanes 1200 vph
- Express ETC Lanes 2200 vph *per lane*

II.08.03. *ACM Coin Detection and Counting Speed Requirements*

The coin detection and counting speed of the AM shall be based on two criteria. The speed to detect and count a single coin transaction shall not exceed .8 second for valid coins. The speed to detect and count up to five coins for the same transaction shall not exceed 1.5 seconds for valid coins.

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II.08.04. Image Processing Throughput Requirements

The Toll Collection System shall have the capability to process images at the rates defined below for the given lane configurations.

- ACM/ETC Lanes – Coins and AVI 30%
- Manual/ETC Lanes – Toll Collector and AVI 1%
- Dedicated ETC Lanes 6%
- Express ETC Lanes 50%

II.08.05. Design Speeds

The System shall be designed to have the capability to process vehicles traveling at the speeds shown below for the given lane configurations:

- ACM/ETC Lanes – Coins and AVI 0-50 mph
- Manual/ETC Lanes – Toll Collector and AVI 0-50 mph
- Dedicated ETC Lanes 0-80 mph
- Express ETC Lanes 0-100 mph

Technical Requirements

Chapter III

III. Installation Requirements and System Implementation

III.01. Installation Program

The Contractor is responsible for the installation of all Toll Collection System equipment provided under this Contract. The Developer is responsible for the Infrastructure design and installation on the US183-A Turnpike. The TxDOT is responsible for the Infrastructure design and installation on other toll facilities as specifically described in the **Attachment B, Scope of Work**. The Contractor is responsible for coordinating with the Developer and the TxDOT during the build-out phase to ensure the Contractor's design criteria are considered. The Contractor shall submit to the CTRMA for review and approval Installation Plan and Installation Drawings. The Contractor shall use the Schedule identified in **Attachment B** as a guideline for the installation work.

This section outlines the installation requirements of the CTRMA, which shall include all labor, materials, transportation, and support services (where applicable). All installations shall comply with all applicable laws, ordinances and codes (specifically, NEC, TxDOT and OSHA), and have the approval of all governing authorities. The Contractor shall be responsible for all costs associated with any permits, plan reviews and inspections.

To ensure that all systems operate as expected, the Contractor is required to participate in the installation phase of the toll facilities. There will be a meeting, or a series of meetings, between the Contractor, the Developer, TxDOT and the CTRMA to clearly define and develop the installation requirements, methodology, timetables, test scripts, roles and contingency plans.

The Contractor is also required to be present throughout the actual installation of the toll facilities infrastructure to ensure that it is build to the specification of the Contractor and meets the Toll Collection System Installation needs.

III.02. Installation Scope of Work

This section describes the Contractor's installation responsibilities as it relates to documentation, installation and testing.

III.02.01. Installation Requirements

The Contractor is responsible for installation, terminating and testing all equipment provided by the Contractor as part of the Toll Collection System under this Contract. It shall include but not be limited to:

III.02.01.01. In-Lane Systems

The Contractor is responsible for:

- All conduits, trays and wiring for all in-lane equipment and connections to the plaza

Technical Requirements

- Installation of all cabinets and enclosures required for the in-lane electronics including air conditioning devices as required
- Installation of all support structures required for the toll collection equipment
- Installation of any roadside cabinets and termination of equipment in these cabinets
- Installation, termination and field testing of all in-lane equipment
- Tuning and testing of the AVI System
- Installation and testing all in-booth equipment
- Installation, configuration and testing of the ACM, and its vaults
- Installing all equipment and wiring needed for the Security Access System
- Installing and testing of the UPS and Emergency Generators on Express Toll Locations and on Toll Ramps

III.02.01.02. Plaza Systems

The Contractor is responsible for:

- Installing and testing all plaza workstations, printers and other equipment in the Field Operations Building
- Installation of the Equipment Cabinets and Plaza Server System in the Plaza Computer room
- Installation of the Local Area Network/Wide Area Network and supporting network equipment
- Installation and testing of the UPS
- Installation and testing of the Emergency Generators
- Installation of the Security Access System
- Installation of the communication network to various ramps and CTRMA Administrative Offices as needed

III.02.01.03: Host Systems

The Contractor is responsible for:

- Installing and testing all host workstations, printers and other equipment in the CTRMA Administrative Offices.
- Installation of the Equipment Cabinets and Host Server System in the Host Computer room
- Installation of the Local Area Network/Wide Area Network and supporting network equipment
- Installation and testing of the UPS
- Installation of the Security Access System
- Installation of the communication network to various ramps/Field Operations Building and CSC/VPC

III.02.02. *Documentation*

The Contractor shall submit to the CTRMA for review and approval the following documentation.

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III.02.02.01. Installation Plan

The Installation Plan shall describe the installation concepts to be used by the Contractor while installing the CTRMA Toll Collection equipment. It shall detail all the termination and testing that will be performed on each component to make it operational. In general the Installation Plan shall address the following at a minimum:

- The need for all installations to be as transparent as possible to the motoring public at facilities where the roadway is open to public
- The need to complete all installations with safety as the paramount theme
- The logistics associated with the installation of equipment and systems at various sites along the CTRMA Turnpike
- The need to complete all installations in accordance with the project schedule
- Detailed lane and toll booth equipment and layouts
- Detailed AVI Reader Unit and antennae equipment and layouts
- Pre-installation test and acceptance procedures
- Shop drawings, documentation and other required submittals
- Lane sub-system testing and acceptance procedures
- Plaza/host sub-system testing and acceptance procedures

The Contractor shall take all actions necessary to prevent any problems that could impact vehicle throughput or endanger any patron, Authority employees, or Contractor employees during lane equipment installation activities. Any physical problems identified during site visits or during construction shall immediately be noted and be presented to the CTRMA. The Contractor shall cease all work as directed by the CTRMA, where applicable. The Contractor shall certify to the CTRMA that a site is ready for the installation of new equipment before any installation activity begins. No work shall be initiated at any site without the written authorization of the CTRMA.

III.02.02.02. Installation Design and Drawings

The Contractor shall submit shop drawings detailing the installation design that can be used on-site for installation purpose. All electrical installation work shall be compliant to applicable electrical standards and must meet the Engineering Design Standards described below. All installation drawings that are used for on-site installation purposes should be certified by a Professional Engineer. UPS and Emergency Generator installation and wiring diagrams should include the sizing requirements. Detailed drawings shall be provided for each lane configurations and if measurements differ from site to site, these shall be noted. For the Plaza/Host Computer room installation, detailed equipment cabinet layout drawings shall be provided. If break out boxes are required such details shall be included.

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III.02.02.03. Engineering Design

The Contractor shall secure the services of a fully qualified engineering design firm(s) for the purpose of performing all infrastructure related engineering design (civil, structural, electrical, mechanical, and architectural) and the preparation of related plans and documentation under this Project. All design work shall be performed under the direct supervision of a Licensed Engineer of the appropriate discipline or Architect in the State of Texas. The engineering design firm(s) shall be subject to the approval of the Authority. If the Engineering Design effort is performed by the Contractor, the Contractor shall submit documentation showing the required qualifications.

III.02.02.04. Electrical Work

Electrical work to be performed shall include, but not be limited to, the following general items of work:

1. Install junction boxes and terminate new cable and conduit attachment devices, where applicable. A new grounding system shall be provided for the Toll Collection facilities. Conduits, manhole frames, metallic junction boxes and other conductive items shall be bonded to the grounding system in conformance with the NEC.
2. Prepare the Field Operations Building and the CTRMA Administrative Offices for the installation of new plaza computers and associated equipment and new host computer and associated equipment, respectively. Furnish and install new isolated ground UPS circuits, where required. An adequate quantity of isolated ground receptacles shall be provided with UPS conditioned power circuits, throughout the Field Operations Building and CTRMA Administrative Offices, in support of any new toll systems computer equipment installed under this Contract. These receptacles shall be clearly identified by color and labeled as receptacles providing isolated ground UPS power for computer use only.
3. Install the electrical infrastructure in toll booths, toll islands, tunnels and toll plaza canopies, as required to facilitate the installation of the new lane controllers, patron feedback equipment, AVI equipment, VES equipment and AVC equipment. The Contractor shall determine the electrical power type requirements (i.e., conditioned or unconditioned) for each item of equipment installed under this Contract and shall ensure that appropriate electrical infrastructure is provided to support those requirements.
4. Perform all modifications within toll booths and at toll islands to accommodate the installation of the new toll system equipment and related items of work, to include but not be limited to terminations of new equipment, performing all electrical installations associated with the installation of new toll system lane controllers, making required connections to other toll booth systems, and providing all protection and grounding of equipment and devices.
5. Furnish and install new surge protection equipment in the Field Operations Building and CTRMA Administrative Offices power rooms on incoming utility electrical services.

Technical Requirements

6. Furnish and install a new lightning protection system for the toll collection facilities.

III.02.02.05. Electrical Methods and Materials

The following methods and materials specifications shall be followed, as applicable, for items of general electrical work to be performed under this project. References made in this section to various Divisions and Sections (e.g. 16000) refer to the Construction Specifications Institute (CSI) Standard Specifications, and subordinate sections of the same document. The Contractor shall utilize the master CSI document as a standard reference for all electrical work not specifically cited in these Technical Specifications.

III.02.02.05.01. Electrical General Provisions (Section 16000)

SUMMARY

This section specifies several categories of provisions for electrical work, including:

1. Certain adaptive expansions of requirements specified in Division 1.
2. General performance requirements within the electrical systems as a whole.
3. General work to be performed as electrical work, because of its close association.

SUMMARY OF ELECTRICAL WORK

Specifications: Refer to Division 16 sections for the primary technical specifications of electrical work.

General Outline: The general facilities and systems affected by work or proposed under this Contract are as follows:

1. Electrical service, control and power distribution systems, including the electrical connection of equipment.
2. Standby and special power generators and transformer/converter/rectifier equipment.
3. Toll Collection systems.
4. Computer Systems.
5. Lightning Protection Systems

COORDINATION OF ELECTRICAL WORK

Refer to Division 1 sections for general coordination requirements applicable to the entire work. It is recognized that the contract documents are diagrammatic in describing certain physical relationships which shall be established within the electrical work, and in its interface with other work including utilities, and that such establishment is the exclusive responsibility of the Contractor.

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Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction, and with a minimum of 7'0" overhead clearance where possible.

Locate operating and control equipment properly to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance. Advise other trades of openings required in their work for the subsequent move-in of large units of electrical work (equipment).

Coordination Drawings: For locations where several elements of electrical work shall be sequenced and positioned with precision in order to fit into the available space, prepare coordination drawings (shop drawings) showing the actual physical dimensions (at accurate scale) required for the installation. Prepare and submit coordination drawings prior to purchase-fabrication-installation of any of the elements involved in the coordination.

Coordination of Options and Substitutions: Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface requirements has been checked and satisfactorily established.

SUBMITTALS FOR ELECTRICAL WORK

The Contractor, prior to forwarding shop drawings and product data to the Engineer, shall check all conditions and make all corrections and sign and date each set. No shop drawings will be reviewed by the Engineer without the signature of the Contractor which shall signify that he has checked the submittals.

Record Drawings: For electrical work, give special attention to the complete and accurate recording of underground conduit and/or cable. Location of major pieces of electrical equipment if different than shown on drawings such as panel boards and major feeders should be carefully recorded on a set of record drawings maintained for this purpose. Work done by change orders where not shown on original documents should also be so recorded. These record drawings shall be submitted to the Engineer upon completion.

QUALITY ASSURANCE AND STANDARDS

Specifically, for the electrical work (in addition to standards specified in individual work sections), the following standards are imposed, as applicable to the work in each instance:

- NEC, National Electrical Code (NFPA No. 70).
- NFPA No. 101, Life Safety Code.
- ANSI C 2, National Electrical Safety Code.
- ANSI C 73, Dimensions of Attachment Plugs and Receptacles.
- NECA standards for installation.
- NEMA standards for materials and products.

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UL, Underwriters Laboratories.

PRODUCTS, ELECTRICAL WORK

Refer to Division 1 sections for general requirements on products, materials and equipment. The following provisions expand or modify the requirements as applicable to electrical work:

Product Listing: Prepare the product listing for electrical work, separately for the listing(s) of products for other work. Include listing of each significant item of equipment and material used in the work; and indicate the generic name, product name, manufacturer, model number, related specification section number(s), and estimated date for start of installation. Materials such as conductors, conduit and boxes taken from Contractor's stock need not be listed. For principal equipment items, list the input/output ratings.

Compatibility: Provide products which are compatible with other products of the electrical work, and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with other work.

ELECTRICAL SYSTEM IDENTIFICATION

Distribution System Equipment: Provide engraved plastic laminate nameplates (orange with black letters ANSI A13.1) on all distribution system equipment including but not limited to switchboards, distribution panels, panelboards and system control panels. Text shall be panel name, designation and electrical characteristics. Letters shall be 1/8" high unless larger size is required for clarity on large arrangements. Markers and colors shall meet requirements of ANSI A13.1-1975 where applicable. (Generally orange with black lettering). Lighting and power panelboards shall have typewritten circuit schedules. All junction boxes and boxes related to flexible wiring system shall be marked with panel and circuit connection using black indelible marker.

Underground Cable Identification: Bury a continuous, pre-printed, bright-colored plastic ribbon cable marker with each underground cable (or group of cables), regardless of whether conductors are in conduit. Locate each directly over cables, 6" to 8" below finished grade.

Cable/Conductor Identification: Provide cable/wire labels on each conductor of primary electrical runs, at enclosures where conductors of more than one circuit or system are present and interrupted. Mark to match contract document numbering and other numbering as subsequently established. Secondary branch wiring with color-coded conductors need not be labeled.

Operational and Warning Signs: Provide engraved plastic-laminate or baked enamel signs at locations of major units of electrical equipment including panelboards, control centers, transformers, lighting controls, emergency gear, and alarm, signal, TV and similar systems, where affected by work under this project.

Attachment E

Technical Requirements

Provide warning signs where there is hazardous exposure or danger associated with access to or operation of electrical facilities. Provide text of sufficient clarity and lettering of sufficient size to convey adequate information at each location; mount permanently in an appropriate and effective location. Comply with ANSI A13.1 standard for color and design.

Operational Tags: Where needed for proper and adequate information on operation and maintenance of electrical systems, provide tags of plasticized card stock, either pre-printed or hand printed to convey the message.

ACCESS, CUTTING AND PATCHING

Access Units: The work of this article is limited to the provisions for access to electrical work. In general and where possible, furnish or furnish-and-mount required access units to other trades prior to their work, so that cutting and patching for the subsequent installation of such access units will not be required.

In occupied spaces, provide finished access units of the maximum concealment type, including locks where appropriate, and matching other access units provided in the same expanse of finish (for non-electrical access, if any).

Removable Access Plates: Where only hand access is sufficient, provide removable plate-type access unit, of minimum size which will facilitate the required access. Provide units of the type, style, design, material and finish appropriate for the location and exposure in each instance. In exposed surfaces of occupied spaces provide round plate units, flush floor units and frame-less low-profile wall units, primed-for-paint in painted surfaces and polished chrome or stainless steel finish in other surfaces.

Cutting and Patching: Comply with the requirements of Division 1 for the cutting and patching of other work to accommodate the installation of electrical work. Except as individually authorized by the Engineer, cutting and patching of electrical work to accommodate the installation of other work is not permitted.

FLOOR AND WALL PENETRATIONS

Where electrical materials penetrate walls or floors that are a part of a fire separation or assembly, the opening shall be effectively sealed to maintain separation integrity. Openings shall be closed using General Electric RTV850 Silicone RVT Foam, or approved equal to form a fire rated, water-tight seal, installation with automatic mixing only. The penetration seal materials shall pass ASTM E 814 (UL 1479) Standard Method of Fire Tests for Through Penetration Fire Stops up to the required fire resistance.

EXCAVATING FOR ELECTRICAL WORK

The work of this article is defined to include whatever excavating and back-filling is necessary to install the electrical work. Coordinate the work with other excavating and back-filling in the

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same area, including dewatering, flood protection provisions, and other temporary facilities. Coordinate the work with other work in the same area, including other underground services (existing and new), landscape development, paving, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and back-filling.

General Standards: Except as otherwise required, comply with the applicable provisions of Division 1 for electrical-work excavating and back-filling. Refer instances of uncertain applicability to the Engineer for resolution before proceeding.

Replacement of Other Work: Where it is necessary to remove and replace landscape work, pavement, flooring and similar exposed finish work, install the replacement to meet original conditions as approved by the Engineer.

ELECTRICAL WORK CLOSEOUT

Refer to Division 1 sections for general close-out requirements. Maintain a daily log of operational data on electrical equipment and systems through the close-out period; record hours of operation, assigned personnel, power consumption and similar information; submit copy to the Authority.

Coordination with Mechanical: Coordinate close-out operations with close-out of toll collection systems, and other power consuming equipment. Accurately record locations of primary conductors which are underground or otherwise concealed. Test run electrical equipment in coordination with test runs of mechanical systems. Clean and lubricate operational equipment. Document the operations, sequencing, maintenance and safety/emergency provisions of the electrical systems in the Maintenance Service Manuals. Until the time of final acceptance of the total work of the Contract, maintain the electrical systems. As part of the Maintenance Training perform the following at a minimum:

- Describe each basic electrical system.
- Outline basic maintenance procedures and major equipment turnaround requirements, including adjustments to optimize output and efficiency of electrical systems.
- Display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage of extra materials, meter readings and similar service items.

Construction Equipment: After completion of performance testing and training, remove Contractor's tools, test facilities, construction equipment and similar devices and materials used in execution of the work but not incorporated in the work.

ELECTRICAL SYSTEM TEST

Modifications to building electrical systems upon completion shall be tested and adjusted by factory engineers from applicable equipment manufacturers, where required. The Contractor

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shall be responsible for coordinating test and adjustment times to provide simultaneous testing of complete system. Certified reports containing full test procedures and results shall be submitted to the Engineer for approval.

System tests shall include Contractor testing of conductors and busducts, testing of all branch circuits, secondary devices and ground fault protection systems.

Upon completion of testing and submission of approval of report, a demonstration of operation shall be conducted in the presence of the Engineer. Factory representatives for applicable equipment shall be present for this demonstration.

Upon completion and energizing of electrical systems, a complete survey shall be made using infrared scanning procedures to identify loose terminations of cables or bussing. Results shall be submitted to the Engineer for review.

Construction Equipment: After completion of performance testing and Owner's operating instructions and demonstrations, remove installer's tools, test facilities, construction equipment and similar devices and materials used in execution of the work but not incorporated in the work.

COMMUNICATIONS PROVISIONS

Provide outlets, raceways, device plates, etc., in conformance with the applicable sections of this specification, as may be required. Consult the Telephone Co. and comply with their requirements where required. Maintain 12" separation between all power and communications services.

Raceways shall be in accordance with "Raceways" part of Section 16110 and the following special conditions. Minimum size shall be 3/4" unless otherwise noted. No more than two standard factory 90 degree bends per 100' or three 90 degree 24" radius bends.

III.02.02.05.02. Electrical Raceways (Section 16110)

SUMMARY

The requirements of this section apply to electrical raceway work specified elsewhere in these specifications.

The types of electrical raceways required for the project may include the following:

- Electrical metallic tubing for interior use in buildings only.
- Liquid-tight flexible metal conduit (max. 24-inch lengths) where approved by the Engineer.
- Rigid metallic conduit for exposed use and in concrete.
- Rigid nonmetallic conduit for underground use only.
- Surface metal raceways where approved by the Engineer.

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- Cabletray where approved by the Engineer.

Flexible non-metallic conduit of any type is not permitted for use on this project.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in manufacture of electrical raceways of types and capacities required, whose products have been in satisfactory use in similar service for not less than three years.

NEMA Compliance: Comply with applicable portions of National Electrical Manufacturers Association standards pertaining to nonmetallic duct and fittings for underground installation.

UL Labels: Provide electrical raceways which have been listed and labeled by Underwriters Laboratories.

NEC Compliance: Comply with National Electrical Code (NFPA No. 70) as applicable to construction and installation of electrical raceways.

PRODUCT DELIVERY, STORAGE AND HANDLING

Provide color-coded end-cap thread protectors on exposed threads of threaded metal conduit. Handle conduit and tubing carefully to prevent bending and end-damage, and to avoid scoring finish. Store pipe and tubing inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, watertight wrapping.

MATERIALS AND COMPONENTS

For each electrical raceway system required, provide a complete assembly of conduit or tubing with fittings including, but not necessarily limited to, connectors, nipples, couplings, elbows, expansion fittings and other components and accessories as needed to form a complete system of type required.

Metal Conduit, Tubing and Fittings: Provide metal conduit, tubing and fittings of type, grade, size and weight (wall thickness) required for each application. Where type and grade are not indicated, provide proper selection determined to fulfill wiring requirements, and comply with National Electrical Code for electrical raceways.

Rigid Aluminum Conduit: FS WW-C-540 and ANSI C80.5.

Rigid Steel Conduit: FS WW-C-581 and ANSI C80.1.

Rigid Metal Conduit Fittings: FS W-F-408, Type and Classes as required.

Technical Requirements

Liquid-tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit comprised of single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside; forming smooth internal wiring channel; with liquid-tight jacket of flexible polyvinyl chloride (PVC).

Liquid-tight Flexible Metal Conduit Fittings: FS W-F-406, Type as required.

Nonmetallic Conduit and Fittings: Provide nonmetallic conduit and fittings of type, size and weight (wall thickness) required for each service. Where type and grade are not indicated, provide proper selection determined to fulfill wiring requirements, and comply with National Electrical Code for electrical raceways, and with type selected in accordance with applicable standards.

Surface Metal Raceways: Provide raceways for surface mounting as required. Raceways shall be of rectangular cross section of size as required by the National Electrical Code (NFPA No. 70) for conductor fill. Raceways shall be of design to accommodate wiring devices as required. Finish shall be of factory prime coat for field painting.

Conduit and Tubing and Raceway Accessories: Provide conduit, tubing and raceway accessories including straps, hangers, angles expansion and deflection fittings as recommended by conduit, tubing and raceway manufacturers.

Cabletray: Provide trough type, ventilated cabletray with 4" inside working depth. Tray shall conform to NEMA Standards publication VE1-1965 and be of class required to support conductor weight as required. Horizontal runs shall be open top and vertical runs shall be closed top with cable supports as required. Installation shall include all offsets, transitions, connectors, hangers, supports, etc. required for complete installation.

INSTALLATION

Install conduit and tubing products as required, in accordance with manufacturer's written instructions, applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve intended function.

Complete the installation of electrical raceways before starting installation of cables within raceways.

Galvanized rigid steel or rigid aluminum conduit shall be used for sizes 3/4" and larger. Where conduit is installed in earth, it shall be PVC, Schedule-40 (min.) conduit. Galvanized rigid steel conduit shall be used in concrete slabs on grade.

Provide liquid-tight flexible conduit for electrical equipment where subject to movement and vibration.

Technical Requirements

Wherever possible, install horizontal raceway runs above water and steam piping. Install surface metal raceways and accessories as required on elevations. Carefully coordinate with interior finishes and furnishings.

At any point where a conduit crosses an expansion joint, or where movement between adjacent sections of conduit can be expected, bronze or alloy expansion fittings shall be installed equal to Type AX as made by the O.Z. Electrical Manufacturing Co., Inc., or equivalent by Hope or Spring City.

III.02.02.05.03. Wire and Connectors (Section 16120)

SUMMARY

The requirements of this section apply to the wire work specified elsewhere in these specifications.

The applications for wire and connectors required on the project may include the following:

- Power distribution circuitry.
- Toll equipment circuitry.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of electrical products of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.

Electrical Installation Contractor: A firm with at least five (5) years of successful installation experience on projects with electrical wiring installation work similar to that required for the project.

NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical cable, wire and connectors.

UL Labels: Provide electrical cable, wire and connectors which have been listed and labeled by Underwriters Laboratories.

NEMA/ICEA Compliance: Comply with National Electrical Manufacturers Association/Insulated Power Cable Engineers Association Standards publications pertaining to materials, construction and testing wire cable, where applicable.

PRODUCT DELIVERY, STORAGE AND HANDLING

Provide factory-wrapped water-proof flexible barrier material for covering wire and cable on wood reels, where applicable; and weather resistant fiberboard containers for factory-packaging

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Technical Requirements

of cable, wire and connectors, to protect against physical damage in transit. Do not install damaged cable, wire or connectors; remove from project site.

Store wire and connectors in factory-installed coverings in a clean, dry indoor space which provides protection against the weather.

MANUFACTURERS

Provide products produced by one of the following (for each type of cable, wire and connectors):

Cable and Wire:

- Anaconda Wire and Cable Co.
- Cerro Wire and Cable Co.
- Cyprus Wire and Cable Co.
- Electrical Cable Div., USS Corp.
- General Cable Corp.
- Phelps Dodge Cable and Wire Co.
- Plastic Wire and Cable Corp.
- Wire and Cable Dept., General Electric Co.
- Rome Cable Corp.

Connectors:

- AMP Inc.
- Burndy Corp.
- General Electric Co.
- Ideal Industries, Inc.
- Minnesota Mining and Mfg. Co.
- OZ/Gedney Co.
- Thomas & Betts Co.

WIRE AND CONNECTORS

Except as otherwise required, provide wire and connectors of manufacturer's standard materials, as required by published product information; designed and constructed as recommended by the manufacturer, and as required for the installation.

Wire:

Provide factory-fabricated wire of the size, rating, material and type as required for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and with NEC standards. Select from only the following types, materials, conductor configurations, insulations, and coverings:

Technical Requirements

UL Type: THW. (Sizes #6 AWG and larger)
UL Type: THHN. (Sizes up to #8 AWG)
UL Type: USE. (Underground installation)
Material: Copper.

Conductors: Solid (AWG 20 to AWG 16 only).
Concentric-lay-stranded (standard flexibility) (AWG 14 and larger).

All wire shall be color coded as follows:

<u>120/208 VOLT</u>	<u>277/480 VOLT</u>
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Orange
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White
Ground - Green or Bare	Ground - Green or Bare

INSPECTION

The Contractor shall examine the areas and conditions under which cable, wire and connectors are to be installed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

INSTALLATION

Install electrical wire and connectors as required, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended functions.

Coordinate cable and wire installation work with electrical raceway and equipment installation work, as necessary for proper interface.

All wire and cable shall be in first class condition when they are installed. Lo-leak lubricants manufactured for the purpose may be used as a pulling lubricant when necessary. All wires shall be continuous from outlet and there shall be no unnecessary slack in the conductors.

Install splices and taps which have equivalent-or-better mechanical strength and insulation as the conductor. Use splice and tap connectors which are compatible with the conductor material.

Technical Requirements

FIELD QUALITY CONTROL

Prior to energizing, check wire for continuity of circuitry, and for short circuits. Correct malfunction when detected. Subsequent to wire hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

III.02.02.05.04. Electrical Boxes and Fittings (Section 16130)

SUMMARY

The types of electrical boxes and fittings required for the project may include the following:

- Outlet boxes.
- Junction boxes.
- Pull boxes.
- Conduit bodies.
- Bushings.
- Locknuts.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of electrical units of types and sizes required, whose products have been in satisfactory use in similar service for not less than three years.

Electrical Installation Contractor: A firm with at least three years of successful installation experience on projects with electrical installation work similar to that required for the project.

NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical boxes and fittings.

U.L. Labels: Provide boxes and fittings which have been listed and labeled by Underwriter's Laboratories.

NEMA Compliance: Comply with National Electrical Manufacturers Association standards as applicable to nonmetallic fittings for underground installation.

NECA Standard: Comply with applicable portions of the National Electrical Contractors Association's "Standard of Installation".

MANUFACTURERS

Provide products produced by one of the following (for each type of box and fitting):

Interior Outlet Boxes:

Technical Requirements

- Appleton Electric Co.
- Arrow Conduit and Fittings Corp.
- National Electric Products Co.
- OZ/Gedney Co.
- Steel City, Midland-Ross Corp.

Weatherproof Outlet Boxes:

- Appleton Electric Co.
- Crouse-Hinds Co.
- Harvey Hubbell, Inc.
- Pyle-National Co.

Junction and Pull Boxes:

- Arrow-Hart, Inc.
- General Electric Co.
- OZ/Gedney Co.
- Square D Co.

Conduit Bodies:

- Appleton Electric Co.
- Crouse-Hinds Co.
- Killark Electric Mfg. Co.
- Pyle-National Co.

Bushings, Knockout Closures and Locknuts:

- Allen-Stevens Conduit Fittings Corp.
- Allied Metal Stamping, Inc.
- Appleton Electric Co.
- Carr Co.
- Raco, Inc.
- Steel City, Midland-Ross Corp.
- Thomas and Betts Co., Inc.

FABRICATED MATERIALS

Interior Outlet Boxes: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.

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Technical Requirements

Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations. Choice of accessories is Installer's option.

Weatherproof Outlet Boxes: Provide corrosion-resistant cast metal weatherproof outlet wiring boxes, of the type, shape and size, including depth of box, with threaded conduit ends, cast metal face plate with spring-hinged waterproof cap suitably configured for each application, including face plate gasket and corrosion proof fasteners.

Junction and Pull Boxes: Provide galvanized sheet steel junction and pull boxes, with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

Conduit Bodies: Provide galvanized cast-metal conduit bodies, of the type, shape and size, to suit each respective location and installation, constructed with threaded conduit ends, removable cover, and corrosion-resistant screws.

Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings of the type and size to suit each respective use and installation.

INSTALLATION OF BOXES AND FITTINGS

Install electrical boxes and fittings in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that the boxes and fittings serve the intended purposes.

Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture exposure. Provide knockout closures to cap unused knockout holes where blanks have been removed. Locate boxes and conduit bodies so as to ensure accessibility of electrical wiring.

All boxes shall be rigidly secured in position. All flush mounted boxes shall be so set that the front edge of the box shall be flush with finished wall or ceiling line.

Wall switch outlets shall be located 48 inches above finished floor except where required to be otherwise. Convenience receptacles and communications outlet boxes shall be located 12 inches above finished floor except where required to be otherwise.

Where any outlet is shown in same location as any heating, air conditioning or plumbing equipment, verify physical dimension of such equipment and install outlet with a minimum clearance of three inches from any such apparatus. Contractor shall be responsible for determining such conflicts.

Technical Requirements

Where standard boxes are not suitable, provide boxes of special design to suit space and function.

III.02.02.05.05. Wiring Devices (Section 16140)

SUMMARY

Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.

The types of electrical wiring devices required for this project may include the following:

- Receptacles.
- Switches.
- Wall plates.
- Plugs.
- Connectors.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in manufacture of wiring devices, of types and ratings required, whose products have been in satisfactory use in similar service for not less than three years.

Electrical Installation Contractor: A firm with at least two years of successful installation experience on projects with electrical installation work similar to that required for the project.

NEC Compliance: Comply with National Electrical Code (NFPA No. 70) as applicable to construction and installation of electrical wiring devices.

UL Labels: Provide electrical wiring devices which have been tested, listed and labeled by Underwriters Laboratories.

NEMA Compliance: Comply with National Electrical Manufacturers Association standards for general- and specific-purpose wiring devices.

MANUFACTURERS

Provide products produced by one of the following:

Technical Requirements

- Arrow-Hart, Inc.
- Bell Electric Co.
- Bryant Electric Co.
- Crouse-Hinds Co.
- Cutler-Hammer, Inc.
- General Electric Co.
- Gould, Inc.
- Harvey Hubbell Inc.
- Pass and Seymour, Inc.
- Slater Electric, Inc.
- Square D Co.
- Hunt Electronics
- Lutron
- Intermatic
- Paragon

FABRICATED DEVICES

Provide factory-fabricated wiring devices, in type and electrical rating for the service required.

Receptacles: Comply with NEMA Stds. Pub. No. WD1 and as follows:

General-Duty Duplex: Provide duplex general-duty type, spec. grade, receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke, 15-ampere, 125-volts, with metal plaster ears, back and side wiring, ivory, NEMA configuration 5-15R unless otherwise required.

Heavy-Duty Duplex: Provide duplex type, spec. grade, receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, 20-ampere, 125-volts, with metal plaster ears, back and side wiring, ivory, NEMA configuration 5-20R unless otherwise required.

GFCI: Provide general-duty, duplex, ground fault circuit interrupter receptacles, feed-thru type, capable of protecting connected downstream receptacles on single circuit, grounding type, UL rated 20 ampere rating, 125 volts, 60 Hz; with solid state ground fault sensing and signaling; with 5 milli-ampere ground fault trip level; equipped with 15-ampere plug configuration, NEMA 5-15R.

Switches: Comply with NEMA Stds. Pub. No. WD1 and as follows:

Provide general-duty flush toggle switches, 20-ampere, 120/277 VAC, with mounting yoke insulated from mechanism, equipped with plaster ears, ivory switch handle, and side-wired screw terminals as follows:

Technical Requirements

- Single pole switches
- Double pole switches
- Three Way switches
- Key-operated

WIRING DEVICE ACCESSORIES

Wall Plates: Provide single switch and duplex outlet wall plates for wiring devices, with ganging and cutouts as required, provide with metal screws for securing plates to devices, screw heads colored to match finish of plate, and wall plates possessing the following additional construction features:

Material and Finish: 0.04" thick, type 430 satin finished stainless steel.

EXAMINATION

Contractor shall examine areas and conditions under which wiring devices are to be installed and notify the Engineer in writing of conditions detrimental to proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

INSTALLATION OF WIRING DEVICES

Install wiring devices where required, in accordance with manufacturer's written instructions, applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve intended function.

Delay installation of devices until wiring is completed. Install receptacles and switches only in electrical boxes which are clean; free from excess building materials, debris, etc.

Switches shall be installed with top of box 48" above finished floor, unless required otherwise. Receptacles shall be installed with bottom of box 12" above finished floor, unless required otherwise.

PROTECTION OF WALL PLATES AND RECEPTACLES

Upon installation of wall plates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

Technical Requirements

TESTING

Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements.

III.02.02.05.06. Panelboards and Enclosures (Section 16160)

SUMMARY

The types of panelboards and enclosures required for the project may include the following:

- Power panelboards.
- Cabinet enclosures.

Refer to Sections 16110 and 16120 for wire, and connectors and electrical raceway work required in conjunction with panelboards and enclosures.

SUBMITTALS

Manufacturer's Data: Submit manufacturer's data on panelboards and enclosures.

Shop Drawings: Submit dimensioned drawings of panelboards and enclosures showing accurately scaled layout of enclosure and required unit sections, including but not necessarily limited to, circuit breakers, and accessories.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of panelboards and enclosures, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Electrical Installation Contractor: A firm with at least three years of successful installation experience on projects with electrical installation work similar to that required for the project.

UL Labels: Provide electrical panelboards, enclosures and accessories which have been listed and labeled by Underwriters Laboratories. Equipment shall be approved for use as service entrance equipment where applicable.

NEC Compliance: Comply with National Electrical Code (NFPA 70/ ANSI C1) as applicable to construction and installation of cabinets and panelboards. Comply with applicable NEC articles pertaining to installation of wiring and equipment in hazardous locations.

Technical Requirements

NEMA Compliance: Comply with National Electrical Manufacturers Association Stds. Pub. No. PBI, "Panelboards," and the installation portion of Std. Pub. No. PBI, "NEMA Instructions for the Safe Installation, Operation and Maintenance of Panelboards."

PRODUCT DELIVERY, STORAGE AND HANDLING

Handle panelboards and enclosures carefully to prevent breakage, denting and scoring the finish.

Store panelboards and enclosures inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

MANUFACTURERS

Provide products produced by one of the following (for each type of panelboard and enclosures):

Cutler-Hammer, Inc.

General Electric Co.

Square D Co.

Federal Pacific Electric Co.

I-T-E Imperial Corp.

Westinghouse Electric Corp.

PANELBOARDS AND ENCLOSURES

Power Panelboards: Provide dead-front safety type lighting and appliance panelboards as required, with switching and protective devices in the number, rating, type and arrangement shown; with anti-burn solderless pressure type lug connectors approved for copper or aluminum conductors, for connecting feeder to panel; equipped with copper or aluminum bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, circuit breakers provide suitable lugs on neutral bus for each outgoing feeder required; install a bare un-insulated grounding bar bolted to the enclosure. All copper parts shall be plated to prevent corrosion.

Panelboard Enclosures: Provide sheet steel enclosures, NEMA type where required, code gage, minimum 16 gage thickness, with multiple knockouts; provide doors with flush lock and key, all panelboard enclosures keyed alike, with concealed hinges; equipped with interior circuit-directory frame, card and clear plastic covering; nameplate; provide painted gray enamel finish over a rust inhibitor.

Circuit Breakers: Provide thermal magnetic type circuit breakers of bolt-in, single unit construction. Multi-pole circuit breakers shall have trip elements in each pole with common trip bar. Frame size 225 Amp and larger shall have adjustable magnetic instantaneous trip. Frame size 400 Amp and larger shall have interchangeable thermal magnetic trip units. All values are minimum at rated voltage.

Shunt trip shall be installed in circuit breakers where required by applicable codes.

Technical Requirements

Switching duty circuit breakers shall be installed where lighting loads are controlled from panelboards. Handle locks shall be provided on circuit breakers where security is required. Ground fault interrupter type circuit breakers shall be installed where required by code.

Minimum interrupting ratings shall be as follows:

Frame Size	240V	277V	480V
100 Amp	10,000	10,000	-
225 Amp	25,000	-	22,000
400 Amp	42,000	-	30,000

INSPECTION

Contractor shall examine the areas and conditions under which panelboards and enclosures are to be installed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

INSTALLATION OF PANELBOARDS AND ENCLOSURES

Install panelboards and enclosures, including electrical connections, in accordance with the manufacturer's written instructions, applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.

Coordinate installation of panelboards and enclosures with cable and raceways installation work. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secured. Fill out enclosure's circuit directory card upon completion of work. Directory shall be typewritten.

III.02.02.05.07. Distribution Panels and Enclosures (Section 16163)

SUMMARY

The types of panelboards and enclosures required for the project may include the following:

- Power distribution panels.
- Cabinet enclosures.

Refer to Section 16110 and 16120 for wire and connectors and electrical raceway work required in conjunction with distribution panels and enclosures (not work of this section).

Technical Requirements

SUBMITTALS

Manufacturer's Data: Submit manufacturer's data on distribution panels and enclosures.

Shop Drawings: Submit dimensioned drawings of installed distribution panels and enclosures showing accurately scaled layout of enclosure and required unit sections, including but not necessarily limited to, circuit breakers, combination switches-and-fuses and accessories.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of panelboards and enclosures, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five years.

Electrical Installation Contractor: A firm with at least three years of successful installation experience on projects with electrical installation work similar to that required for the project.

UL Labels: Provide electrical panels, enclosures and accessories which have been listed and labeled by Underwriters Laboratories. Equipment shall be approved for use as service entrance equipment where applicable.

NEC Compliance: Comply with National Electrical Code (NFPA 70/ ANSI C1) as applicable to construction and installation of cabinets and distribution panels. Comply with applicable NEC articles pertaining to installation of wiring and equipment in hazardous locations.

NEMA Compliance: Comply with National Electrical Manufacturers Association Stds. Pub. No. PB1, "Panelboards", and the installation portion of Std. Pub. No. PB1.1, "NEMA Instructions for the Safe Installation, Operation and Maintenance of Panelboards."

PRODUCT DELIVERY, STORAGE AND HANDLING

Handle distribution panels and enclosures carefully to prevent breakage, denting and scoring the finish. Store distribution panels and enclosures inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, waterproof wrapping.

MANUFACTURERS

Provide products produced by one of the following (for each type of panel and enclosure):

- Cutler-Hammer, Inc.
- Federal Pacific Electric Co.
- General Electric Co.

Technical Requirements

- I-T-E Imperial Corp.
- Square D Co.
- Westinghouse Electric Corp.

DISTRIBUTION PANELS AND ENCLOSURES

Power Distribution Panels: Provide dead-front safety type power distribution panels, as required, with switching and protective devices in the number, rating, type and arrangement shown; with anti-turn solderless pressure type main lug connectors approved for copper or aluminum conductors, for connecting feeder to panel; equipped with copper or aluminum bus bars, and full-size neutral bus; provide suitable lugs on neutral bus for each outgoing feeder requiring a neutral connection; provide main and branch circuit types for each circuit with handle as required.

Provide a bare un-insulated grounding bar suitable for bolting to the enclosure; and provide panelboards fabricated by same manufacturer as enclosure. All copper parts shall be plated to prevent corrosion.

Minimum short circuit rating of panels shall be as follows:

<u>Bus Amp Size 240 V 480 V</u>	
100 amp	18,000 14,000
225 amp	25,000 22,000
400 amp	42,000 30,000

Distribution Panel Enclosures: Provide sheet steel enclosures, NEMA type as required, code gage, minimum 16 gage thickness, with multiple knockouts; provide doors with flush lock and key, all distribution panel enclosures keyed alike, with concealed hinges and door, equipped with interior circuit-directory frame, card and clear plastic covering; nameplate; provide painted gray enamel finish over a rust inhibitor.

Circuit Breakers: Provide thermal magnetic type circuit breakers of bolt-in, single unit construction. Multi-pole circuit breakers shall have trip elements in each pole with common trip bar. Frame size 225 Amp and larger shall have adjustable magnetic instantaneous trip. Frame size 400 Amp and larger shall have interchangeable thermal magnetic trip units.

Shunt trip shall be installed in circuit breakers where required. Ground fault interrupter type circuit breakers shall be installed where required by code.

Technical Requirements

Minimum interrupting ratings shall be as follows:

<u>Frame Size</u>	<u>240V</u>	<u>277V</u>	<u>480V</u>
100 Amp	10,000	10,000	-
225 Amp	25,000	-	22,000
400 Amp	42,000	-	30,000

Fusible Switches: Provide fusible switch assemblies, 3-pole, quick-make, quick-break type mounted in a metal enclosure with an externally operated handle which can be locked in "ON" or "OFF" position.

INSPECTION

Contractor shall examine the areas and conditions under which panelboards and enclosures are to be installed and notify the Engineer in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Engineer.

INSTALLATION OF DISTRIBUTION PANELS AND ENCLOSURES

Install distribution panels and enclosures, including electrical connections, in accordance with the manufacturer's written instructions, applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.

Coordinate installation of distribution panels and enclosures with cable and raceways installation work. Anchor enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically secured. Fill out the enclosure's circuit directory card upon completion of work. Directory shall be type written. Insert fuses, of the ratings required, in installed panels.

III.02.02.05.08. Safety and Disconnect Switches (Section 16170)

SUMMARY

The types of safety and disconnect switches required for the project may include the following:

- Equipment disconnects.
- Service disconnects.

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Technical Requirements

SUBMITTALS

Manufacturer's Data: Submit manufacturer's data on electrical safety and disconnect switches.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of safety and disconnect switches of the types and capacities required, whose products have been in satisfactory use in similar service for not less than three years.

Electrical Installation Contractor: A firm with at least three years of successful installation experience on projects with electrical installation work similar to that required for the project.

NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical safety and disconnect switches.

UL Labels: Provide safety and disconnect switches which have been listed and labeled by Underwriters Laboratories. Switches shall be approved for service entrance equipment where applicable.

NEMA Compliance: Comply with National Electrical Manufacturers Association Stds. Pub. No. KS1.

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver switches individually wrapped in factory-fabricated fiber-board type containers.

Handle switches carefully to avoid damage to material components, enclosure and finish. Do not install damaged switches; remove from project site.

Store switches in a clean dry space. Protect switches from dirt, fumes, water and physical damage.

MANUFACTURERS

Provide products produced by one of the following (for each type of switch):

Cutler-Hammer, Inc.
General Electric Co.
Square D Company

Federal Pacific Electric Co.
I-T-E Imperial Corp.
Westinghouse Electric Corp.

FABRICATED SWITCHES

Technical Requirements

Heavy-Duty Disconnect Switches: Provide heavy-duty type, sheet steel enclosed switches, of the type and size and electrical characteristics required; surface mounted, incorporating switches so constructed that the switch blades are visible in "OFF" position with door open; equipped with operating handle which is an integral part of the enclosure base and whose position is easily recognizable, and is padlockable in the "OFF" position; with current carrying parts constructed of high-conductivity copper, and silver-tungsten type switch contacts; and constructed with stamped enclosure knockouts. Lugs shall be suitable for copper or aluminum conductors. Fused units shall be provided with rejection kits.

Fuses: Provide fuses for safety switches of class, type and rating as required.

INSPECTION

Installer shall examine the areas and conditions under which safety and disconnect switches are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

INSTALLATION OF SAFETY AND DISCONNECT SWITCHES

Install safety and disconnect switches where required, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function. Coordinate safety and disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.

III.02.02.05.09. Fuses (Section 16181)

SUMMARY

The types of fuses required for the project may include the following:

- Class RK1
- Class RK5
- Class L

All fuses shall be labeled with the interrupting current, class and time delay (if applicable).

SUBMITTALS

Manufacturer's Data: Submit manufacturer's data on fuses.

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Technical Requirements

QUALITY ASSURANCE

Manufacturer's: Firms regularly engaged in the manufacture of fuses of the types and capacities required, whose products have been in satisfactory use in similar service for not less than three years.

Electrical Installation Contractor: A firm with at least three years of successful installation experience on projects with electrical installation work similar to that required for the project.

NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of fuses.

UL Labels: Provide fuses which have been listed and labeled by Underwriters Laboratories.

NEMA Compliance: Comply with National Electrical Manufacturers Association Stds. Pub. No. FU-1.

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver fuses individually wrapped in factory-fabricated fiber-board type containers.

Handle fuses carefully to avoid damage to material components, enclosure and finish. Do not install damaged fuses; remove from project site. Store fuses in a clean dry space. Protect fuses from dirt, fumes, water and physical damages.

MANUFACTURERS

Provide products produced by one of the following (for each type of switch):

- Gould Shawmut
- Bussman
- Economy (F.P.E.)

FUSES

Provide fuses of the type, class and rating as required and specified. Fuses shall be manufacturer's premium grade.

INSPECTION

Installer shall examine the areas and conditions under which fuses are to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

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Technical Requirements

INSTALLATION OF FUSES

Install fuses where required, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended function.

Fuses for motor loads shall be class RK5 with time delay.

Fuses for lighting and general power loads shall be class RK5 for 600 Amp or less and Class L for over 600 Amps with no time delay.

SPARE FUSES

Furnish three (3) spare fuses of each size and type used on the projects. Furnish "Spare fuse cabinet" with hinged and locked door of size required for number of fuses furnished. Install as required or directed. Cabinet shall have nameplate per Section 16000.

III.02.02.05.010. Electrical Services (Section 16400)

SUMMARY

Upgrade existing incoming electrical services where required.

Provide underground conduit for service conductors. Install to utility standards, and seal conduit to keep water out of enclosure.

Pay all necessary fees to utility company required to provide temporary and permanent electrical service to these facilities.

CONDUIT

Contractor shall provide underground conduit for utility service conductors. Contractor shall have utility inspect conduit placement prior to covering of conduit.

COORDINATION

Electrical Contractor shall coordinate connection with Utility all pursuant to Utility standards.

III.02.02.05.011. Grounding (Section 16450)

Technical Requirements

SUMMARY

Furnish labor and material to provide grounding facilities for the entire electrical installation as required by all inspecting and jurisdictional authorities as herein specified. The following are included, but not limited to, as items requiring grounding:

- Electrical service neutral conductor.
- Neutral conductor of all transformer secondaries.
- Conduits, boxes and other conductor enclosures.
- Neutral or identified conductor of interior wiring system.
- Distribution panels, power and panelboards.
- Non-current - carrying parts of fixed equipment, such as transformers, motors, starters, control cabinets, disconnects, lighting fixtures, stand-by generator, etc.
- Metallic cabinets and auxiliary systems cabinets.

EQUIPMENT

Furnish and install all boxes and/or access plates required for installation and inspection of grounding connections to cold water piping system or other made electrodes.

Provide brass identifying tags on all ground clamps.

INSTALLATION

Ground connections made to metallic cold water piping system at such locations as will be readily available for inspection. Provide jumper connections around all meters and shut off devices.

Where cold water piping is not available for ground connections, use other available or made electrodes as described in NEC Sections 250-81 or 250-83.

Conduit Grounding: All grounding bushings within all enclosures including equipment enclosures, shall be wired together and connected internally to the enclosure grounding lug or grounding bus with bare copper conductor. Grounding conductors sized in accordance with NEC shall be used with all grounding bushings.

Equipment Grounding: All electrical equipment shall be grounded. Large equipment such as metal-clad or metal-enclosed switchgear will be furnished with a grounding bus. Most other equipment will be furnished with grounding pads or grounding lugs. All ground connections shall be cleaned immediately prior to connection. Contractor shall provide all grounding material required but not furnished with the equipment.

Technical Requirements

Where the ground conductor is included with the power conductors in the motor circuit raceway, a compression type ground conductor termination shall be used and connected to the motor frame inside the motor terminal housing.

Suitable grounding facilities shall be furnished on motors not so equipped. The grounding facilities shall consist of compression type ground conductor termination bolted to the motor frame and providing a minimum of joint resistance.

No grounding conductor shall be smaller in size than 12 AWG unless it is a part of an acceptable cable assembly.

III.02.02.05.012. Lightning Protection (Section 16601)

DESCRIPTION OF WORK:

Each unit is defined to include (but not by way of limitation) air terminals (lightning rods), lightning conductors (electrical cabling), ground rods and surge arresters. This phase of the Work includes the furnishing and installation of all labor and materials necessary to provide an installation which is complete in every respect and of the composition and quality as specified herein.

QUALITY ASSURANCE:

System Engineering: Firms regularly engaged in the engineering, and installation of, lightning protection systems similar to the one specified, and are members of the Lightning Protection Institute.

Manufacturers: Firms regularly engaged in manufacture of lightning protection equipment, of types and sizes required, and are manufacturer members of Lightning Protection Institute.

Contractor: A firm with at least two years of successful installation experience on projects with lightning protection work similar to that required for project and are installer members of Lightning Protection Institute.

NFPA Compliance: Comply with NFPA No. 70, National Electrical Code, and NFPA No. 78, Lightning Protection Code, as applicable to materials and installation of lightning protection systems and associated equipment and wiring.

UL Labels: Comply with applicable UL installation requirements and with UL Master Label requirements.

SUBMITTALS:

Product Data: Lightning Protection Systems:

Submit manufacturer's data on lightning protection systems and components.

Technical Requirements

Shop Drawings, Lightning Protection Systems:

Submit dimensioned drawings of installed lightning protection systems and components. Show conductor routing and accessories layouts including ground rods, air terminals, splicers, fasteners and connectors.

UL Certificate: Upon completion of installation, provide Owner with Master Label, suitable for fastening to building, issued by Underwriter's Laboratories, Inc.

PRODUCT HANDLING AND STORAGE:

Handle lightning protection components carefully to avoid damage. Do not install damaged components; replace and remove damaged units from project site.

Store components in original wrappings and protect from dirt, weather and construction work traffic.

LIGHTNING PROTECTION SYSTEM COMPONENTS:

Provide lightning protection system components, of types, styles, and ratings required, which comply with manufacturer's standard materials, design, and construction in accordance with published project information, and as required for a complete installation. Lightning protection equipment shall be similar to Lightning Prevention Systems Type ALS-3000 dissipation system, or approved equal. Surge protection equipment shall be similar to Edco Type HMP series, or approved equal.

INSTALLATION:

Install lightning protection system in accordance with equipment manufacturer's written instructions, in compliance with applicable portions of NFPA (No. 70 and 78) codes, and with UL's lightning protection standards, to ensure that lightning protection system complies with requirements and serves intended purposes.

Coordinate with other work, including electrical wiring and roofing work, as necessary to interface installation of lightning protection system with other work.

Install conductors with direct paths from air terminals to ground connections avoiding sharp bends and narrow loops. All conductor drops to earth shall be concealed in building structure.

TESTING:

Upon completion of installation of lightning protection system, test ground resistance with a megger ground tester. Where tests show resistance to ground is over 5 ohms take appropriate

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action to reduce resistance to 5 ohms or less by driving additional ground rods and/or treating soil around ground rods with sodium chloride (salt), calcium chloride, copper sulfate, or magnesium. Then re-test to demonstrate compliance.

III.02.02.06. Installation Checklist

The Contractor shall be responsible for generating and maintaining an installation checklist to be used on-site during the installation phase. An attested copy of the checklist shall be provided to the CTRMA after the completion of the installation activity for each lane at each plaza. The Contractor is also responsible for conducting an inspection of all installations and certifying the installation work.

III.02.02.07. Weekly Installation Meetings

The Contractor shall be responsible for scheduling weekly installation meetings the purpose of which shall be to educate the CTRMA and other involved personnel of the installation activities and plan of action for the following week. All issues that were recorded during the installation activity that week shall be discussed and resolved.

III.02.02.08. As-built Drawings/Documents

At the time of installation and during inspection, the drawings used for installation and construction needs to be marked up to reflect the final install and these final as-built drawings need to be submitted to the CTRMA. If there were changes to the installation plan/checklist, these need to be updated and submitted to the CTRMA.

Technical Requirements

Chapter IV

IV. TESTING REQUIREMENTS AND SYSTEM ACCEPTANCE

IV.01. Overview

The requirements described in this Section detail the labor, materials, and support services necessary to test the CTRMA Toll Collection System during performance of the Contract. The testing shall be conducted in various phases as detailed below to validate the Toll Collection System integrity, reliability, functionality and compliance to the requirements of the Contract, including without limitation, those set forth in Chapter II.

The objective of the CTRMA Testing Plan is to ensure that the CTRMA Toll Collection System is systematically and thoroughly tested for Contract compliance and the System operates reliably per the CTRMA Toll Collection Business Rules and Policies. The Contractor shall make best efforts to test the System simulating normal traffic conditions for all controlled testing identified in this Chapter.

The Toll Collection System provided by the Contractor shall be integrated with the CSC/VPC and entire System shall be tested prior to opening the System to revenue collection. The Contractor is responsible for all test logistics (lane closures, test vehicles, drivers, etc.) and coordination activities. The CTRMA and its representatives shall only witness and approve the testing, and the Contractor shall be responsible for all aspects of the testing. Approval of any aspect of testing shall not relieve the Contractor's responsibility in meeting the full requirements of the Contract.

IV.02. General Testing Requirements

The Contractor shall provide to the CTRMA, for review, comment and final approval, a Master Test Plan that outlines the scope and testing concepts to be used to validate the Toll Collection System from initial development through installation and Project Acceptance. As described in the Scope of Work, the CTRMA Toll Collection System will be opened to revenue service in Segments. It is anticipated that the Factory Acceptance Test (FAT) and the Prototype On-site Test (POT) will be conducted once to test the full System functionality. Each Segment will have its Commissioning and Operational Test, and upon the implementation of all Segments, there shall be a Project Acceptance Test. This Master Test Plan shall cover the factory, prototype commissioning, operations, and acceptance testing. Once the Master Test Plan is approved in writing by the CTRMA, it shall then be used to compose the detailed test procedures, which shall be submitted to the CTRMA for review and approval. It is essential that the Contractor provide sufficient time for the submission and review of the Master Test Plan and the detailed test procedures.

After the completion of each test, the Contractor shall submit to the CTRMA for review and approval the Test Report that documents the results of the test. The Test Report shall include the results of the test, any anomalies identified, and the corrective action and any re-tests necessary to successfully complete each testing phase.

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During the development of the System software, the Contractor shall conduct tests or demonstrations as reasonably requested by the CTRMA to ensure that the Toll Collection System meets the functional specifications set forth in Chapter II.

IV.03. Factory Acceptance Test (FAT)

The Factory Acceptance Test (FAT) shall be conducted to verify that all functional elements of the Toll Collection System and components provided by the Contractor are in conformance with the CTRMA technical and operational requirements and the final System design as approved by the CTRMA. The FAT shall be conducted either at the Contractor's facility or at a facility designated by the CTRMA in accordance with the approved Master Test Plan and test procedures.

The CTRMA shall witness the FAT, and the Contractor shall have the responsibility to perform the FAT and the results of such testing shall be subject to the CTRMA approval. FAT shall provide sufficient confidence to the CTRMA that the Contractor's System meets the CTRMA operational requirements and is ready to be installed on-site.

The Contractor shall provide the required support personnel, and testing shall be conducted in accordance with the Project Schedule and test procedures. Upon completion of the FAT, the Contractor shall submit a test report that details the results of the test. Upon the approval of the FAT by the CTRMA, the Contractor shall be given the authorization to move forward to the Prototype On-site Test.

IV.03.01. *Hardware Production Testing*

All hardware provided by the Contractor under Chapter II shall be unit tested to ensure it complies with the requirements set forth in Chapter II. The Contractor shall verify that each component meets the approved design specifications. The Contractor shall also provide certification that the hardware provided under this Contract meet the requirements for the environmental conditions identified in Chapter II.

Development machines can be used to test the Plaza, Host, MOMS and Security Access System.

IV.03.02. *Functionality Testing*

As part of the FAT, the Contractor shall demonstrate that the Toll Collection System provided by the Contractor is in compliance with the requirements of the Chapter II and its functionality complies with the operational requirements and the approved design documents. The lane, plaza, host, security access and maintenance on-line management systems shall be tested for functionality and interface to various other devices and systems. The transfer of files and data between various Systems including the CSC/VPC shall be tested. The Contractor shall work with the CSC/VPC operator to coordinate the CSC/VPC interface testing.

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IV.03.02.01. Lane Software Functionality

During the FAT, the Contractor shall demonstrate the lane operations in all modes, specifically, Manual/ETC, ACM/ETC, Dedicated ETC, and Express ETC. Transactions shall be created and processed using simulated and/or real vehicles and sensors emulating on-site traffic flow. The intention of these simulations is to give the CTRMA a full understanding of the lane logic and vehicular processing. The Express ETC Lane functionality shall be demonstrated in a live lane environment.

Real vehicles shall be used to validate accurate assignment and proper framing of each vehicle through the various lane types. The accurate capture of images and association of transponders to the correct vehicles shall also be verified using real vehicles.

The Contractor, with input from the CTRMA, shall detail various test scenarios that emulate conditions such as rush-hour traffic (bumper to bumper), vehicles backing out of the lane, Toll Collector pre-classification, Toll Collector post-classification, late transponder reads, early transponder reads, patron beating the ACM, degraded System, etc. The objective of this testing shall be to understand how the Toll Collection System behaves in such scenarios and to ensure that the results are acceptable to the CTRMA.

As part of FAT, simulated data shall be used to run the Toll Collection System continuously over a two (2) day period to ensure the data files are correctly created and the data is transferred accurately to each Lane Controller, the associated Plaza Computer, plaza/host workstation, Host Computer, and CSC/VPC. As part of this test, every output device shall be exercised including the VES. During this time, comprehensive tag status downloads shall be simulated.

IV.03.02.02. Plaza Functionality

As the lane functionality is tested, the results shall be validated at the Plaza Computer. The plaza functionality shall be demonstrated as part of the FAT, and the accurate transfer of data from each Lane Controller to the associated Plaza Computer and from the Plaza Computer to the Host Computer shall be verified to be in compliance to the Interface Control Documents (ICD) that is part of the design documents. All of the plaza functionality including all failures and alarm conditions shall be validated during FAT.

IV.03.02.03. Host Functionality

All host functionality shall be tested and data created from testing shall be verified. Screens and reports shall be verified to be accurate and in compliance with the design documents and CTRMA operational procedures. New employee additions, transponder status changes, and toll schedule and toll rate creations shall be performed to verify that the data is transferred successfully to each Plaza Computer and then on to the lanes and the changes shall be verified by conducting transactions in the lanes. The host interface to the CSC/VPC shall be thoroughly tested and data shall be verified at the CSC/VPC.

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IV.03.02.04. Maintenance Online Management System (MOMS)

The Contractor shall setup the MOMS for CTRMA operations and demonstrate that it meets the System requirements. The MOMS functionality of equipment inventory, purchasing, employee scheduling, maintenance services, and alarm reporting and tracking shall be demonstrated. The alarms generated in the lanes and plaza during FAT shall be validated on the MOMS to demonstrate the System's ability to report and track alarms. The Contractor shall also verify how the employee data is obtained from the Host Computer.

IV.03.02.05. Security Access System

The functionality of the Security Access System shall be demonstrated during FAT, specifically, its ability to obtain the employee data from the Host Computer. The management and recording of access events shall be demonstrated.

IV.03.03. Vehicle Per Hour (ETC, Express)

The Contractor shall conduct tests approved by the CTRMA that validate the capability of the Toll Collection System to process the volumes of vehicles (vehicle per hour) for the Dedicated ETC and Express ETC Lane configurations as identified in Chapter II.

IV.04. **Prototype On-site Testing (POT)**

The objective of the Prototype On-site Test (POT) is to verify the full functionality of the Toll Collection System and its compliance with the requirements of Chapter II and approved design specifications in a controlled, on-site environment using different types of vehicles in different lane types and lane modes. All equipment provided under this Contract by the Contractor shall be part of this test including the communications network. The Plaza Computer and the Host Computer shall be installed in their final location. It is possible that some of the CTRMA toll lanes may be open to traffic in which case, testing will be conducted in a very controlled manner with proper lane closures. The Contractor shall detail in the Master Test Plan the logistics of the testing.

The Contractor and the CTRMA shall agree on a test site(s) and the Contractor shall work with TxDOT and the Developer for the US183-A Turnpike Project in setting up the lane and installing all equipment in the lane. All equipment and software that is required under the Contract shall be in place, and prior to the start of the test, the Contractor shall formally notify the CTRMA that the Toll Collection System is "ready" for testing. The test shall be conducted by the Contractor and witnessed by the CTRMA. The test shall be conducted in accordance to approved test procedures and test schedule, all in accordance with the Contract requirements.

As part of this test, the Contractor shall develop a Compliance Matrix that is reviewed and approved by the CTRMA, that identifies each requirement and the tests conducted that prove compliance to the Contract. It is the Contractor's responsibility to ensure that each requirement is certified and/or tested for compliance.

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This phase of testing is very critical to the success of the Project, as such, all anomalies shall be documented in the Test Report. The Contractor and the CTRMA shall determine the corrective action required and, depending on the severity of the anomaly, the status of the Project shall be determined by the CTRMA.

Upon the successful completion and approval of the on-site prototype testing, any further changes to the software shall be fully documented and made only with the approval of the CTRMA. Depending on the changes made to the Toll Collection System, the CTRMA reserves the right to request a re-test of the entire or part of the prototype testing. The objective of this is to ensure that changes to one part of the Toll Collection System do not have a negative ripple effect on the rest of the System.

IV.04.01. Lane Operations and Functional Test

As part of this test, the various configurations of the lane shall be tested, namely Manual/ETC Lane, Dedicated ETC Lane, Express ETC Lane, and ACM/ETC Lane. Different types of transactions of sufficient number, as determined by the CTRMA, shall be conducted when the lane is OPEN, in STANDBY, or CLOSED. In an ACM lane, a static test shall be conducted to verify that the Toll Collection System can process the various coins of payment. ACM testing shall also include the switching of vaults, and the vault removal and insert operations. During this test, the operations of the various in-lane equipment and their ability to report failures shall be verified.

IV.04.02. Plaza Functionality

As the lane functionality is tested, the results shall be validated at the Plaza Computer. The plaza functionality also shall be demonstrated during this test. The Business Day assignment process shall be thoroughly exercised to create all types of failure to test the process. All screens will be tested for correctness, error conditions, ease of use and functionality. Reports will be generated to verify the data entered and to reconcile the transactions conducted in the lanes.

The accurate transfer of test data from each Lane Controller to the associated Plaza Computer, and from each Plaza Computer to Host Computer, and on to the CSC/VPC, shall be verified to be in compliance with the design documents. Various plaza level failure conditions shall be generated to test the MOMS alarm and maintenance requirements.

IV.04.03. Host Functionality

All screens will be tested for correctness, error conditions, ease of use and functionality. Reports will be generated to verify the data entered at the host and the plaza, and to reconcile the transactions conducted in the lanes. Test files shall be obtained from the bank to the test the bank interface.

New employee additions, and toll rate and toll schedule creations shall be performed to verify that the data is transferred successfully to each Plaza Computer and then on to the lanes and the changes shall be verified by conducting transactions in the lanes. The host

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interface to the CSC/VPC shall be thoroughly tested and data shall be verified at the CSC/VPC. Reports shall be generated on both Systems to verify the transactions, revenue and payments.

The Host Computer redundancy capability shall be tested and its ability to backup, archive and restored shall be demonstrated.

IV.04.04. CSC/VPC Functionality

Various accounts shall be established at the CSC per the CTRMA Customer Policy and transactions generated against these accounts. The transfer of the toll rate and toll schedule to the CSC/VPC shall be tested. Various ETC and non-payment transactions shall be created in the lanes to verify the CSC/VPC compliance to the CTRMA Business Rules and Policies. Reports shall be generated at the host and CSC/VPC to verify the ETC and non-payment transactions reconciliation.

IV.04.05. MOMS

The Contractor shall set up the complete Maintenance On-line Management System for the CTRMA prior to the Prototype On-site Test. During the test, the Contractor shall verify the System's compliance to the design documents. Failures shall be simulated on all equipment capable of reporting the status and the alarm messages and their tracking shall be verified through the MOMS.

IV.04.06. Security Access System

The Contractor shall ensure that, prior to the Prototype On-site Test, the Security Access System is installed and setup for operations. The functionality of the System shall be verified during the Prototype On-site Test.

IV.04.07. Specific Lane Tests

IV.04.07.01. Express ETC Lane Testing

Additional testing shall be performed in the Express ETC Lanes to simulate vehicles straddling lanes, traveling on the shoulder lanes and closely following the preceding vehicle. Degraded operations in Express ETC Lanes also shall be tested to verify the System redundancy capability.

IV.04.07.02. Bumper to Bumper

Vehicles traveling bumper to bumper emulating rush-hour traffic shall be tested in all lane configurations to verify that the Toll Collection System can process the vehicles accurately.

IV.04.07.03. Varying Speed

Vehicles traveling at various speeds (stop and go to 50 mph in ACM/ETC and Manual/ETC Lanes, stop and go to 80 mph in Dedicated ETC lanes, and stop and go to 100 mph in

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Express ETC Lanes) shall be tested in all lane configurations to verify that the Toll Collection System can process the vehicles accurately.

IV.04.07.04. Business Rules Test

Business Rules shall be developed by the CTRMA with Contractor input during the design phase that identify what data will be required to generate a transaction for the various lane configurations, modes and equipment conditions. It shall also indicate under what conditions an image is taken. The Business Rules test shall be conducted to verify that the Toll Collection System operates per the established Business Rules. The test shall be conducted in Manual/ETC, ACM/ETC, Express ETC and Dedicated ETC Lanes in OPEN, STANDBY and CLOSED modes of operation.

IV.04.07.05. Out of Synchronization Scenarios

Various conditions shall be simulated to test the System's ability to handle scenarios that put the System out of synch with the vehicle. The Contractor and the CTRMA shall jointly develop these test conditions.

IV.04.07.06. Various Unusual Occurrence (UO) Scenarios

The Contractor, with the CTRMA input, shall identify various scenarios that can occur in a toll-collecting lane that are considered unusual such as vehicle backing up, Toll Collector post and pre classification, etc. A test shall be conducted by the Contractor to identify how the Toll Collection System handles such scenarios.

IV.04.07.07. Degraded Mode of Operation

The operational effect of different types of failures on the Toll Collection System shall be demonstrated.

IV.04.07.08. Vehicles Per Hour (ACM, Manual)

The Contractor shall conduct tests approved by the CTRMA that validate the capability of the Toll Collection System to process the volumes of vehicles (vehicle per hour) for the ACM and Manual Lane configurations as identified in Chapter II. The Contractor shall conduct tests, which shall be defined in the Master Test Plan for live traffic testing in the mixed mode lanes.

IV.05. System Installation and Commissioning

Upon the successful completion and approval of the Prototype On-site Test, the Contractor shall be given the authorization to install the Toll Collection System on Segment 1. A Commissioning Test shall be conducted on Segment 1 to validate the functionality and operational status of the lanes. Every piece of in-lane equipment and its interface to the Lane Controller shall be verified to be fully operational. During this test the Lane Controller, Plaza Computer, Host Computer, and the CSC/VPC interface will be validated to ensure that the communication system is in place and the CTRMA Toll Collection System to ready for

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revenue collection. The installation of all equipment and software, and their operations shall be verified end to end.

Upon approval to proceed with each of the other Segments, the Contractor shall conduct a Commissioning Test for each of the Segments.

IV.06. Operational Testing

Immediately after commissioning Segment 1, the System shall be observed in live operations by the Contractor and the CTRMA for a minimum of one month to cover a monthly audit cycle. If a different Segment is commissioned prior to Segment 1, then the applicable sections of the Operational Test shall be conducted on that Segment. During this period System accuracy, performance, reliability and auditability shall be verified. The alarms displayed on the Maintenance System shall be analyzed. Anomalies identified shall be categorized by criticality, and resolution of all anomalies shall be agreed to by the CTRMA and the Contractor. The Contractor shall correct the anomalies and the CTRMA shall verify the corrections.

The objective of the Operational Test is to ensure that the Toll Collection System software and hardware functions over a period of thirty (30) days with limited manual intervention. It is intended to confirm that all lanes on Segment 1, Segment 1 plaza, host, CSC/VPC and the network are sized and configured correctly and data is processed without interruption. The following requirements shall be validated during the Operational Test.

IV.06.01. *Vehicle Detection and Association Accuracy*

The Contractor shall verify in a live environment and under all lane configurations as applicable that the Toll Collection System accurately and reliably detects vehicles and associates axles and other sensor information to the vehicle per the requirements of Chapter II. The sample size and data collection methodology shall be detailed in the test procedures document.

IV.06.02. *Vehicle Classification Accuracy*

The Contractor shall verify in a live environment and under normal traffic conditions that the Toll Collection System accurately classifies vehicles per the requirements of Chapter II. The sample size and data collection methodology shall be detailed in the test procedures document.

IV.06.03. *Transponder Read and Association Accuracy*

The Contractor shall verify in a live environment and under normal traffic conditions that the Toll Collection System reads transponders and accurately associates them to the correct vehicle per the requirements of Chapter II. The sample size and data collection methodology shall be detailed in the test procedures document.

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IV.06.04. VES Accuracy

The Contractor shall verify in a live environment that the images captured by the Toll Collection System are accurate, readable and meet the specifications in Chapter II. The sample size and data collection methodology shall be detailed in the test procedures document.

IV.06.05. System Audit

An entire twenty-four (24) hour period of data for each lane type (covering three Shifts) shall be monitored in selected lanes, and the data collected from such lanes, associated Plaza Computers, Host Computer and CSC/VPC shall be thoroughly analyzed to ensure that the CTRMA can conduct an audit on the Toll Collection System that reconciles the expected revenue to the actual revenue. Correct posting of ETC transactions to customer accounts, and accurate processing of violations shall be verified. If required, video tapes shall be used to help analyze the data. The test procedures shall detail the data collection and analysis methodology.

All anomalies and performance deficiencies identified during the Toll Collection System Operational Test shall be analyzed and explained by the Contractor. The CTRMA and the Contractor shall determine the corrective action to be taken. These audits shall be repeated until the CTRMA is satisfied that the Toll Collection System meets the CTRMA functional, operational and audit requirements, however the entire Toll Collection System audit test shall not extend beyond sixty (60) days.

The images of violations shall be reviewed and verified to ensure the correct image was taken. Anomalies identified shall be analyzed and explained by the Contractor and corrective action determined. These tests shall be repeated until the CTRMA is satisfied that the Toll Collection System meets the Contract requirements as defined in the design documents and the System specifications in Chapter II.

At a minimum the following items shall be verified during the thirty (30) day Operational Test. Other verifications, based on the proposed System, may be added.

- The software in every lane shall be verified to be the same.
- The tag status in each lane shall be validated for a week to ensure that the comprehensive Transponder Validation List is being received by every lane consistently.
- The CTRMA application software including Security Access and MOMS software shall be verified.
- AVI logs shall be compared against the lane logs and transactions at the Host Computer and CSC/VPC as part of the AVI accuracy test to ensure that all tags read by the AVI System are recorded and processed by each Lane Controller and the associated Plaza Computer. The sample size shall be 10,000 transactions collected from separate lanes.
- VES accuracy shall be confirmed through the evaluation of a minimum of 5,000 violations transactions collected from the same lanes as used in the AVI accuracy testing.

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- The transaction framing shall be validated to ensure that tag reads are assigned to the correct vehicle.
- MLT/ACM lock-ups shall be investigated and recorded.
- Computer System lock-ups, and process failures shall be investigated and recorded.
- Failure of any programs at the Plaza Computer and Host Computer shall be investigated and recorded.
- The System's ability to assign Business Days shall be verified and all Business Day failures shall be investigated.
- The storage and archival capability of the each System shall be verified.
- The Host Computer's ability to archive, purge and restore data shall be verified.
- All transactions generated by each Lane Controller in accordance with the above accuracy requirements shall be reported at the associated Plaza Computer with an accuracy of 100% using a sample size of one 24-hour period data from one lane. The transactions shall be verified to have reached the Host Computer and the CSC/VPC.
- All reports that reconcile Toll Collector deposits, vault deposits, ETC, and violation transactions shall be verified and discrepancies investigated.

IV.07. Segment Operational Testing

Immediately after the commissioning of each of the other Segments, a thirty (30) day Segment Operational Test shall be conducted on each of the commissioned Segments. Any performance deficiencies that were identified during the Operational Test identified in Section IV.06 shall be verified during this test. However, in general the System will be monitored for anomalies during this time.

IV.08. Project Acceptance Test

At a mutually agreed upon date, following satisfactory completion of the above described testing as determined by the CTRMA, the Project Acceptance Test shall begin. The acceptance test shall be conducted on the Toll Collection System and is considered a requirement for Project Acceptance. During this period, the Toll Collection System will be allowed to operate without interruption and monitored for thirty (30) days. Anomalies that are identified shall be classified as critical or non-critical. Depending on the severity of the anomaly, the thirty (30) day clock may re-start. The test procedures shall detail the data analysis process. If the System failed to meet the performance and accuracy requirements of the Contract, then these shall be re-tested to be successful during the Project Acceptance Test.

The Project Acceptance Test shall be considered successfully completed when the acceptance test criteria, developed during the design phase, is satisfied. Upon the successful completion of the Project Acceptance test as reasonably determined by the CTRMA, the Contractor will be given a Provisional Acceptance for the Toll Collection System.

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Chapter V

V. MANAGEMENT SYSTEM

V.01. Overview

The Contractor shall employ a Project Management System that is sufficiently detailed to enable the CTRMA to review and ascertain that the Contractor has the necessary management, staff and controls in place to meet the specifications of these technical requirements. This System shall enable the CTRMA to monitor the progress and quality of the work performed on the Project.

V.02. Project Schedule

The Contractor shall develop a detailed Project Schedule that lists all tasks related to the design, development, testing, installation and deployment of the CTRMA Toll Collection System in Microsoft Project format (Office 2003 or above). The Project Schedule should identify all milestones and events starting with the Notice to Proceed through the date of Project Acceptance. This Project Schedule will form the basis for all subsequent schedules and updates throughout the duration of the Project. The Project Schedule shall be baselined upon approval and the Contractor is required to update the Project Schedule on a monthly basis.

V.03. Monthly Report

At a minimum, monthly progress meetings shall be held on or about the 20th of each month at a location designated by the CTRMA. Three working days prior to the meeting, the Contractor shall submit monthly progress reports to the CTRMA. The reports shall include the following documents, when applicable:

- A written report outlining the labor, materials and the percentage of work performed for each task in the Project Schedule. Comments shall be included, where appropriate.
- The written report shall include an analysis of all critical path tasks, potential risks associated with them and any contingency plan to circumvent a delay to those items.
- An updated Project Schedule showing proposed changes from the original approved Project Schedule, if any, and showing progress from the previous month for discussion purposes. If no Project Schedule change has been requested, the Contractor shall so state.
- A progress payment request, if applicable, with the monthly progress report. Progress payment requests received at other times will be held until the following month.
- If necessary change order requests for Project Schedule or monetary changes to the Contract shall be submitted with the monthly progress report.

Attachment E

Technical Requirements

- A summary of the time devoted to the Project by each Key Staff for the immediately preceding month.
- Change order work requests not relating to the Project Schedule or monetary changes may be submitted for review at any time during the month.

V.04. Staffing

It is the Contractor's responsibility to maintain and assign a sufficient number of competent and qualified professionals, and other technical personnel to meet the specifications of these technical requirements. The Contractor shall provide the CTRMA with an Organization Chart that identifies the Contractor's employees dedicated to this Project (the "Key Staff").

V.05. Communication Plan

The Contractor shall submit a Communications Plan to the CTRMA for review and approval. The Communications Plan shall describe the communication procedures for controlling all correspondence, submittals and other communications between the Contractor and the CTRMA. Since the Contractor has to work with other vendors on this Project, the communications among the teams is very critical for the success of the Project.

- **Correspondence** -- Correspondence shall be identified as to originator and designated receiver.
- **Document Control** -- The Contractor shall manage the Project correspondence through the use of Expedition or functionally equivalent software.
- **Submittals** - All submittals shall be submitted as an enclosure to the Contractor's submittal letter. Each submittal letter shall be limited to a single subject or item. The Contractor's letter shall identify the letter itself, Contract Number, Contract Name, and Subject of the submittal.
- **Contract Number and Contract Name** - All items of correspondence, submittals and documentation shall contain the Contract Number and the words "CTRMA Toll Collection System Implementation".
- **Information** -- No party shall be entitled to rely on any information unless it is in writing and received from the other party's Designated Representative.
- **Change Orders** -- Any change orders from the CTRMA shall be in writing and shall be executed by one of the CTRMA Designated Representatives and one of the Contractor Designated Representatives.
- **Status** -- The CTRMA or the CTRMA's Designated Representative may inquire of the Contractor as to the status of the Project.

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- **Access to Contractor Key Personnel** -- The CTRMA or the CTRMA's authorized representative who is knowledgeable in the field of work, shall have unlimited access to the Key Staff during the Contractor's performance of this Contract.

V.06. Software Design and Development Requirements

To ensure that the design requirements for the CTRMA Toll Collection System is fully understood by the CTRMA and the Contractor, a series of requirements and design review steps are specified herein. The Contractor shall establish and maintain an effective software design and development program to ensure compliance with the specifications of these technical requirements. This Section V.06 provides the description and guidelines for the techniques and methodologies to be employed to monitor the software development elements of these technical requirements.

V.06.01. *The Software Development Plan (SDP)*

The Contractor shall submit a Software Development Plan (SDP) to the CTRMA that establishes the framework used for the software development of the CTRMA Toll Collection System. The SDP shall describe the software life-cycle approach that emphasizes the necessary interfaces between various System development disciplines, i.e., software developers, system engineers, test engineers, Software Quality Assurance (SQA) personnel, configuration management administrator, documentation specialists, project management staff, and software maintenance personnel. The SDP shall also include detailed information on the technical approach, problem reporting and tracking process, software configuration and change management, and other items pertinent to a complete plan for software development for the Project.

V.06.02. *System Detailed Design Document (SDDD)*

In order to meet the Schedule Milestones and to ensure the System meets the CTRMA requirements, the design review shall be conducted as a two-phase process. Two weeks after Notice to Proceed, the System Detailed Design Document (SDDD) shall be submitted to the CTRMA for review. This document shall be what is considered by the Contractor as Standard Toll Collection System that meets the CTRMA Contract requirements. This document also shall address the Express ETC Lanes and describe all functionality related to the remote Express Toll Locations thoroughly. The CTRMA will review, and if necessary, provide Conditional Approval of the SDDD for those sections relating to remote Express Toll Locations. It is understood that there shall be some iterations of the submission and review cycle before this Conditional Approval is given. The Contractor shall develop the remote Express Toll Locations of the CTRMA Turnpike System and coordinate the designs with TxDOT per the conditionally approved SDDD.

The CTRMA and the Contractor shall continue to develop the design for the complete System. During this phase, any changes/additions needed to the Contractor Standard Software to meet the CTRMA technical and operational requirements shall be discussed and finalized. It is understood that there shall be some iterations of the submission and review

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cycle before approval of the complete SDDD is given. The Contractor shall develop the complete System per the approved SDDD.

During the development of System design, numerous demonstrations/walkthroughs of the System shall be conducted to present the hardware and software design to the CTRMA. During these demonstrations/walkthroughs, the CTRMA will identify any Contract and/or operational deficiencies which shall be corrected by the Contractor.

The SDDD shall include, but not be limited to:

- The specification sheets for all equipment
- The requirements for all peripheral device interfaces and control
- All user interfaces
- Lane layouts, and logic and timing details
- All operational and business rules
- Interface Control Documents for all interfaces
- Coordination with TxDOT infrastructure design and construction
- Report and screen format
- Computer sizing and design details

V.06.03. Software Development and Walkthrough

The Contractor shall conduct a series of software application walkthroughs and solicit inputs from the CTRMA during the development of the Toll Collection System. The intent of these design walkthroughs is to help ensure that the final product will meet the CTRMA technical and operational requirements. This approach will also ensure that CTRMA is familiar with the product thus expediting the testing process.

V.07. Documentation

The Contractor is required to provide various design, user, installation, and training documentation. All documentation provided under this Contract shall meet the requirements described below.

V.07.01. General

Detailed and accurate documentation is required to ensure that the CTRMA can operate and maintain the Toll Collection System. Detailed documentation will enable the CTRMA to understand the Toll Collection System thus resulting in better performance of audit and reconciliations. It also will assist the CTRMA in making better, informed decisions on any required system changes or revisions to Business Rules.

The Contractor shall provide standard commercially available documentation for third-party provided hardware, software, maintenance materials, and support documentation provided under this Contract. The Contractor shall provide comparable documentation for all other items under this Contract.

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The Contractor shall furnish, install and maintain, in current updated condition, the following 'Primary Set' of all documentation required under this Contract for equipment provided by the Contractor. This material shall be provided in its commercially available form or a comparable form and placed in racks or shelves to be retained at the CTRMA Offices for the duration of this Contract. Additionally, a softcopy of these documents with updates to them if available shall be provided to the CTRMA. Acceptable softcopy formats are Microsoft Office 2003 Suite or higher, and AutoCad 14 or higher for prepared documentation as listed below. Soft copies of manuals may be provided in unsecured Portable Document Format (.pdf). All updated documents shall show the revisions and also include a version of the clean document.

- One complete set of hardware manuals for all hardware supplied under this Contract. This set shall include the manufacturers' manuals for every assembly as provided by each manufacturer.
- One complete set of software manuals for each version of computer system supplied under this Contract. This set shall include the operating system, utilities, programming languages, application software, communications software and any software purchased by the Contractor for development under this Contract.
- One complete set of Users Manuals for the various Systems provided under this Contract to include the Toll Collection Manual, Maintenance Service Manual, Supervisor's Manual, Lane Operations Manual, Audit Manual, System Users Manual.

V.07.02. Design Documentation

As part of the design review process, the Software Development Plan and the System Detailed Design Document shall be submitted to the CTRMA for review and approval. The System Detailed Design Document should demonstrate that the Contractor understands the functional and operational requirements of the Project and has the processes and policies in place to provide a high quality and reliable product that meets the requirements of the Contract.

After the completion of the Project Acceptance Test, the Contractor shall submit the As-Built System Detailed Design Document that includes all changes made during the software development and testing phase.

V.07.03. Software Documentation

All Contractor software provided under this Contract shall be fully documented to meet the applicable coding standards. Comments shall be incorporated to enable programmers to understand the code and make changes. Detailed software code documentation shall also be provided along with the As-Built System Detailed Design Document.

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V.07.04. Manual Requirements

New manuals provided under this Contract that are not standard commercial catalogs or manuals shall meet the following requirements. Draft copies of all manuals shall be submitted to the CTRMA for approval, prior to final printing. Whenever possible, all data shall be printed on 8-1/2" x 11" sheets, foldouts should be 11" x 17".

Each manual shall contain a title sheet, table of contents, list of illustrations (if applicable), list of reference drawings (if applicable) and a parts list (if applicable). All manuals with over fifty pages shall have an index.

All text, graphs and illustrations produced for the Toll Collector's Manual, and any other special manuals prepared for the CTRMA under this Contract, shall be produced in a Microsoft Software product. Any special software required to produce scaleable typefaces or other graphs shall be provided by the Contractor as part of the documentation for the manuals.

V.07.04.01. Toll Collector's Manual

This manual shall be provided as a training manual for the Toll Collectors. A complete description of all operational procedures and a non-technical description of the Manual Lane Terminal (MLT) features and functions shall be provided. The manual shall contain illustrations and pictorial diagrams to demonstrate the step-by-step operations required for processing all normal and irregular toll transactions. Actual MLT screens for each transaction processing step shall be captured and incorporated into the manual. This manual shall not include any information that could jeopardize the integrity of the Toll Collection System.

V.07.04.02. Supervisor's Operational Manual

This manual shall detail all the Supervisor operations to be performed on Manual/ETC, ACM/ETC, Dedicated ETC and Express ETC Lanes. It shall also include all functions to be performed by the Supervisor on the Toll Collection System application as part of the supervisory responsibility. A complete description of all operational procedures and a non-technical description of the plaza screens, reports, and functions shall be provided. The manual shall contain illustrations and pictorial diagrams to demonstrate the step-by-step operations required for performing the supervisory functions. Any applicable host functions accessed by the Supervisor shall also be included in this manual. This manual shall be used by the Contractor while training the Supervisors, and every effort shall be made to use valid data as examples.

V.07.04.03. Audit Manual

This manual shall detail all procedures used to audit the System for Manual, ACM, and ETC means of payment. It shall also include the reconciliation of transactions and revenue for each mode of payment within the System as well as with the CSC/VPC. A complete description of all audit procedures and a non-technical description of the screens, reports, and functions shall be provided. The manual shall contain illustrations and pictorial diagrams to

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demonstrate the step-by-step operations required for performing the audit functions. Reports included in the submittal shall have correct and accurate data and this manual shall be used to train the auditors.

V.07.04.04. System User Manual

This manual shall detail the use of the System application software that serves the plaza, host, MOMS and Security Access System. The manual shall contain illustrations and pictorial diagrams to demonstrate the step-by-step operations required for performing functionality and navigating the screens. All usage of all reports and the data fields shall be clearly explained. This manual shall be used for training purposes.

V.07.04.05. Maintenance Service Manual

This manual shall be prepared for properly trained technical personnel assigned to the maintenance of the hardware within the Toll Collection System. This manual shall include a general description, theory of operation, operator instructions, mechanical functions, installation, test and troubleshooting procedures, preventive and corrective maintenance procedures and schedules, diagrams, schematics, layouts and parts lists required to service each piece of all Contractor supplied hardware.

Standard service manuals for commercial products used for the equipment will be acceptable if they contain sufficient information to service the equipment. Large-size logic diagrams and mechanical assembly diagrams do not have to be reduced or incorporated into the manuals if these drawings are provided with the manuals.

V.07.04.06. Support Documentation - Catalogs - Parts Lists

The Contractor shall provide each manufacturer's product documentation that is delivered with specific items such as a power supply, sensors, printed circuit card, electronic module or mechanical assembly.

All material listed in the Parts Lists shall be identified by part number, type, model, or other descriptive nomenclature, together with the vendor's name and manufacturer. Second manufacturer sources shall be provided for all standard commercial components, as required elsewhere in the Contract.

The Contractor shall furnish to the CTRMA all documentation available from the manufacturers associated with the computers and peripheral equipment provided. The documentation shall include, but not be limited to, all operator's guides, installation guides, hardware reference manuals, options catalogs, user's manuals, programmer's reference manuals, maintenance manuals, technical manuals, illustrated parts breakdown, and similar documents offered by the various component manufacturers. The Contractor shall provide a physical layout of the computer processor and its peripherals including communications cabinets and the uninterruptible power supply cabinets.

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Technical Requirements

The Contractor shall provide a complete description of the Plaza and Host Computer hardware including product literature and specification sheets for all major elements of the Plaza and Host Computer System. The Contractor shall justify the design being proposed to ensure System reliability and performance.

V.07.05. As-Built Drawings

The Contractor shall provide to the CTRMA a complete set of as-built drawings, which shall be delivered as two (2) full-size and four (4) half-size complete sets of prints, and shall deliver the same in electronic format, for all equipment furnished under this Contract. The sets shall include, but not be limited to, all schematics, logic diagrams, layouts, wiring diagrams, assembly drawings, parts detail drawings for all mechanical parts designed or modified under this Contract and interface details so as to provide a complete record of the as-built status of the equipment.

Drawings contained in standard catalogs and manuals for commercial products do not have to be reproduced as part of the as-built drawing sets. All drawings for revisions to standard commercial assemblies or components for the equipment shall be included in the as-built drawing set. The as-built drawing set for the Toll Collection System architecture shall be provided.

All As-Built drawings shall contain a table of contents that shall include a listing of all drawings with headings for drawing number, drawing title, revisions number and date, and the type of material list, wiring diagram, wire list, specification control drawing or similar categories.

V.08. Quality Assurance and Quality Control Program

The Contractor shall establish and maintain an effective Quality Assurance/Quality Control (QA/QC) Program to ensure compliance with the Contract. The Quality Assurance Plan that details the Contractor's QA/QC Program shall be submitted to the CTRMA for review and approval ten (10) working days after the Notice to Proceed.

The Plan shall include the Contractor's QA/QC Program through design, production, purchasing and testing of all hardware and software provided under this Contract. The QA/QC Program shall also include, at a minimum, problem logging and tracking, follow-up tracking, and final disposition tracking during the testing and implementation. The quality control process shall ensure accurate problem description and recording, assignment of personnel, tracking of progress for corrections/revisions, and disposition of the problem throughout the design, development, testing and implementation phases of the Project.

The QA/QC Program shall ensure adequate quality throughout all areas of this Contract performance, including, design, development, fabrication, processing, assembly, inspection, test, maintenance, packaging, shipping, storage, site preparation and installation.

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All supplies and services under this Contract, whether manufactured or performed within the Contractor's plant or at any other source, shall be controlled at all points necessary to ensure conformance to the specifications of these technical requirements. The QA/QC Program shall provide for the prevention and ready detection of discrepancies and for timely and positive corrective action. The Contractor shall make objective evidence of quality conformance readily available to the CTRMA.

The authority and responsibilities of those Contractor personnel in charge of the design, production, testing and inspection of quality shall be clearly stated. Facilities and standards such as drawings, engineering changes, measuring equipment and the like, which are necessary for the creation of the required quality, shall be effectively managed. The QA/QC Program shall include effective control of purchased materials and subcontracted work. Manufacturing, fabrication and assembly work conducted within the Contractor's plant shall be controlled completely by the Contractor.

V.08.01. Quality Assurance Management

The Contractor's Quality Assurance Plan shall identify the organizational elements and Key Staff responsible for managing the overall QA/QC Program, and shall clearly define the related responsibilities and functions molding both policy and action. Provisions shall be made and documented for regular management review of the status and adequacy of the Plan.

V.08.02. Records

The Contractor shall maintain records or data essential to providing objective evidence of quality for the later of (i) five (5) years after Project Acceptance. Examples of quality-related data include: inspection and test results, records of subcontractor QA/QC Programs, cost records pertinent to acceptance of nonconforming material, design reviews and walkthroughs, and the results of internal and vendor audits. Records shall be maintained in a manner that will allow for easy access and analysis of the status of the overall QA/QC Program. The Contractor shall retain these records until the expiration of the guarantee/warranty period and they shall be made available to the CTRMA upon request.

V.08.03. Drawings, Documentation and Changes

The Contractor shall document and maintain procedures to ensure that all engineering drawings and documentation are adequate, complete, and current. All changes shall be controlled and documented.

V.08.04. Control of Purchases

The Contractor shall be responsible for ensuring that all supplies, components, developmental tools, assemblies, subassemblies and services procured from subcontractors and vendors conform to the specifications of these technical requirements. The Contractor's responsibility includes the establishment of procedures for the selection of qualified suppliers. In selecting qualified suppliers, the Contractor shall ensure that the subcontractors and vendors control the quality of the supplies and services provided.

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V.08.05. Inspection and Verification

The Contractor's QA/QC Program shall include requirements for inspection and verification for in-process, final assembly, unit tests and system testing of the Contractor supplied Systems.

- The inspection and verification procedures (and testing procedures) shall be the basis for determining Project Acceptance or Segment Acceptance, as applicable, or the rejection of any hardware and software. This inspection function responsibility, which includes nondestructive testing, shall not be delegated to any agency or testing laboratory without prior approval from the CTRMA.
- Identification of the inspection and verification points shall be the responsibility of the Contractor's engineering and software development departments.
- The CTRMA reserves the right to recommend modifications or additions to the inspection or verification points. Such recommendations will be based on the audit or inspection results at the time of review of the Contractor's Quality Assurance Plan or at any time during the inspection or verification action if such procedures are determined to be inadequate to ensure the quality of the Contractor supplied Systems.
- Once the inspection and verification points have been established for in-process, final assembly, unit tests and system testing, any work delivered by the Contractor related to the assembly of the Contractor supplied Systems shall not be considered acceptable until: (a) inspection "acceptance" action as applicable has been completed, or (b) the CTRMA revises the requirements in writing, or (c) the Contractor's corrective action for a discrepant condition is satisfactorily resolved or otherwise completed.
- The conduct of an inspection action that has a satisfactory result will be documented by the signature of the CTRMA.
- The conduct of an inspection or verification action which results in a "rejection" will be documented for evaluation and corrective and preventive actions in accordance with the procedures for such actions in the Contractor's Quality Assurance Plan that has been approved by the CTRMA. Any item that is reworked, repaired or modified must be re-inspected or re-tested.
- Procedures for the in-process, final assembly, unit tests, system testing and test inspections or verifications for conducting these tests shall be incorporated in the Contractor's QA/QC Program and applicable software and testing plans and shall be submitted to the CTRMA for approval.
- The status of the inspection or verification shall be maintained to preclude issue or use of materials or tests of Systems, subsystems or components on which the required inspections or verifications have not been completed. Identification of status shall be accomplished by means of stamps, tags, routing cards or other control devices.

V.08.06. Handling, Storage and Delivery

The Contractor's QA/QC Program shall provide for adequate, documented handling, storage, preservation, packaging, and shipping instructions to protect the quality of products required by these technical requirements. Any unique or special requirements applicable to procured items shall be delineated in the procurement documents.

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V.08.07. *Inspection at Subcontractor-Vendor Facilities*

The CTRMA reserves the right to inspect, at the source, supplies or services not manufactured or performed within the Contractor's facility. The CTRMA inspection shall not constitute acceptance, nor shall it in any way replace the Contractor's inspection activity or relieve the Contractor of the responsibility to furnish an acceptable end product.

V.08.08. *Access to/Inspection of Contractor's Facilities*

Upon request, the CTRMA or the CTRMA's Designated Representative who is knowledgeable in the field of work shall have access to the Contractor's facilities and personnel. This access may be restricted to those portions of the facilities and personnel involved with or otherwise performing work under this Contract. Such access shall be for the purpose of inspecting the facilities, verifying progress, inspecting materials, work-in-progress, finished goods, test performance and results, etc.

V.09. *Disaster Recovery Plan*

The Contractor shall provide a Disaster Recovery Plan and subsequent Disaster Recovery Procedures for the Toll Collection System to be reviewed and approved by CTRMA. As part of the Operational Test, the Contractor shall implement its Disaster Recovery solution and shall test the System accordingly.

V.010. *Training*

The Contractor shall provide comprehensive training for the operation and maintenance of the Toll Collection System. The Contractor shall develop and present for CTRMA review and comments, the initial Toll Collection System Training Manuals and training materials, including training for toll collection, toll management, system administration, audit and reconciliation, system reporting, ad hoc reporting, security access, and maintenance. Toll Collector training shall be conducted as a "train-the-trainer" format.

Training shall apply to all areas of the System. The Contractor shall submit a Training Plan and Schedule to include System Operations, Maintenance, Administration and Disaster Recovery. The Training Plan shall detail the scope of each training session by providing detailed content and the duration of each training session, as well as timing, logistics and equipment and materials necessary to conduct hands-on interactive training. The Training Plan shall be submitted to the CTRMA for review and approval prior to the initiation of any training.

Technical Requirements

Chapter VI

VI. LANE OPERATIONS

VI.01. Introduction

The purpose of this section is to define the procedures for the toll operations staff for operating the lane equipment at each toll plaza and remote Express Toll Locations. These procedures will be incorporated into the training procedures for all Toll Collection staff. This section addresses the Manual, ACM, Dedicated ETC and Express ETC modes of toll collection operations. On the Mainline plaza, there will be only Manual and Dedicated ETC lanes. On the ramps there will be Dedicated ETC, ACM and Manual lanes. At remote Express Toll Locations, there will not be any attended lanes or ACMs, and only Express ETC Lanes will be operated. Transponders are accepted in all lanes.

VI.02. Opening a Lane

VI.02.01. From the Lane

VI.02.01.01. Manual Lane Operations

The Manual Lane can be opened from the Manual Lane Terminal (MLT) by a Toll Collector or Supervisor with a valid employee identification (ID) and Pin Number (PIN). A Manual Lane has three modes: Open, Standby, and Closed. The Toll Collector will enter their employee ID and PIN at the log-in screen which will then display the screen that lists the various modes the lane can be opened in. The Toll Collector will then press **OPEN MANUAL** to open the lane in a manual mode of toll collection. Once the Toll Collector presses **OPEN MANUAL**, the canopy light turns from a RED X to a GREEN arrow ↓, and the lane is open to the patrons. The MLT will have a canopy light indicator that will turn GREEN.

VI.02.01.02. ACM Lane Operations

An ACM Lane will be opened only by the Plaza Supervisor. The Supervisor will enter their ID into the ACM keypad and turn the Key to the OPEN position. Once the ID is accepted, the ACM will send a message to the Lane Controller to open the lane. The canopy light will turn to a flashing GREEN indicating the lane is an Exact Change ACM Lane. There is no MLT control for an ACM Lane. Prior to the opening the lane, the Supervisor will ensure that there is at least one empty vault in the ACM. If both vaults are full, the lane will not open and a Maintenance On-Line Management System (MOMS) alarm will be generated.

Technical Requirements

VI.02.01.03. Dedicated ETC Lane Operations

Every lane will have the capability to be opened in Dedicated ETC mode of operation. Only a Supervisor can open the lane in ETC mode. If the lane has an MLT, **OPEN ETC** is one of the options presented when the Supervisor ID is entered into the System. In an ACM Lane, the keypad will be used to open the lane in Dedicated ETC mode. When the lane is opened in Dedicated ETC mode, the YELLOW canopy light will flash indicating that the lane is opened in Dedicated ETC mode.

VI.02.01.04. Express ETC Lane Operations

Since there are no booths in Express ETC Lanes, these lanes cannot be opened from the lane. Express ETC Lanes are programmed to be OPEN at all times and an Express ETC Lane is only closed for maintenance activity.

VI.02.02. *Remotely*

Only Dedicated ETC and Express ETC Lanes may be opened by the Supervisor from the Plaza Workstation at the Field Operations Building. The Plaza Supervisor will ensure that there are no obstructions or staff members in the lane prior to opening the lane. The lane can then be opened by using the Real Time screen by selecting the lane and clicking **OPEN LANE**. The lane status will change from **CLOSED** to **OPEN**, and the lane will be ready to process transactions. When a lane is opened in Dedicated ETC or Express ETC mode, the YELLOW canopy light will flash indicating that the lane is opened in Dedicated ETC or Express ETC mode. The Supervisor will verify on the Real Time screen that the lane is open and processing transactions.

VI.03. Closing a Lane

VI.03.01. *From the Lane*

VI.03.01.01. Manual Lane Operations

When a Toll Collector is nearing the end of their Shift or needs to take a break, the Toll Collector will be required to close the lane. The lane is first placed in a Standby mode by pressing the canopy light indicator. This will turn the canopy light to a RED X and the canopy light indicator will turn RED. Once the lane is placed in Standby mode, the Toll Collector will then process the remaining vehicles in the lane. Once the Toll Collector has processed the vehicles in the lane, the Toll Collector will press **CLOSE** to close the lane and log out of the lane. This will shut the lane for vehicle processing and the PFD will display **LANE CLOSED** or **the ITL will be RED**. It is recommended that the lane be opened in Dedicated ETC mode if the Toll Collector is on break and there is no replacement.

Technical Requirements

VI.03.01.02. ACM Lane Operations

An ACM Lane can be closed from the ACM keypad by a Plaza Supervisor. The Supervisor will enter their employee ID and then turn the key to the CLOSED position. The canopy light will turn to a RED X and the coin wheel will stop turning. The PFD will display *LANE CLOSED or the ITL will be RED.*

VI.03.01.03. Dedicated ETC Lane Operations

A Dedicated ETC Lane will be closed using the MLT or the ACM keypad. The canopy light will turn to a RED X and the PFD will display *LANE CLOSED or the ITL will be RED.*

VI.03.01.04. Express ETC Lane Operations

Express ETC Lanes cannot be closed from the lane.

VI.03.02. *Remotely*

All lanes on the entire Turnpike System can be closed remotely from the Plaza Workstation by Plaza Supervisor. The lane to be closed will be selected using the Real Time screen and the Supervisor will click *CLOSE LANE*. If a Manual Lane is being closed, it will first be placed in *Standby* mode and then closed. Once the lane is closed, the Supervisor or a Toll Collector will place a cone in the lane to indicate that the lane is closed. The PFD will display *LANE CLOSED or the ITL will be RED*, and the canopy light will be RED X.

VI.04. Vault Operations

VI.04.01. *Removing Vaults*

A vault can be removed by a Plaza Supervisor or other authorized person. Prior to removing a vault, the vault manifest identifying the vaults to be pulled is printed. When the lane is open, only a non-active vault can be removed and is indicated by a dim LED present on the Vault ID cage. When the lane is closed, both vaults can be removed. An authorized person can remove the vault by inserting the vault release key and turning it slightly to the release position. After the ACM beeps, the authorized ID will be entered into the ACM Keypad. Once this is entered and accepted, the vault will release from the frame. The authorized person will pull the vault out and insert an empty vault immediately. If the second vault has to be removed and the lane is open, then the active vault will be switched to the new vault and the same operation is repeated. Before leaving the lane, the personnel will make sure the lane is operational. Vault manifest information such as Insert Time, Removal Time, and Removed By ID will be recorded by the System for audit purpose.

Technical Requirements

VI.04.02. Inserting Vaults

To insert a vault, there must be an empty vault slot. Once the vault is inserted, if there is not another vault in the ACM, this will become the active vault. If there is another vault in the ACM, the active vault will remain as the other vault until it is full and then will switch over. The Supervisor will ensure that the vaults are unlocked prior to inserting them into the ACM. Once they are inserted into the ACM, the vault will be locked and secure. If both vaults are missing from the ACM, or if both vaults full, the lane will automatically close.

VI.04.03. Switching Vaults

The ACM is programmed to automatically switch to an empty vault when the active vault is full. The automatic vault switch will be based on vault weight and this number is configurable through the System. An authorized staff person can also switch the active vault to inactive and make the inactive vault active from the Plaza Workstation or from the lane. The authorized staff person will log into the Plaza Workstation and go to the vault monitor screen. At the vault monitor screen, the Plaza Supervisor will press the **SWITCH VAULTS** button after selecting the lane. This will make the inactive vault active. To switch the vault from the lane, on the vault cage press the **SWITCH VAULT** button. This will make the inactive vault active. If there is not a second empty vault in the ACM, the **SWITCH VAULT** button will be disabled and this feature is not available.

VI.05. Canopy Lights

The canopy lights are used to direct the patron to **OPEN** lanes in advance of the plaza per their mode of payment. The canopy lights are on top of the plazas and ramps and are indicated by a **GREEN** arrow ↓ if the lane is **OPEN** in manual mode and a **RED X** if the lane is **CLOSED**. When the lane is open in ACM mode, the **GREEN** light will flash. When the lane is open in Dedicated ETC mode, the **YELLOW** light will flash. The canopy lights are controlled by the Lane Controller based on the operational status of the lane, but can be overridden by the Toll Collector, maintenance personnel or Plaza Supervisor for safety reasons. A Canopy Override Switch (COS) is located in each booth. A Toll Collector can force the COS switch to **RED** to direct patrons away from a lane that may need to be temporarily closed. Similarly if the equipment in the lane was not functional but for operational reasons the lane has to be opened, then the COS is placed in the **GREEN** position. In such an event, tolls will have to be collected manually.

VI.06. Toll Collection Procedures

VI.06.01. Toll Collector

When a Toll Collector begins their workday (Shift beginning), the Plaza Supervisor will assign the Collector a Money bag that is used to temporarily store funds during the Toll Collector's Shift, and this Money bag will be used at the end of the Shift for the Toll Collector deposit. The Money bag number assigned to each Toll Collector is logged into the System and is retained in the Toll Collector partial-shift and Shift reports for audit purposes.

Attachment E

Technical Requirements

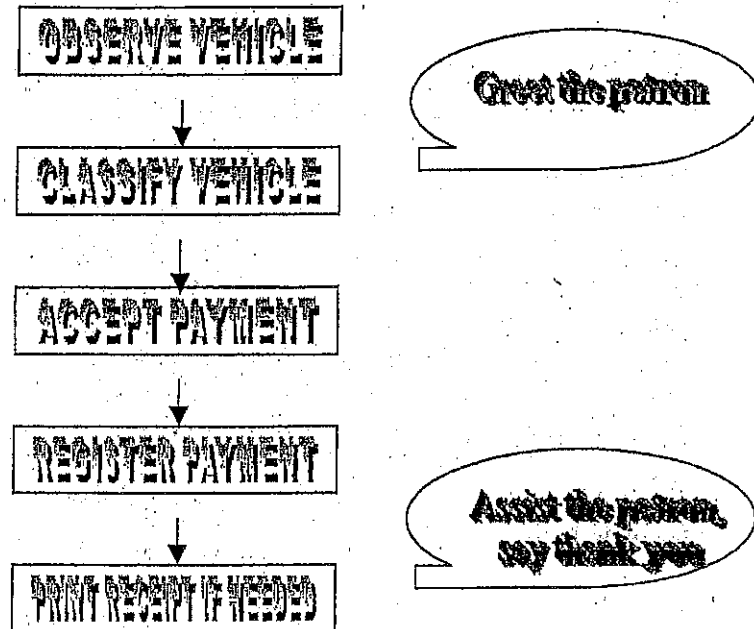
Each Toll Collector is given a cash tray that contains a pre-established initial change fund amount. The cash tray is installed into the cash drawer in the toll booth and used during the Shift for money storage. The Supervisor also assigns the Toll Collector a lane(s) in which the Toll Collector will collect tolls during their Shift.

Upon reaching the lane, the Toll Collector will insert the cash tray into the cash drawer and make a final organization of the money, radio etc. The Toll Collector will then step out into the lane to remove the safety cone. The Toll Collector will key-in onto the Toll Collection System utilizing the MLT in the toll booth. This process can be performed by manually entering an employee ID and PIN. Once the employee ID and PIN are verified by the System, an equipment check out is performed by the System, and the Toll Collector is informed that the lane is ready for toll collection. The canopy light changes from RED X to GREEN arrow ↓, signaling to the patrons that the lane is open for toll collection in a manual mode. The Changeable Message Sign (CMS) will indicate the mode of lane operations [Manual/ETC], the PFD will display *LANE OPEN*, and the ITL will stay RED. The booth window will be opened by the Toll Collector to service customers.

As vehicles enter the lane, the System will automatically classify the vehicle to a default of 2-axle, and the PFD will display the 2-axle fare. If the axles are different, the Toll Collector classifies the vehicle, as prompted by the MLT and the toll due is displayed on the MLT and the PFD. The ITL is RED until the transaction is completed. The Toll Collector collects the toll payment from the patron, indicates that the toll has been paid on the MLT, makes change if necessary, and provides a receipt if requested. The ITL turns GREEN, and the PFD will show *THANK YOU*. When the vehicle leaves the lane, the PFD will blank and the ITL will turn RED, and the System is ready for the next transaction.

The sequence of tasks for the routine toll collection procedure on manual operations is as follows:

Technical Requirements



CTRMA Toll Collection Procedure

Toll Collectors will be trained on handling various special transactions, unusual occurrences, and specific situations that can occur during the course of normal operations. Generally, every unique situation and occurrence shall be logged by the Toll Collector. The toll collection software will accommodate the preparation of these reports in electronic format on the MLT. More common unusual occurrences shall be incorporated into the MLT screen menus allowing quick access to the appropriate report formats. Other unusual occurrences can be reported on an individual basis through custom report formats. The more common unusual occurrences include transponder replenishments, convoys, emergency vehicles, military vehicles, invalid ETC, insufficient or No-Funds, and lane run-throughs and violations.

VI.06.01.01. Transponder Replenishment

A CTRMA customer who has a transponder may stop at the toll booth to replenish their account. A transponder has to be read in order for the System to replenish the account. Customers can replenish their accounts with \$20 or \$50 amounts. The Toll Collector will press the appropriate button depending on the amount provided. Two receipts will automatically print, one for the customer and one to be retained by the Toll Collector to be submitted when depositing the cash.

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Technical Requirements

VI.06.01.02. Convoys

Convoys typically consist of multiple vehicles that pass through the toll lane with one toll payment. In normal circumstances, the Supervisor will be notified of the convoy passage, and permission granted. The person in charge of the convoy will be told that payment should be made in the lane for all the vehicles that are part of the convoy before the vehicles are processed. The receipt will be provided after the last vehicle in the convoy has been processed. When the convoy arrives in the lane, the Toll Collector will press the **BEGIN CONVOY** button and then process the vehicles as cash paying patrons. The accumulated total will be displayed after each vehicle is processed. ETC reads will not be considered part of the convoy. If a vehicle that is not part of the convoy gets among the convoy, the convoy processing will be paused (**PAUSE CONVOY**) and this vehicle processed, then the convoy processing will be resumed (**RESUME CONVOY**). Once all the vehicles that are part of the convoy are processed, the convoy processing will be stopped (**STOP CONVOY**) and two receipts will be automatically printed. One copy will be provided to the last driver and one is retained for Toll Collector records. Proper documentation of this unusual occurrence is necessary to allow toll audit. Each vehicle that was part of the convoy will be flagged by the System.

VI.06.01.03. Emergency and Military Vehicles

The passage of emergency and military vehicles will be allowed without toll payment. The Toll Collector will classify the vehicle and then enter the vehicle type (**EMERG** or **MILITARY**).

VI.06.01.04. Invalid ETC Vehicles

Occasionally, patrons with an invalid ETC tag will drive into the Manual Lane to pay cash. The MLT will notify the Toll Collector that the tag read is invalid. The Toll Collector will process the vehicle as a cash payment after canceling the ETC read (**CANCEL ETC**). Valid patrons wanting to pay cash will be advised that cash payments are not accepted once the tag is read.

VI.06.01.05. Insufficient or No-Funds

Insufficient or No-Funds unusual occurrences consist of a patron passing through the toll plaza and notifying the Toll Collector that they do not have the full toll amount or do not have any of the toll amount. The Toll Collector will process the vehicle as a "No-Fund" transaction and enter the amount paid. If possible, the license plate number is recorded on the MLT and two receipts are automatically printed. On one receipt information consisting of their name, address, telephone number, and automobile make and model is recorded. The other receipt stating the toll amount due and a mailing address is given to the patron so payment can be made at a later date. Payment can either be made through the mail, dropped

Technical Requirements

in at the toll plaza or at a toll booth on a future trip. Follow-up letters can also be sent, if necessary. If a patron is paying for a previous "No-Fund" transaction, then the Toll Collector will first process the vehicle and collect the payment for the present trip. The payment for the previous trip is collected and kept separate from the collections. The "No-Fund" payments are given to the Supervisor who deposits it separately after processing the payment.

VI.06.01.06. Lane Run-throughs or Violations

Lane run-throughs and violations consist of patrons passing through the toll plaza without full or any toll payment and without acknowledgment to the Toll Collector of such actions. The Toll Collector will record the vehicle license plate number, make and model, if possible. The enforcement agency is notified, if enforcement activities are being carried out at the time, and the violator is pursued. Otherwise, pertinent information is documented and a letter is sent to the patron if DMV database information is available, or the violation is simply documented and considered lost revenue.

VI.06.01.07. Other Unusual Occurrences

Other unusual occurrences are documented by the Toll Collector and incorporated into the audit process. In most cases, such reporting will be automated so as to minimize the paperwork. The objective will be to ensure that all unusual activities in the lane are accounted for. Unusual occurrences that cannot be entered in the MLT will be recorded and entered at the Plaza Workstation by the Supervisor.

Specific situations that may occur in the toll lanes such as disabled vehicles, accidents, or other similar situations will be administered by the Toll Collectors. Normally, if a vehicle or vehicles block a toll lane or approach to the toll plaza, it is important to move the vehicle to the side as quickly as possible. Toll Collectors are typically not responsible for physically assisting in clearing the lane because of liability and safety issues. The on-call towing/garage service will be immediately notified by the Toll Collector or Supervisor by phone or radio. The problem and location will be described as accurately as possible and assistance requested. In the case of accidents, police and ambulance services will similarly be requested.

Patrons requesting assistance or directions will be treated courteously and professionally, in accordance with the administrative requirements established for the operation of the facility.

Communications methods available in the toll booths will consist of an intercom system. The intercom system will allow communications between toll booths and from the toll booths to the Field Operations Building. The telephone can be used on an as-needed basis.

In the event of a robbery, the Toll Collector shall be trained to cooperate and remain calm. The Toll Collection System shall include an emergency button located in an inconspicuous

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Technical Requirements

place to notify the administrative office or other pre-determined location of a robbery or other similar situation.

During the course of a Toll Collector Shift, several rest and meal breaks are typically allowed. The Toll Collector will key-out of the Toll Collection System utilizing the MLT and will retain their existing cash drawer and contents. Each key-in and key-out constitutes a Segment-of-Duty (SOD). A relief Toll Collector normally assumes the duties during these breaks and is treated as a separate Toll Collector for audit purposes. The same Shift beginning activities are required prior to a relief Toll Collector assuming duties for a Toll Collector on break. Partial-shift files are created for all Toll Collectors during a day. These files are aggregated into Shift files at the end of a Shift.

At the end of Shift, the Toll Collector keys out of the System and gathers all toll revenue collected for the Shift. The Toll Collector then counts all toll revenue by denomination and completes a Toll Collector deposit slip. The change fund is maintained at the same amount so the deposited toll revenue represents all money collected during the Shift. The counting activities can be conducted either in the toll booth or at the plaza office. The deposit is verified by the Plaza Supervisor or other authorized person. The deposit slip is then entered into the System along with any unusual occurrence that was not entered into the MLT. The deposit slip is placed into the Money bag with the money and is placed in the vault or a secure location at the Field Operations Building for pick-up by the bank service. The change fund is verified and secured, and acknowledged by the Supervisor or other authorized person.

[END OF SECTION]

PAYMENT BOND

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY
CONTRACT FOR TOLL COLLECTION SYSTEM

Bond No. _____

KNOW ALL PERSONS BY THESE PRESENTS, that the _____, a _____, as "Principal" and _____, as "Surety" or as "Co-Sureties", each a corporation duly organized under the laws of the State indicated on the attached page, having its principal place of business at the address listed on the attached page, in the State indicated on the attached page, and authorized as a surety in the State of Texas, are hereby jointly and severally held and firmly bound unto the CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY, a regional mobility authority created by Travis County and Williamson County, Texas, as "Obligee", in the sum of \$ _____, (the "Bonded Sum"), for the payment whereof Principal and Surety or Co-Sureties, bind themselves, and their heirs, executors, administrators, representatives, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Obligee, has awarded to Principal, a Contract for Toll Collection System for the CTRMA Turnpike System, duly executed and delivered as of _____, 2005 (the "Agreement"), on the terms and conditions set forth therein; and

WHEREAS, pursuant to the Agreement, Principal is required to furnish a bond guaranteeing payment of claims, subcontractors, suppliers, materialmen and mechanics.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if Principal shall fail to pay any claims, subcontractors, suppliers, materialmen and mechanics with respect to the work required under the Agreement ("Work"), then Surety shall pay for the same in an amount not to exceed the Bonded Sum; otherwise this obligation shall be null and void upon completion of the Agreement in accordance with its terms.

The following terms and conditions shall apply with respect to this bond:

1. The Agreement (including all Schedules, Attachments and Exhibits thereto) is incorporated by reference herein.

2. No alteration, modification or supplement to the Agreement or the nature of the Work to be performed thereunder, including without limitation any extension of time for performance, shall in any way affect the obligations of Surety under this bond, provided that the aggregate dollar amount of changes in Work required by CTRMA, without Surety's prior written consent thereto having been obtained, does not increase the Contract Price (as defined in the Agreement) by more than \$ _____ [10% of the Contract Price]. Surety waives notice of

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any alteration, modification, supplement or extension of time other than Change Orders (as defined in the Agreement) for CTRMA required changes in excess of such amount.

3. Correspondence or claims relating to this bond should be sent to Surety at the following address:

4. This bond shall inure to the benefit of the persons identified above so as to give a right of action to such persons and their assigns in any suit brought upon this bond.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of _____, 2005.

Principal:

By: _____
Its: _____
(Seal)

Surety:

By: _____
Its: _____
(Seal)

[ADD APPROPRIATE SURETY ACKNOWLEDGMENTS]

PERFORMANCE BOND

**CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY
CONTRACT FOR TOLL COLLECTION SYSTEM**

Bond No. _____

KNOW ALL PERSONS BY THESE PRESENTS, that the _____, a _____, as "Principal" and _____, as "Surety" or as "Co-Sureties", each a corporation duly organized under the laws of the State indicated on the attached page, having its principal place of business at the address listed on the attached page, in the State indicated on the attached page, and authorized as a surety in the State of Texas, are hereby jointly and severally held and firmly bound unto the CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY, a regional mobility authority created by Travis County and Williamson County, Texas, as "Obligee", in the sum of \$ _____ (the "Bonded Sum"), for the payment whereof Principal and Surety (or Co-Sureties), bind themselves, and their heirs, executors, administrators, representatives, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Obligee, has awarded to Principal, a Contract for Toll Collection System for the CTRMA Turnpike System, duly executed and delivered as of _____, 2005 (the "Agreement"), on the terms and conditions set forth therein; and

WHEREAS, pursuant to the Agreement, Principal is required to furnish a bond guaranteeing the faithful performance of its obligations under the Agreement.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if Principal shall promptly and faithfully perform all of its obligations under the Agreement, including any and all amendments and supplements thereto, then this obligation shall be null and void; otherwise it shall remain in full force and effect. The Obligee shall release this bond upon the occurrence of all of the conditions set forth in the Agreement.

The following terms and conditions shall apply with respect to this bond:

1. The Agreement (including all Schedules, Attachments and Exhibits thereto) is incorporated by reference herein.
2. This bond specifically guarantees the performance of each and every obligation of Principal under the Agreement, as it may be amended and supplemented.
3. Whenever Principal shall be, and is declared by the Obligee to be, in default under any other provisions of the Agreement, provided that the Obligee is not then in material default thereunder, Surety shall promptly take one of the following actions with the consent of the Obligee:
 - a. arrange for the Principal to perform and complete the Agreement;

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b. complete the work required by the Agreement (the "Work") in accordance with the terms and conditions of the Agreement then in effect, through its agents or through independent contractors;

c. obtain bids or negotiated proposals from qualified contractors acceptable to the Obligeé for a contract for performance and completion of the Work, through a procurement process approved by the Obligeé, arrange for a contract to be prepared for execution by the Obligeé and the contractor selected with the Obligeé's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Agreement, and pay to the Obligeé the amount of damages as described in Paragraph 5 in excess of the unpaid balance of the Contract Price incurred by the Obligeé resulting from the Principal's default; or

d. waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances, (i) after investigation, determine the amount for which it may be liable to the Obligeé and, as soon as practicable after the amount is determined, tender payment therefore to the Obligeé, or (ii) deny liability in whole or in part and notify the Obligeé citing reasons therefore.

4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the Obligeé to Surety demanding that Surety perform its obligations under this Bond, and the Obligeé shall be entitled to enforce any remedy available to the Obligeé. If Surety proceeds as provided in Subparagraph 3.d, and the Obligeé refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice the Obligeé shall be entitled to enforce any remedy available to the Obligeé.

5. After the Obligeé has terminated the Principal's right to complete the Agreement, and if Surety elects to act under Subparagraph 3.a, 3.b, or 3.c above, then the responsibilities of Surety to the Obligeé shall not be greater than those of the Principal under the Agreement, and the responsibilities of the Obligeé to Surety shall not be greater than those of the Obligeé under the Agreement. To the limit of the Bonded Sum, but subject to commitment of the unpaid balance of the Contract Price to mitigation costs and damages on the Agreement, Surety is obligated without duplication for:

- a. the responsibilities of the Principal for correction of defective work and completion of the Work;
- b. additional legal, design professional and delay costs resulting from Principal's default, and resulting from the actions or failure to act of Surety under Paragraph 3; and
- c. Liquidated Damages under the Agreement.

6. Except as provided in Paragraph 2, no alteration, modification or supplement to the Agreement or the nature of the Work to be performed thereunder, including without limitation any extension of time for performance, shall in any way affect the obligations of Surety under this bond, provided that the aggregate dollar amount of changes in the Work required by CTRMA, without Surety's prior written consent thereto having been obtained, does not increase the Contract Price (as defined in the Agreement) by more than \$ _____ [10% of the Contract Price]. Surety waives notice of any

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alteration, modification, supplement or extension of time other than Change Orders (as defined in the Agreement) for CTRMA required changes in excess of such amount.

7. Correspondence or claims relating to this bond should be sent to Surety at the following address:

8. No right of action shall accrue on this bond to or for the use of any entity other than the Obligee or its successors and assigns.

IN WITNESS WHEREOF, Principal and Surety have caused this bond to be executed and delivered as of _____, 2005.

Principal:

By: _____
Its: _____
(Seal)

Surety:

By: _____
Its: _____
(Seal)

[ADD APPROPRIATE SURETY ACKNOWLEDGMENTS]

**TOLL COLLECTION SYSTEMS IMPLEMENTATION
FEE SCHEDULES**

Payment Measurement

This section provides descriptions of the Method of Measurement and the Basis of Payment for the bid items necessary to complete the work under this Project, as described in this RFP. The Contractor is required to submit price proposals using the forms provided with this Schedule 4A, which are based on the method of measurement and basis of payment for each item described in this section.

Segment Payments

1. Installation/Electrical Design and Plans

Method of Measurement

Installation/Electrical Design Plan shall be measured on a lump sum basis. The lump sum unit shall include all labor, materials and support services for the preparation of all installation documentation as detailed in Chapter III of Attachment E, Technical Requirements. This shall include but not be limited to installation documentation, lane testing, field assessment documentation, as-built plans, shop drawings, design drawings, schematic drawings and all other documentation developed as part of the Installation Program.

Basis of Payment

Payment will be made at the lump sum bid upon approval of the documentation identified in Chapter III of Attachment E, Technical Requirements.

2. Field Installation and Electrical Work, Materials and Labor

Method of Measurement

Field Installation and Electrical Work, Materials and Labor shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services to complete the design, installation, testing, and acceptance of equipment installation in toll booths, toll islands, toll plaza canopies, Field Operations Building, and CTRMA Administration Offices per the Installation Scope identified in Chapter III of Attachment E, Technical Requirements.

Basis of Payment

Payment will be made at the lump sum bid price upon the successful completion of the field installation and electrical work as defined in Chapter III of Attachment E, Technical Requirements. Payment shall also include warranty-guarantee services, in accordance with the requirements of the Specifications.

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3. Lane Controller Hardware

Method of Measurement

Lane Controller Hardware shall be measured per each Lane Controller as specified in Chapter II of Attachment E, Technical Requirements. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the Lane Controller Hardware, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the Lane Controller Hardware. Payment for the Lane Controller Hardware delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

4. Communication Equipment

Method of Measurement

Communication Equipment shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services necessary to complete the design, purchase, packaging, delivery, installation, field testing, and acceptance of the Communication Equipment in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment for each Segment will be made at the lump sum bid price upon installation and verification of the communication network from each Segment to the CTRMA Administrative Offices. Payment for the host communications equipment will be made when the complete CTRMA communications network is installed and tested, including connection to the CSC/VPC.

5. Automatic Vehicle Classification (AVC) System, Toll Lane

Method of Measurement

Automatic Vehicle Classification (AVC) System, Toll Lane shall be measured per each AVC System installed on each toll lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the AVC System, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the AVC System for each toll lane. Payment for the AVC System delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

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6. Automatic Vehicle Classification (AVC) System, Express ETC Lane

Method of Measurement

Automatic Vehicle Classification (AVC) System, Express ETC Lane shall be measured per each AVC System installed on the Express ETC Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the AVC System, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the AVC System for each Express ETC Lane. Payment for the AVC System delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

7. AVI System Hardware, Toll Lane

Method of Measurement

AVI System, Toll Lane shall be measured per each AVI System installed on each toll lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the AVI System, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the AVI System for each toll lane. Payment for the AVI System delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

8. AVI System Hardware, Express ETC Lane

Method of Measurement

AVI System, Express ETC Lane shall be measured per each AVI System installed on the Express ETC Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the AVI System, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the AVI System for each Express ETC Lane. Payment for the AVI System delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

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9. Patron Feedback System, Toll Lane

Method of Measurement

Patron Feedback System, Toll Lane shall be measured per each Patron Feedback System installed on each Toll Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the Patron Feedback System, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the Patron Feedback System. Payment for the Patron Feedback System does not relieve the Proposer from any responsibilities and terms specified in the Contract.

10. Violation Enforcement System (VES) Hardware, Toll Lane

Method of Measurement

Violation Enforcement System (VES) Hardware, Toll Lane shall be measured per each VES Hardware installed on each toll lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the VES Hardware, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the VES Hardware for each toll lane. Payment for the VES Hardware delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

11. Violation Enforcement System Hardware, Express ETC Lane

Method of Measurement

Violation Enforcement System (VES) Hardware, Express ETC Lane shall be measured per each VES Hardware installed on each Express ETC Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the VES Hardware, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the VES Hardware for each Express ETC Lane. Payment for the VES Hardware delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

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12. Manual Lane Terminal (MLT)

Method of Measurement

Manual Lane Terminal (MLT) shall be measured per each MLT installed on each Toll Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the MLT, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the MLT. Payment for the MLT does not relieve the Proposer from any responsibilities and terms specified in the Contract.

13. Receipt Printer

Method of Measurement

Receipt Printer shall be measured per each Receipt Printer installed on each Toll Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the Receipt Printer complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the Receipt Printer. Payment for the Receipt Printer does not relieve the Proposer from any responsibilities and terms specified in the Contract.

14. Automatic Coin Machine (ACM)

Method of Measurement

Automatic Coin Machine (ACM) shall be measured per each ACM System installed on each Toll Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the ACM System, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the ACM System. Payment for the ACM System does not relieve the Proposer from any responsibilities and terms specified in the Contract.

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15. Lane Changeable Message Sign (CMS)

Method of Measurement

Lane Changeable Message Sign (CMS) shall be measured per each Lane CMS installed on each Toll Lane. Each shall include furnishing all labor, materials, and support services to complete the design, fabrication, factory testing, packaging, delivery, unpacking, and acceptance of the Lane CMS, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the Lane CMS. Payment for the Lane CMS does not relieve the Proposer from any responsibilities and terms specified in the Contract.

16. Plaza Computer System Hardware

Method of Measurement

Plaza Computer System Hardware shall be measured per each Plaza Computer as specified in Chapter II of Attachment E, Technical Requirements. Each shall include furnishing all labor, materials, licenses, warranty, and support services to complete the design, purchasing, factory testing, packaging, delivery, unpacking, site installation, configuration, documentation, training, testing and acceptance of the Plaza Computer System Hardware, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the Plaza Computer System Hardware. Payment for the Plaza Computer System Hardware delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract. Payment shall also include warranty-guarantee and maintenance services, in accordance with the requirements of the Contract.

17. UPS

Method of Measurement

UPS shall be measured per each UPS installed at each Toll Location. Each shall include furnishing all labor, materials, warranty, and support services to complete the design, purchasing, factory testing, packaging, delivery, unpacking, installation, testing, training and acceptance of the UPS, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the UPS at each Toll Location. Payment for the UPS delivery does not relieve the Proposer

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from any responsibilities and terms specified in the Contract. Payment shall also include warranty-guarantee services, in accordance with the requirements of the Contract.

18. Emergency Generators

Method of Measurement

Emergency Generator shall be measured per each Emergency Generator installed at each Toll Location. Each shall include furnishing all labor, materials, warranty, and support services to complete the design, purchasing, factory testing, packaging, delivery, unpacking, installation, testing, training and acceptance of the Emergency Generator, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the Emergency Generator. Payment for the Plaza Emergency Generator delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract. Payment shall also include warranty-guarantee services, in accordance with the requirements of the Contract.

19. Segment Commissioning Test

Method of Measurement

The Segment Commissioning Test shall be measured on a unit basis per each Segment. Each shall include furnishing all labor, materials, and support services to complete the commissioning and testing as detailed in Chapter IV of Attachment E, Technical Requirements.

Basis of Payment

Payment will be made at the unit bid price per each Segment upon the successful completion and approval of the Segment Commissioning Test by the CTRMA per the requirements of the Contract. Each shall include furnishing all labor, materials, and support services to complete the testing as detailed in Chapter IV of Attachment E, Technical Requirements. Payment for the Segment Commissioning Test does not relieve the Proposer from any responsibilities and terms specified in the Contract.

20. Segment Operational Test

Method of Measurement

The Segment Operational Test shall be measured on a unit basis per each Segment. Each shall include furnishing all labor, materials, and support services to complete the operational testing as detailed in Chapter IV of Attachment E, Technical Requirements.

Basis of Payment

Payment will be made at the unit bid price per each Segment upon the successful completion and approval of the Segment Operational Test by the CTRMA per the

Schedule 1

requirements of the Contract. Payment for Segment I Operational Test shall include the successful Escrow of the Toll Collection System Software per the terms of the Contract. Each shall include furnishing all labor, materials, and support services to complete the testing as detailed in Chapter IV of Attachment E, Technical Requirements. Payment for the Segment Operational Test does not relieve the Proposer from any responsibilities and terms specified in the Contract.

21. Lane Controller Software

Method of Measurement

Lane Controller Software shall be measured on a lump sum basis as specified in Chapter II of Attachment E, Technical Requirements. The lump sum unit shall include furnishing all labor, materials, licenses, and support services to complete the design, development, factory testing, site installation, configuration, documentation, training, testing and acceptance of the Lane Controller Software all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price upon successful delivery and verification of the complete and operable Lane Controller Software. Payment shall also include warranty-guarantee services, in accordance with the requirements of the Specifications. Payment for the Lane Controller Software delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

22. Plaza Computer Software

Method of Measurement

Plaza Computer Software shall be measured on a lump sum basis as specified in Chapter II of Attachment E, Technical Requirements and shall include the Operating System and the Database as applicable. The lump sum unit shall include furnishing all labor, materials, licenses, and support services to complete the design, purchase, development, factory testing, site installation, configuration, documentation, training, testing and acceptance of the Plaza Computer Software all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price upon successful delivery and verification of the complete and operable Plaza Computer Software. Payment shall also include warranty-guarantee services, and maintenance services, in accordance with the requirements of the Specifications. Payment for the Plaza Computer Software delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

Schedule 1

23. Host Computer Software

Method of Measurement

Host Computer Software shall be measured on a lump sum basis as specified in Chapter II of Attachment E, Technical Requirements and shall include the Operating System and the Database. The lump sum unit shall include furnishing all labor, materials, licenses, and support services to complete the design, purchase, development, factory testing, site installation, configuration, documentation, training, testing and acceptance of the Host Computer Software all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price upon successful delivery and verification of the complete and operable Host Computer Software. Payment shall also include warranty-guarantee services, and maintenance services, in accordance with the requirements of the Specifications. Payment for the Host Computer Software delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

24. Toll Collection System Application Software

Method of Measurement

Toll Collection System Application Software shall be measured on a lump sum basis as specified in Chapter II of Attachment E, Technical Requirements and shall include all support software. The lump sum unit shall include furnishing all labor, materials, licenses, and support services to complete the design, purchase, development, factory testing, site installation, configuration, documentation, training, testing and acceptance of the Toll Collection System Application Software all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price upon successful delivery and verification of the complete and operable Toll Collection System Application Software. Payment shall also include warranty-guarantee services, and maintenance services, in accordance with the requirements of the Specifications. Payment for the Toll Collection System Application Software delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

25. Security Access System Software

Method of Measurement

Security Access System Software shall be measured on a lump sum basis as specified in Chapter II of Attachment E, Technical Requirements and shall include all support software. The lump sum unit shall include furnishing all labor, materials, licenses, and support services to complete the design, purchase, development, factory testing, site installation, configuration, documentation, training, testing and acceptance of the Security Access

Schedule 1

System Software all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price upon successful delivery and verification of the complete and operable Security Access System Software. Payment shall also include warranty-guarantee services, and maintenance services, in accordance with the requirements of the Specifications. Payment for the Security Access System Software delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

26. Maintenance Online Management System Software

Method of Measurement

Maintenance Online Management System Software shall be measured on a lump sum basis as specified in Chapter II of Attachment E, Technical Requirements and shall include all support software. The lump sum unit shall include furnishing all labor, materials, licenses, and support services to complete the design, purchase, development, factory testing, site installation, configuration, documentation, training, testing and acceptance of the Maintenance Online Management System Software all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price upon successful delivery and verification of the complete and operable Maintenance Online Management System Software. Payment shall also include warranty-guarantee services, and maintenance services, in accordance with the requirements of the Specifications. Payment for the Maintenance Online Management System Software delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract.

27. Host Computer System Hardware

Method of Measurement

Host Computer System Hardware shall be measured on a lump sum basis as specified in Chapter II of Attachment E, Technical Requirements. The lump sum unit shall include furnishing all labor, materials, licenses, warranty, and support services to complete the design, purchasing, factory testing, packaging, delivery, unpacking, site installation, configuration, documentation, training, testing and acceptance of the Host Computer System Hardware, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the Host Computer System Hardware. Payment for the Host Computer System Hardware

Schedule 1

delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract. Payment shall also include warranty-guarantee and maintenance services, in accordance with the requirements of the Contract.

28. Host UPS

Method of Measurement

UPS shall be measured on a on a unit basis. Each unit shall include furnishing all labor, materials, warranty, and support services to complete the design, purchasing, factory testing, packaging, delivery, unpacking, installation, testing, training and acceptance of the UPS, complete with all internal components, enclosures, and mounting devices, all in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the unit bid price upon successful delivery and verification of the UPS at the host location. Payment for the UPS delivery does not relieve the Proposer from any responsibilities and terms specified in the Contract. Payment shall also include warranty-guarantee services, in accordance with the requirements of the Contract.

29. Host Communication Equipment

Method of Measurement

Host Communication Equipment shall be measured on a on a unit basis. Each shall include furnishing all labor, materials, and support services necessary to complete the design, purchase, packaging, delivery, installation, field testing, and acceptance of the Communication Equipment in conformance with the requirements of the Contract, and as accepted by the CTRMA.

Basis of Payment

Payment for the host communications equipment will be made at the bid unit price when the host communication equipment is installed at the CTRMA Administrative Offices and the complete CTRMA communications network is installed and tested, including connection to the CSC/VPC.

30. Factory Acceptance Test

Method of Measurement

The Factory Acceptance Test shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services to successfully complete the Factory Acceptance Test as detailed in Chapter IV of Attachment E, Technical Requirements.

Basis of Payment

Payment will be made at the lump sum bid price upon the successful completion and approval of the Factory Acceptance Test by the CTRMA per the requirements of the Contract, and successful Escrow of the Toll Collection System Software per the terms of

Schedule 1

the Contract. Each shall include furnishing all labor, materials, and support services to complete the testing as detailed in Chapter IV of Attachment E, Technical Requirements. Payment for the Factory Acceptance Test does not relieve the Proposer from any responsibilities and terms specified in the Contract.

31. Prototype On-site Test

Method of Measurement

The Prototype On-site Test shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services to successfully complete the Prototype On-site Test as detailed in Chapter IV of Attachment E, Technical Requirements.

Basis of Payment

Payment will be made at the lump sum bid price upon the successful completion and approval of the Prototype On-site Test by the CTRMA per the requirements of the Contract. Each shall include furnishing all labor, materials, and support services to complete the testing as detailed in Chapter IV of Attachment E, Technical Requirements. Payment for the Prototype On-site does not relieve the Proposer from any responsibilities and terms specified in the Contract.

32. Project Acceptance Test

Method of Measurement

The Project Acceptance Test shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services to successfully complete the Project Acceptance Test as detailed in Chapter IV of Attachment E, Technical Requirements.

Basis of Payment

Payment will be made at the lump sum bid price upon the successful completion and approval of the Project Acceptance Test by the CTRMA per the requirements of the Contract, and successful Escrow of the Toll Collection System Software per the terms of the Contract. Each shall include furnishing all labor, materials, and support services to complete the testing as detailed in Chapter IV of Attachment E, Technical Requirements. Payment for the Project Acceptance does not relieve the Proposer from any responsibilities and terms specified in the Contract.

33. Training

Method of Measurement

Training shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services to develop, complete and implement all Training procedures for CTRMA staff members and the Representatives, in conformance with the requirements of the Chapter V of Attachment E, Technical Requirements, and as accepted by the CTRMA.

Schedule 1

Basis of Payment

Payment will be made at the lump sum bid price upon the completion and approval by the CTRMA of the Training detailed in the Contract.

34. Spare Equipment

Method of Measurement

Spare Equipment shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services to complete the fabrication, purchasing, unit testing, packaging, delivery, unpacking, and acceptance of Toll Collection System Spare Equipment in conformance with the requirements of the Specifications, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price which shall include the cost of all labor, materials, and support services to provide the fabrication, purchasing, unit testing, packaging, delivery, unpacking, acceptance, and all else necessary to furnish Toll Collection System Spare Equipment.

35. Spare Parts

Method of Measurement

Spare parts shall be measured on a lump sum basis. The lump sum unit shall include furnishing all labor, materials, and support services to complete the fabrication, purchasing, unit testing, packaging, delivery, unpacking, and acceptance of Toll Collection System Spare Parts in conformance with the requirements of the Specifications, and as accepted by the CTRMA.

Basis of Payment

Payment will be made at the lump sum bid price which shall include the cost of all labor, materials, and support services to provide the fabrication, purchasing, unit testing, packaging, delivery, unpacking, acceptance, and all else necessary to furnish Toll Collection System Spare Parts.

36. Documentation

Method of Measurement

Documentation shall be measured on a lump sum basis. The lump sum unit shall include all labor, materials and support services for the preparation of all program documentation which shall include but not be limited to system documentation, software documentation, hardware documentation, installation documentation, training documentation, integration documentation, field assessment documentation, as-built plans, shop drawings, design drawings, schematic drawings and all other documentation developed during the design and implementation phases of the Project as detailed in Chapter V of Attachment E, Technical Requirements.

Schedule 1

Basis of Payment

Payment will be made at the lump sum bid price upon the approval of the documentation by the CTRMA as detailed in Chapter V of Attachment E, Technical Requirements.

37. Project Management

Method of Measurement

Training shall be measured on a lump sum basis. The lump sum unit shall include oversight and management of the CTRMA Toll Collection Project as defined in the Contract.

Basis of Payment

Payment will be made at the lump sum bid price upon the completion and Project Acceptance of the CTRMA Toll Collection System. The Contract can submit an invoice for partial payments upon approval of critical milestones as defined in the Contract.

				UNIT PRICE		AMOUNT	
ITEM #	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
1	1	LS	Installation/Electrical Design and Plans	128,750	00	128,750	00
2	1	LS	Field Installation and Electrical Work, Materials and Labor	459,483	00	459,483	00
3	24	Ea.	Lane Controller Hardware	5,159	13	123,819	00
4	1	LS	Communication Equipment	41,752	00	41,752	00*
5	14	Ea.	Automatic Vehicle Classification System, Toll Lane	20,177	64	282,487	00
6	10	Ea.	Automatic Vehicle Classification System, Express ETC Lane	24,557	20	245,572	00
7	14	Ea.	AVI System Hardware, Toll Lane	34,189	00	478,646	00
8	10	Ea.	AVI System Hardware, Express ETC Lane	46,918	00	469,183	00
9	14	Ea.	Patron Feedback System, Toll Lane	3,598	43	50,378	00
10	14	Ea.	Violation Enforcement System Hardware, Toll Lane	23,219	50	325,073	00
11	10	Ea.	Violation Enforcement System Hardware, Express ETC Lane	93,081	00	906,976	00
12	10	Ea.	Manual Lane Terminal	1,314	50	12,897	00
13	10	Ea.	Receipt Printer	534	00	5,341	00
14	2	Ea.	Automatic Coin Machine	85,013	00	170,026	00
15	12	Ea.	Lane Changeable Message Sign	19,248	33	230,980	00
16	1	Ea.	Plaza Computer System Hardware	51,784	00	51,784	00
17	4	Ea.	UPS	7,913	75	31,655	00
18	1	Ea.	Emergency Generators	19,542	00	19,542	00
19	1	LS	Segment Commissioning Test	30,075	00	30,075	00
20	1	LS	Segment Operational Test	24,474	00	24,474	00
				Subtotal Segment 1		3,376,841 00	

* Does Not Include Monthly T1 Charges

Fiber Option Available for \$589,800 Which Does Not Require Recurring Monthly

Wireless Option Available for \$216,150 Which Does Not Require Recurring Monthly

				UNIT PRICE		AMOUNT	
ITEM #	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
21	1	LS	Installation/Electrical Design and Plans	25,750	00	25,750	00
22	1	LS	Field Installation and Electrical Work, Materials and Labor	168,508	00	168,508	00
23	6	Ea.	Lane Controller Hardware	5,979	00	35,874	00
24	1	LS	Communication Equipment	26,569	00	26,569	00*
25	6	Ea.	Automatic Vehicle Classification System, Express ETC Lane	27,857	67	167,146	00
26	6	Ea.	AVI System Hardware, Express ETC Lane	28,995	66	173,974	00
27	6	Ea.	Violation Enforcement System Hardware, Express ETC Lane	78,076	33	468,458	00
28	3	Ea.	UPS	3,241	00	9,723	00
29	3	Ea.	Emergency Generators	6,514	00	19,542	00
30	1	LS	Segment Commissioning Test	30,075	00	30,075	00
31	1	LS	Segment Operational Test	24,474	00	24,474	00
				Subtotal Segment 2		1,150,092	00

* Does Not Include Monthly T1 Charges

Fiber Option Available for \$589,800 Which Does Not Require Recurring Monthly Charges

Wireless Option Available for \$216,150 Which Does Not Require Recurring Monthly

				UNIT PRICE		AMOUNT	
ITEM #	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
32	1	LS	Installation/Electrical Design and Plans	38,625	00	38,625	00
33	1	LS	Field Installation and Electrical Work, Materials and Labor	1,051,630	00	1,051,630	00
34	36	Ea.	Lane Controller Hardware	6,100	44	219,616	00
35	1	LS	Communication Equipment	147,820	00	147,820	00*
36	36	Ea.	Automatic Vehicle Classification System, Express ETC Lane	27,084	06	975,026	00
37	36	Ea.	AVI System Hardware, Express ETC Lane	16,006	05	576,218	00
38	36	Ea.	Violation Enforcement System Hardware, Express ETC Lane	55,394	64	1,994,207	00
39	21	Ea.	UPS	2,315	05	48,616	00
40	21	Ea.	Emergency Generators	4,652	91	97,711	00
41	1	LS	Segment Commissioning Test	30,075	00	30,075	00
42	1	LS	Segment Operational Test	24,474	00	24,474	00
				Subtotal Segment 3		5,204,017 00	

* Does Not Include Monthly T1 Charges

Fiber Option Available for \$589,800 Which Does Not Require Recurring Monthly Charges

Wireless Option Available for \$216,150 Which Does Not Require Recurring Monthly

				UNIT PRICE		AMOUNT	
ITEM#	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
43	1	LS	Installation/Electrical Design and Plans	12,875	00	12,875	00
44	1	LS	Field Installation and Electrical Work, Materials and Labor	84,872	00	84,872	00
45	4	Ea.	Lane Controller Hardware	5,432	50	21,730	00
46	1	LS	Communication Equipment	11,787	00	11,787	00*
47	4	Ea.	Automatic Vehicle Classification System, Express ETC Lane	25,807	25	103,229	00
48	4	Ea.	AVI System Hardware, Express ETC Lane	24,497	25	97,898	00
49	4	Ea.	Violation Enforcement System Hardware, Express ETC Lane	100,884	50	403,538	00
50	1	Ea.	UPS	9,723	00	9,723	00
51	1	Ea.	Emergency Generators	19,542	00	19,542	00
52	1	LS	Segment Operational Test	30,075	00	30,075	00
53	1	LS	Segment Commissioning Test	24,474	00	24,474	00
				Subtotal Segment 4		819,742	00

* Does Not Include Monthly T1 Charges

Fiber Option Available for \$589,800 Which Does Not Require Recurring Monthly Charges

Wireless Option Available for \$216,150 Which Does Not Require Recurring Monthly

				UNIT PRICE		AMOUNT	
ITEM #	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
54	0	LS	Installation/Electrical Design and Plans	0	00	0	00
55	0	LS	Field Installation and Electrical Work, Materials and Labor	0	00	0	00
56	0	Ea.	Lane Controller Hardware	0	00	0	00
57	0	LS	Communication Equipment	0	00	0	00*
58	0	Ea.	Automatic Vehicle Classification System, Express ETC Lane	0	00	0	00
59	0	Ea.	AVI System Hardware, Express ETC Lane	0	00	0	00
60	0	Ea.	Violation Enforcement System Hardware, Express ETC Lane	0	00	0	00
61	0	Ea.	UPS	0	00	0	00
62	0	Ea.	Emergency Generators	0	00	0	00
63	0	LS	Segment Operational Test	0	00	0	00
64	0	LS	Segment Commissioning Test	0	00	0	00
				Subtotal Segment 5		0 00	

* Does Not Include Monthly T1 Charges

Fiber Option Available for \$589,800 Which Does Not Require Recurring Monthly Charges

Wireless Option Available for \$216,150 Which Does Not Require Recurring Monthly

				UNIT PRICE		AMOUNT	
ITEM #	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
65	1	LS	Installation/Electrical Design and Plans	51,500	00	51,500	00
66	1	LS	Field Installation and Electrical Work, Materials and Labor	229,175	00	229,175	00
67	12	Ea.	Lane Controller Hardware	5,250	25	63,003	00
68	1	LS	Communication Equipment	31,734	00	31,734	00*
69	8	Ea.	Automatic Vehicle Classification System, Toll Lane	21,202	50	169,620	00
70	4	Ea.	Automatic Vehicle Classification System, Express ETC Lane	25,807	25	103,229	00
71	8	Ea.	AVI System Hardware, Toll Lane	16,458	00	131,664	00
72	4	Ea.	AVI System Hardware, Express ETC Lane	34,368	75	137,475	00
73	8	Ea.	Patron Feedback System, Toll Lane	3,303	75	26,430	00
74	8	Ea.	Violation Enforcement System Hardware, Toll Lane	22,754	75	182,038	00
75	4	Ea.	Violation Enforcement System Hardware, Express ETC Lane	99,950	50	399,802	00
76	8	Ea.	Manual Lane Terminal	1,289	63	10,317	00
77	8	Ea.	Receipt Printer	534	13	4,273	00
78	0	Ea.	Automatic Coin Machine	0	00	0	00
79	8	Ea.	Lane Changeable Message Sign	19,293	75	154,350	00
80	1	Ea.	Plaza Computer System Hardware	41,853	00	41,853	00
81	1	Ea.	UPS	2,485	00	2,485	00
82	1	Ea.	Emergency Generators	0	00	0	00
83	1	LS	Segment Commissioning Test	30,075	00	30,075	00
84	1	LS	Segment Operational Test	24,474	00	24,474	00
				Subtotal Segment 7		1,793,496 00	

* Does Not Include Monthly T1 Charges

Fiber Option Available for \$589,800 Which Does Not Require Recurring Monthly

Wireless Option Available for \$216,150 Which Does Not Require Recurring Monthly

ITEM #	QTY.	UNIT	DESCRIPTION	UNIT PRICE		AMOUNT	
				DOLLARS	CENTS	DOLLARS	CENTS
85	1	LS	Lane Controller Software	306,485	00	306,485	00
86	1	LS	Plaza Computer Software	306,485	00	306,485	00
87	1	LS	Host Computer Software	306,485	00	306,485	00
88	1	LS	Toll Collection System Application Software	306,485	00	306,485	00
89	1	LS	Security Access System Software	39,687	00	39,687	00
90	1	LS	Maintenance Online Management System Software	306,485	00	306,485	00
91	1	Ea.	Host Computer System Hardware	355,073	00	355,073	00
92	1	Ea.	Host UPS	7,755	00	7,755	00
93	1	Ea.	Host Communication Equipment	16,968	00	16,968	00
94	1	LS	Factory Acceptance Test	42,550	00	42,550	00*
95	1	LS	Prototype On-site Test	49,766	00	49,766	00
96	1	LS	Project Acceptance Test	115,288	00	115,288	00
97	1	LS	Training	229,959	00	229,959	00
98	1	LS	Spare Equipment	89,671	00	89,671	00
99	1	LS	Spare Parts	641,058	00	641,058	00
100	1	LS	Documentation	221,554	00	221,554	00
101	1	LS	Project Management	939,625	00	939,625	00
				Subtotal Common Items		3,668,407 00	
				TOTAL PROPOSED PRICE-All Segments and Common Items		16,012,596 00	

Caseta Technologies
Firm Name of Proposer

[Signature]
Principal Signature

* Does Not Include Monthly T1 Charges
Fiber Option Available for \$589,800 Which Does Not Require Recurring Monthly
Wireless Option Available for \$216,150 Which Does Not Require Recurring Monthly

CTRMA TOLL ROAD SEGMENTS

<u>Segment No.</u>	<u>Description</u>	<u>Systems Installation³</u>	<u>Open to Traffic¹</u>	<u>Subject to Tolling²</u>
1	US 183A: San Gabriel to SH 45 North	12/2006	02/2007	02/2007
2	US 290 W phase of the "Y" in Oak Hill	02/2009	04/2009	04/2009
3	US 183 / SH 71: IH 35 to the Airport			
	US 183 S: IH 35 to Springdale	08/2008	03/2006	12/2008
	US 183 S: Springdale to Bolm	08/2008	12/2008	12/2008
	US 183 S: Bolm to Patton	08/2008	12/2008	12/2008
	SH 71 E: IH 35 to Riverside	07/2010	01/2007	09/2010
	SH 71 E: Riverside to US 183	07/2010	09/2010	09/2010
4	SH 45: SW: Loop 1 to FM 1626 (4 lanes)	01/2008	03/2008	03/2008
5	SH 71 W phase of the "Y" in Oak Hill	03/2011	05/2011	05/2011
6	LP 360 RM 2244 to south of Walsh Tarlton	Pending	Pending	Pending
7	US 290 East: US 183 to SH 130	T.B.D.	T.B.D.	T.B.D.
8	LP 360: LP 1 to US 290	Pending	Pending	Pending

NOTES:

The dates presented are based on information available as of the date of this RFP. The information on the Toll Implementation Plan segments is provided only for the purposes of preparing the Proposals. The Systems Integrator will be provided with a Notice to Proceed for each of the individual Toll Road Segments NO LATER THAN six (6) months prior to the actual "Subject to Tolling" date. All dates are subject to change.

¹ The "Open to Traffic" date is the estimated completion date for construction of the particular toll road segment, at which time the segment may be opened to traffic prior to tolling.

² The "Subject to Tolling" date is the date that the Toll Road Segment will be opened to tolled traffic with the Toll Collection System installed, tested and fully operational.

³ The "Systems Installation" date is based on the anticipated access to the roadway and toll systems infrastructure provided by others, which is scheduled to be a minimum of sixty (60) days prior to the "Subject to Tolling" date.

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

WORK AUTHORIZATION

WORK AUTHORIZATION NO. 1

TOLL SYSTEM IMPLEMENTATION

THIS WORK AUTHORIZATION is made pursuant to the terms and conditions of Article 1 of the GENERAL PROVISIONS, Attachment A to the Contract for Toll System Implementation, Contract No. _____ (the Contract) entered into by and between the Central Texas Regional Mobility Authority (the "Authority" or "CTRMA"), and Caseta Technologies, Inc. (the Contractor).

PART I. The Contractor will perform toll integration services generally described in the Scope of Work attached hereto as Exhibit A, including the Detailed Lane Configurations attached thereto. The Contractor's duties are further described in the Project Schedule and Milestones contained in Exhibit C hereto. The Contractor's duties and responsibilities to coordinate with the CTRMA's contracted Developer for the 183-A Turnpike Project, Hill Country Constructors (the "Developer") is detailed in the Responsibilities Matrix attached hereto as Exhibit D. Exhibits A, C and D are attached hereto and made a part of this Work Authorization.

PART II. The maximum amount payable under this Work Authorization No. 1 is \$7,980,093. This amount is based generally upon the estimated fees set forth in Schedule 1 of the Contract, as superseded by the fee schedule set forth in Exhibit B hereto which is incorporated herein and made a part of this Work Authorization.

PART III. Payment to the Contractor for the services established under this Work Authorization shall be made in accordance with Article 12 of the Contract, and Attachment A, Article 1 of the GENERAL PROVISIONS.

PART IV. This Work Authorization shall become effective on the date of execution by the parties hereto and shall terminate on March 1, 2007 unless extended by a supplemental Work Authorization as provided in Attachment A, Article 1 of the GENERAL PROVISIONS. The work shall be performed in accordance with the Project Schedule and Milestones as set forth in Exhibit C.

PART V. This Work Authorization No. 1 does not waive any of the parties' responsibilities and obligations provided under the Contract, and except as specifically modified by this Work Authorization, such responsibilities and obligations remain in full force and effect.

IN WITNESS WHEREOF, this Work Authorization No. 1 is executed in duplicate counterparts and hereby accepted and acknowledged below.

THE CONTRACTOR:

Signature	Date
Typed/Printed Name and Title	

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

Executed for and approved by the Central Texas Regional Mobility Authority for the purpose and effect of activating and/or carrying out the orders, established policies or work programs heretofore approved and authorized by the Texas Transportation Commission.

Signature	Date
Typed/Printed Name and Title	

LIST OF EXHIBITS

- Exhibit A Scope of Work
- Exhibit B Fee Schedule/Budget
- Exhibit C Project Schedule
- Exhibit D Developer/Contractor Responsibility Matix

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY
TOLL COLLECTION SYSTEMS IMPLEMENTATION

SCOPE OF WORK

A1.0 General

A1.01. Background

The Central Texas Regional Mobility Authority (CTRMA) designated the 183-A Turnpike Project as the first priority for implementation in conjunction with the TxDOT plans for development of the Central Texas Turnpike Project (CTTP). Subsequent to the implementation of the design/build process for the 183-A Turnpike Project, the Capital Area Metropolitan Planning Organization (CAMPO) approved the implementation of the proposed Toll Implementation Plan to construct additional capacity on various segments of highway network in the CAMPO Long-Range Plan as toll road facilities as part of the CTRMA Turnpike System. The first segment of the Project, designated as Segment 1 (the 183-A Turnpike Project) is currently expected to open in February of 2007 with an early finish of September 2006.

A1.02. Summary Scope of Work

The Scope of Work for Work Authorization No. 1 shall consist of a toll collection, transaction processing, video enforcement, reconciliation, and a reporting system with an established interface to the Customer Service Center / Violation Processing Center (CSC/VPC) system which is being developed under a separate contract by the Texas Turnpike Authority (TTA) Division of the Texas Department of Transportation (TxDOT). The work generally will include, but not be limited to: design, development, testing, and installation of a complete and fully functioning electronic toll collection system, with associated infrastructure, that shall include attended manual toll lanes and lane-based electronic toll collection equipment that will process tolls and violations. Plaza/Host and Lane Computers and all associated hardware and software, as well as software for reporting, reconciliation and other audit functions, also are included.

A detailed tabulation of the elements of the Toll Collection System, indicating locations and basic components is attached as "*Detailed Lane Configuration*". The general locations and layouts for the proposed toll facilities of the CTRMA 183-A Turnpike Project is indicated on the schematic diagrams in *Attachment D* of the Contract. This diagram is based on the best information currently available

and is intended for information only for the purposes of this Toll System Implementation Contract. The locations are subject to change, and it should be anticipated that refinements and adjustment to the locations and layouts indicated will be required as designs for the Toll Collection System are developed further. The basic Technical Requirements for the implementation of the Toll Collection System are included as *Attachment E* of the Contract.

A1.03. Basic Objective

The objective of this Work Authorization No. 1 is to authorize the Contractor to implement the CTRMA's Toll Collection System successfully designed, developed, tested and operational in time to meet the designated "Subject to Tolling" Date for Segment 1 of the CTRMA Turnpike System.

A2.0 General Description—183-A Turnpike:San Gabriel to SH 45 North

The proposed 183-A Turnpike is located in Williamson County, extending from RM 620/SH 45, south of the City of Cedar Park, to the San Gabriel River approximately three miles north of the City of Leander. The corridor is approximately 11.6 miles in length and includes connections to RM 620/SH 45, local road networks, and the existing U.S. Route 183. The southern terminus for the Project coincides with the improvements to upgrade the U.S. Route 183 and RM 620/SH45 interchange currently being implemented by TxDOT and referred to as Section 9.

The 183-A Project will be developed in two separate phases, the Interim Build Phase and the Ultimate Build Phase. The Interim Build Phase, which is being constructed under a Comprehensive Development Agreement (CDA) design/build process, will consist of the construction of a six-lane mainline roadway (3 NB and 3 SB) and ramps from the southern terminus of the Project at RM 620/SH45 to just north of FM 1431; and from north of FM 1431 to the San Gabriel River only the frontage roads will be constructed. An all ETC system will be installed on the mainline roadways in Section 9. A conventional (combination) mainline toll plaza, consisting of a minimum twelve (12) toll lanes will be constructed in the vicinity of Park Street, and two, 3-lane ramp plazas will be constructed on the ramps at Brushy Creek Road.

The Ultimate Build Phase, which will be constructed in the future under a separate agreement, will add mainline roadways, ramps, and toll facilities from FM1431 to the San Gabriel River. Construction of the full build-out of the Ultimate Build Phase will be implemented as traffic conditions warrant and funding becomes available. This full build-out is not expected to occur during the term of this Toll System Implementation Contract.

A3.0 Toll Collection Systems Elements**A3.01. General Requirements**

The Toll Collection System for the CTRMA Turnpike System, generally, will be similar in composition and functionality to those used on other toll roads in Texas, using automatic vehicle identification and classification technology, a Violation Enforcement System (VES) with an integrated camera and triggering system to capture referenced digital images of license plates, and a Maintenance Online Management System (MOMS).

It is required that the System be interoperable with the other Texas ETC systems so that ETC customers from other cities such as Dallas and Houston can use the facility without multiple transponders in their vehicles.

The Customer Service Center (CSC) and the Violation Processing Center (VPC) will be co-located in a new facility which is being developed and will be administrated by the TTA Division of TxDOT. The CTRMA will contract with TTA for CSC and VPC services for its customers. Development of CTRMA toll collection systems will include extensive coordination and design of appropriate interfaces with the CSC/VPC. Appropriate communications links between the various toll facilities on the CTRMA Turnpike System and the CTRMA Administrative Offices, the Field Operations Building(s) and the CSC/VPC are part of the requirements of this Work.

A3.02. 183-A: Turnpike: San Gabriel to SH 45 North

The 183-A Turnpike Project initially will be operated with a combination of manual, automated coin collection, and electronic (ETC) modes of toll collection. Automatic coin machine (ACM) lanes will be restricted to 2 axle vehicles, whereas manual and dedicated ETC lanes will be open to all traffic. Violation enforcement equipment will be installed in all lanes, and toll evaders will be pursued in accordance with established CTRMA Policies, as well as Chapter 370 of the Texas Transportation Code.

There will be two main toll collection areas on the 183-A Turnpike. An all ETC system will be installed on the mainline roadways in Section 9. A conventional mainline barrier toll plaza, together with a Field Operations Building, will be constructed at Park Street. Offices with adequate parking facilities for administrative, management, and supervisory personnel will be located in a Field Operations Building adjacent to the mainline toll plaza at Park Street.

The mainline barrier toll plaza, at Park Street, will be configured to transition from the typical section to ETC/AVI lanes and cash collection lanes. The ETC only lanes will be located in the center of the plaza and will provide express toll collection at high speeds. Cash customers will exit from the right lane when approaching the toll plaza to use conventional toll lanes equipped with both

electronic and manually operated toll equipment. The Express ETC system will consist of only a gantry over the mainline roadways. The ramp toll plazas will utilize a combination of both cash (attended lanes and/or automatic coin machines) and ETC options or ETC only, depending on their location.

A4.0 Gantries and Roadside Equipment for ETC Systems

For all toll collection system field installations on the various roadway segments of the Turnpike System, including the 183-A Turnpike Project, the Contractor shall provide and install the toll equipment systems and hardware for complete operating toll collection systems. The principle items of work and primary components of the Toll Collection System at each Location shall include, but are not limited to:

- Lane Controllers
- Express ETC Lane components, including VES and AVI systems and hardware
- All ETC Lane Equipment hardware, brackets, and fasteners required to attach the equipment to the gantries
- Provision for Uninterruptible Power Supply
- Emergency Generators

Construction and installation of the Toll Collection Equipment and Systems generally shall be in accordance with the applicable requirements as specified in *Attachment E* of the Contract.

The procurement, fabrication and installation of gantries for the toll collection system to be located on designated segments of the CTRMA Turnpike System, including the 183-A Turnpike Project, will be by others. The CTRMA shall provide the basic design criteria and standard detailing for the roadside gantry structures. A generic gantry configuration has been developed by TxDOT to accommodate the toll systems lane equipment. The Contractor will be required to provide a toll gantry design concept specific to its particular toll system to the Authority for consideration. The costs for concept designs for the toll gantries will be incidental to the Lump Sum price for Project Management under the Contract. Should the Authority elect to utilize the Contractor's proposed gantry design concept, design of the toll gantries if designed by the Authority will be accomplished under separate Work Authorization. It will be the responsibility of the Contractor, nevertheless, to establish the precise locations for each of the gantry structures and to provide the Roadway Contractor(s) with detailed information of the installation of the toll collection system equipment at each location.

All toll system infrastructure facilities at the remote Express Toll Locations on the various segments of the CTRMA Turnpike System, including the 183-A Turnpike Project, will be provided by others as indicated in *Section A6.02* hereof. It will

be the responsibility of the Contractor to fully coordinate the designs for the toll collection system with others and provide the required details and technical requirements to ensure that the construction of the toll system infrastructure facilities will be fully compatible and meet the requirements for the toll collection system.

A5.0 Coordination with Other Vendors

The Contractor will be responsible for establishing relationships with a wide variety of third parties. In this role, the Contractor will work closely with CTRMA in developing the required network.

A6.0 Work by Others

A6.01. Customer Service Center (CSC)

There will be one CSC/VPC System located in the Austin area. As part of this Work Authorization No. 1, the Contractor shall develop an interface to communicate to the CSC/VPC system as detailed in the Contract using available communication infrastructure (T-1 line or fiber back bone) for network communication links. The CSC/VPC will be located in a facility in Austin, Texas to be identified and provided by the Texas Department of Transportation (TxDOT).

A6.02. Civil/Roadway Construction

The CTRMA, through its road Developer shall provide for a minimum of 120 linear feet of continuously reinforced concrete pavement in the area designated for toll collection. The pavement will be reinforced with fiber reinforced polymer bars (FRPB). No transverse joints and longitudinal joints will be placed at positions equal to lane widths. Power and communication lines to support the Wide Area Network (WAN) will be provided by others and terminated in an area within 150 feet of the designated tolling location. The Contractor is responsible for the communication links between the plaza, the ramps and Section 9 toll facilities and the communication trunkline provided by others.

Except as may be expressly indicated elsewhere, all toll system infrastructure required for the toll collection systems at the designated remote Express Toll Locations will be provided and installed by others. The principle items of work and primary components of the Toll Collection System infrastructure at each remote Express Toll Location shall include, but are not limited to:

- All toll gantry installations, including foundations and gantry structures;
- Control Cabinets, including concrete foundation slab. The cabinets are to be provided with appropriate environmental protection and climate controls for housing the electronic equipment;

EXHIBIT A

- Conduit and ground boxes providing connections between the control cabinets and the ETC Lane equipment installations.
NOTE: It is the responsibility of the Contractor to coordinate with the Roadway Contractor(s) for the placement and installation of these elements to ensure that the construction is acceptable for the toll collection system as designed.
- Power and WAN communication services up to the location of the proposed Control Cabinets.
- All signing, pavement markings, traffic barriers and other roadway appurtenances required at each remote Express Toll Location.

It is the responsibility of the Contractor, nevertheless, to coordinate with others and provide all necessary details, system requirements, and reviews of construction documents to ensure that the gantries are located and configured properly to accommodate the Contractor's own particular system components as required to meet the CTRMA Toll Collection System performance and accuracy requirements.

A6.03. Toll Plaza and Host Elements

At the designated locations for toll plazas for the 183-A Turnpike Project, both on the mainline roadways and on ramps, toll plaza elements, including toll booths, toll islands, canopies, equipment bases, pavement, pavements markings, signing, and toll systems elements, including counters, equipment brackets, conduit, electrical and mechanical systems, uninterruptible power supplies, and emergency generators will be provided by others, unless specifically provided for otherwise.

It is the responsibility of the Contractor, nevertheless, to coordinate with others and to provide all necessary details, system requirements, and reviews of construction documents to ensure that the toll plaza elements are located and configured properly to accommodate the Contractor's own particular system components as required to meet the CTRMA Toll Collection System performance and accuracy requirements.

A7.0 Work Authorization No. 1 Responsibility Matrix

The Contractor is responsible for all aspects of the work as identified in the attached Responsibility Matrix and shall work with the road Developer as described therein.

Installation of all toll collection system components, and all electrical and communications and termination work will be the responsibility of the Contractor. Installation of the Security Access System components at all locations as identified in the Contract is the responsibility of the Contractor. All equipment at the plaza and at the host required to support Segment 1 of Toll Collection System as identified in the Contract also will be the responsibility of the Contractor. The host equipment shall include Security Access System, Maintenance On-line Management System, Host Computer Systems Hardware, Computer Equipment Cabinets, and Communication Equipment UPS.

A7.01. Software

The Contractor shall deliver the Toll Collection System software required for Segment 1 that is compliant to the Contract requirements.

A7.02. Testing

The Contractor shall conduct the Factory Acceptance Test, the Prototype On-site Test, the Segment Commissioning Test and the Segment Operational Test as described in the Contract.

A7.03. Documentation and Training

The Contractor is responsible for the timely submission of all documentation described in the Contract that is required to support Segment 1 implementation. This shall include all Software, Training, System, Users' Maintenance and Hardware Support documentation. All training necessary to support the operation of Segment 1 toll lanes shall be conducted per the requirements of the Contract.

A8.0 Project Schedule

The Contractor shall comply with the requirements identified in Attachment E to the Contract, Section V. Management System, Subsection V.02 while implementing Segment 1 and the associated Common Items. As a first order of business, a very detailed, resource-loaded schedule shall be submitted to the CTRMA which upon approval shall become part of the Contract and shall be the Project Schedule. This Project Schedule shall be developed to incorporate the Milestone Dates established for this Work Authorization as presented in Exhibit C.

[END OF SECTION]

Central Texas Regional Mobility Authority
CTRMA Turnpike System
Detailed Lane Configurations

Project	CTRMA Turnpike Seg	Toll Plaza or Express Toll Location	Lane Type				General Equipment Mounting Type					Toll Plaza with Canopy	Overhead Gantry	Exterior Control Cabinet	Lane Controller	Manual Lane Terminal	Receipt Printer	ACM (Ramp) Booth	ETC, Toll Lane	Express ETC	VES, Toll Lane	Express ETC Lane	AVC System, Toll Lane	AV System, Express ETC Lane	AV System Hardware, Toll Lane	ETC Lane	Patrol Override Switch	Lane Feedback System 12	Uninterruptible Message Sign	Emergency Power Supply	Plaza Computer System	Plaza/Exit Projections																					
			MAN / ETC	ACM / ETC	DED/ ETC	Exp. ETC	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment																						General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment	General Equipment
183-A Turnpike	1	Park Street Mainline	1	1					X					1	1	1	1	1	1	1	1	1	1	1	1	1																											
			2	1					X					1	1	1	1	1	1	1	1	1	1	1	1	1																											
			3	1					X					1	1	1	1	1	1	1	1	1	1	1	1	1																											
			4	1					X					1	1	1	1	1	1	1	1	1	1	1	1	1																											
			5					1				X			1				1	1	1	1	1	1	1																												
			6					1				X			1				1	1	1	1	1	1	1																												
			7					1				X			1				1	1	1	1	1	1	1																												
			8					1				X			1				1	1	1	1	1	1	1																												
			9	1				X							1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1																		
			10	1				X							1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1																		
			11	1				X							1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1																		
			12	1				X							1	1	1	1	1	1	1	1	1	1	1				1	1	1	1	1	1	1																		
		Plaza Bldg																											1	1	1	1	1	1																			
		Subtotal	8	0	0	0	4							12	8	8	0	8	4	8	4	8	4	8	4	8	4	8	8	8	1	0	1	0	3																		
		Lakeline Express Toll Location	1									X		X	1				1	1	1	1	1	1																													
			2									X		X	1				1	1	1	1	1	1																													
			3									X		X	1				1	1	1	1	1	1																													
			4									X		X	1				1	1	1	1	1	1																													
			5									X		X	1				1	1	1	1	1	1																													
			6									X		X	1				1	1	1	1	1	1																													
		Express Toll Location																											1	1																							
		Subtotal	0	0	0	0	6							6	0	0	0	0	6	0	6	0	6	0	6	0	6	0	6	0	0	0	0	0	0																		
		Brushy Creek SB Entrance Ramp	1	1							X				1	1	1	1	1	1	1	1	1																														
			2		1						X				1	1	1	1	1	1	1	1	1	1																													
			3			1					X				1	1	1	1	1	1	1	1	1	1																													
			Ramp Plaza																											1																							
		Subtotal	1	1	1	1	0							3	1	1	1	3	0	3	0	3	0	3	0	3	0	3	0	2	3	3	1	0	0	0																	
		Brushy Creek NB Exit Ramp	1	1							X				1	1	1	1	1	1	1	1	1																														
			2		1						X				1	1	1	1	1	1	1	1	1	1																													
			3			1					X				1	1	1	1	1	1	1	1	1	1																													
			Ramp Plaza																											1																							
		Subtotal	1	1	1	1	0							3	1	1	1	3	0	3	0	3	0	3	0	3	0	2	3	3	1	0	0	0	0																		

Detailed Lane Configurations

Project	CTRMA Turnpike Seg	Toll Plaza or Express Toll Location	Lane Number	Lane Type				General Equipment Mounting Type																				
				MAN / ETC	ACM / ETC	DED/ ETC	Exp. ETC	Toll Plaza with Canopy	Overhead Gantry	Exterior Control Cabinet	Lane Controller	Manual Lane Terminal	Receipt Printer	ACM (Ramp) Booth	ETC Toll Lane	Express ETC	YES, Toll Lane	YES, Express ETC Lane	AVC System, Toll Lane	AVC System, Express ETC Lane	AVI System Hardware, Toll Lane	AVI System Hardware, Express ETC Lane	CDL Override Switch	Patron Feedback System	Lane Changeable System ¹	Emergency Message Sign	Plaza Generator	Toll Computer System
Administrative Offices		N/A	Total Admn. Offices	0	0	0	0				0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
				10	2	2	10	0	0	0	24	10	10	2	14	10	14	10	14	10	14	10	12	14	14	5	1	1
Grand Totals																												

Notes:

- All Plaza lanes have a dedicated Lane Controller. The Express ETC lanes have two Lane Controllers.
- VES (Violation Enforcement System) cameras are planned for all lanes. Dedicated and Express ETC will have both front and rear camera systems.
- Conduits and wiring within the Plaza, Ramp or Express Lanes must be designed to support the ultimate build-out and not restricted to the lane configurations shown in this table.
- All Attended Lanes will have a *Patron Feedback System*. Stand-alone ACM's will have integrated MLT and single line PTD display .

Patron Feedback System

- ¹ Traffic Signal heads will only have Red and Green Lights (AIT and ACM) or Yellow (w/low balance stencil) and Green (w/thank you stencil) (D/ETC).
- ² Traffic Signal heads will have Red, Yellow (w/low balance stencil), and Green Lights.

EXHIBIT B

				UNIT PRICE		AMOUNT	
ITEM #	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
1	1	LS	Installation/Electrical Design and Plans	128,750	00	128,750	00
2	1	LS	Field Installation and Electrical Work, Materials and Labor	459,483	00	459,483	00
3	24	Ea.	Lane Controller Hardware	5,159	13	123,819	12
4	1	LS	Communication Equipment	49,658	00	49,658	00
5	14	Ea.	Automatic Vehicle Classification System, Toll Lane	20,177	64	282,486	96
6	10	Ea.	Automatic Vehicle Classification System, Express ETC Lane	24,557	20	245,572	00
7	14	Ea.	AVI System Hardware, Toll Lane	34,189	00	478,646	00
8	10	Ea.	AVI System Hardware, Express ETC Lane	50,825	00	508,250	00
9	14	Ea.	Patron Feedback System, Toll Lane	3,598	43	50,378	02
10	14	Ea.	Violation Enforcement System Hardware, Toll Lane	23,219	50	325,073	00
11	10	Ea.	Violation Enforcement System Hardware, Express ETC Lane	90,695	40	906,954	00
12	10	Ea.	Manual Lane Terminal	1,290	00	12,900	00
13	10	Ea.	Receipt Printer	534	00	5,340	00
14	2	Ea.	Automatic Coin Machine	85,013	00	170,026	00
15	12	Ea.	Lane Changeable Message Sign	19,248	33	230,979	96
16	1	Ea.	Plaza Computer System Hardware	51,784	00	51,784	00
17	4	Ea.	UPS	10,345	75	41,383	00
18	1	Ea.	Emergency Generators	39,084	00	39,084	00
19	1	LS	Segment Commissioning Test	30,075	00	30,075	00
20	1	LS	Segment Operational Test	24,474	00	24,474	00
				Subtotal Segment 1		\$4,165,116	06

EXHIBIT B

				UNIT PRICE		AMOUNT	
ITEM #	QTY.	UNIT	DESCRIPTION	DOLLARS	CENTS	DOLLARS	CENTS
21	1	LS	Lane Controller Software	306,474	00	306,474	00
22	1	LS	Plaza Computer Software	306,474	00	306,474	00
23	1	LS	Host Computer Software	306,474	00	306,474	00
24	1	LS	Toll Collection System Application Software	306,474	00	306,474	00
25	1	LS	Security Access System Software	39,687	00	39,687	00
26	1	LS	Maintenance Online Management System Software	306,474	00	306,474	00
27	1	Ea.	Host Computer System Hardware	355,073	00	355,073	00
29	1	Ea.	Host UPS	7,755	00	7,755	00
30	1	Ea.	Host Communication Equipment	16,968	00	16,968	00
31	1	LS	Factory Acceptance Test	42,550	00	42,550	00
32	1	LS	Prototype On-site Test	49,766	00	49,766	00
33	1	LS	Project Acceptance Test	115,288	00	115,288	00
34	1	LS	Training	229,948	00	229,948	00
35	1	LS	Spare Equipment	89,671	00	89,671	00
36	1	LS	Spare Parts	174,763	00	174,763	00
37	1	LS	Documentation	221,544	00	221,544	00
38	1	LS	Project Management	\$ 939,594	00	\$ 939,594	00
				Subtotal Common Items		\$ 3,814,977	00
Work Authorization No. 1				TOTAL PROPOSED PRICE-Segment 1 and Common Items		\$ 7,980,093	06

Contractor _____

Principal Signature _____

COMMON ITEMS

WA1 - B2

Work Authorization No. 1

C1.0 Project Schedule

The Project Schedule is based on anticipated dates of completion of the roadway construction (by others) of the 183-A Turnpike Project as indicated in *Attachment D* of the Contract. The dates are based on current estimated information on the Toll Implementation Plan segments and are provided for information only for the purposes of preparing the Proposals. All dates are subject to change. The proposed schedule dates by which the Contractor plans to make submittals and dates for completion shall be coordinated with the construction contracts for the various toll road segments by others, and it will be subject to the review and approval by TxDOT and the CTRMA.

The anticipated milestones and submittals for the Common Items and the individual toll road segments shall be as set forth (all days shown as work days) in the format of Table 1, Milestone. Anticipated completion dates are provided, however, these shall be revised per the Project Schedule submitted by the Contractor. The end date for the Project may change, and the Contractor shall revise other submittal and milestones dates as it becomes apparent that changes will improve work or progress. Target dates should be in calendar days.

Table 1- Initial Milestones and Submittal Schedule

Milestones	Target Dates
Source Code Submission	May, 2005
Project Schedule Submission	May, 2005
Communication Plan, Quality Assurance Plan, Software Development Plan Submission	May, 2005
In-Lane System Requirements Document Submission	June, 2005
In-Lane Test Hardware Installation	June, 2005
Spare Equipment Hardware Delivery	June, 2005
Back Office Test Hardware Installation	June, 2005
Back Office System Requirements Document	June, 2005
Installation Plan Submission	July, 2005
System Business Rules Submission / Preliminary In-Lane System Design Review	August, 2005
System Business Rules Submission / Preliminary Back Office System Design Review	September, 2005
System Detailed Design Document Submission / In-Lane System Critical Design Review	Approval of System Requirements Document +30 days
Master Test Plan Submission	October, 2005
In-Lane System Factory Acceptance Test Procedures Submission	October, 2005
Back Office System Factory Acceptance Test Procedures Submission	October, 2005
System Detailed Design Document Submission / Back Office System Critical Design Review	November, 2005
Prototype In-Lane Test Unit	November, 2005
Factory Test In-Lane Development -- Software	December, 2005
Back Office System Build	February, 2006
Factory Test Back Office Development -- Software	April, 2006
In-Lane Prototype Testing	April, 2006
Back Office Factory Test	June, 2006
Factory System Acceptance Test	July, 2006
Prototype On-Site Test Procedures Submission	July, 2006
Toll System Hardware Delivery	August, 2006
Start Prototype On-site Test	September, 2006
Maintenance Plan Submission	September, 2006
Prototype On-site System Acceptance	October, 2006
User Manuals Submission	October, 2006
Training Classes	October, 2006
Segment 1 Operational Test Procedures	October, 2006
Toll Equipment Installation Complete	November, 2006
Software Licenses and Source Code Submission	November, 2006
Segment 1 Operational Test	December, 2006
Open to Traffic	December, 2006
Parts List and Catalogues	December, 2006
As-Built Drawings	December, 2006
Final System Acceptance -- Segment 1	December, 2006

Notes: *Dates represent submission of documents for first review.*

Target dates based on Developer schedule of open to traffic by February 2007. Possible early-open dates may occur depending on actual progress of construction. Contractor shall work with CTRMA and Developer to support possible early open dates.

[END OF SECTION]

TOLL COLLECTION SYSTEMS IMPLEMENTATION AND MAINTENANCE
Segment 1 - 183-A Turnpike Project

LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	Design	Procure	Install and/or Construct
------------------	--------	---------	--------------------------

Element/Task/Component/ Sub-system	Developer (CDA)			System Integrator (SI)			Comments Other Responsibility/Information
	1	2	3	1	2	3	
TOLL COLLECTION FACILITIES							
TOLL PLAZA, RAMPS & BUILDINGS							
Schedule	A	A	A	B	C	B	
Request for Early Opening	A	A	A	B	B	B	SI must be able to match schedule
Plaza, Ramp Lane and Building Layouts	A	A	A	B	C	C	SI to provide requirements for specific lane and building layouts. Developer to incorporate into Physical Layout Design Packages.
Plaza & Building Physical Layout	A	A	A	B	C	C	Concept Drawings provided by Developer
Grading	A	A	A	C	D	C	
Drainage	A	A	A	C	D	C	
Aesthetic Committee Review/Approval	A	A	A	B	D	D	Concept Drawings provided by Developer. SI to review for tolling equipment placement requirements.
Utilities	A	A	A	B	C	C	SI to provide specific requirements for power and HVAC for Toll Collection System. Developer to incorporate into FOB design and install, including provisions for UPS and emergency generators.
HVAC	A	A	A	B	C	C	SI to provide any special air conditioning requirements related to Toll Collection System.
Signing	A	A	A	B	D	D	Logo as per Scope

TOLL COLLECTION SYSTEMS IMPLEMENTATION AND MAINTENANCE
Segment 1 - 183-A Turnpike Project

LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	Design	Procure	Install and/or Construct
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Element/Task/Component Sub-system	Developer (CDA)			System Integrator (SI)			Comments Other Responsibility/Information
Striping	A	A	A	B	D	D	SI to provide requirements for Toll Collection System specific striping. Developer to incorporate into Striping Plan. Concept Drawings provided by Developer.
Pylons/Gantries/Canopies/Roadside Cabinets & Shelters with Air Conditioning	A	A	A	B	C	D	SI to provide requirements for specific equipment mounts, conduits, J boxes, power and data wiring for Toll Collection System. Developer to incorporate into structural design and provide and install.
Furniture	A	A	A	B	D	D	SI to provide network and power outlet configurations and locations to support the Toll Collection System workstations, printers, and related equipment.
Systems Servers & Workstations	B	C	C	A	A	A	
Telephone/Intercom System	A	A	A	B	C	B	
Landscaping	A	A	A	C	D	D	Concept Drawings provided by Developer.
Fencing/Guardrail/Bollards	A	A	A	B	C	C	SI to provide requirements for specific equipment clearances for Toll Collection System. Developer to incorporate into Roadway Design.
• Access Control							
Communications System and Facility Security Design	A	A	A	B	C	C	SI to provide communications design requirements at plaza specifically for Toll

TOLL COLLECTION SYSTEMS IMPLEMENTATION AND MAINTENANCE
Segment 1 - 183-A Turnpike Project

LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	Phase		
	Design	Procure	Install and/or Construct

Element/Task/Component/ Sub-system	Developer (CDA)			System Integrator (SI)			Comments Other Responsibility/Information
							Collection System. Developer to incorporate into the plaza designs.
Access Control Door Hardware (Proximity Badge Readers, Electric Door Locks, Power supplies, Request-to-Exit, Proximity infrared Sensors, Magnetic Door Sensors, conduit, J-boxes and wiring)	B	A	A	A	C	B	Developer to provide and install all security systems equipment. SI to provide software design and specific requirements for conduit, j-boxes, power and wiring. Developer to incorporate into the plaza/building designs.
Access Control Server	B	C	B	A	A	A	SI to provide requirements for Access Control Server mounting, conduits, j-boxes, power (hardwire) and data wiring. Developer to incorporate into the plaza designs and install conduits, j-boxes, power (hardwire) and data wiring.
Camera mounts and enclosures	B	A	A	A	B	B	SI to provide requirements for camera locations and mounts. Developer to provide and install conduits, j-boxes, mounting brackets, power and data wiring (pig-tailed at end of conduit runs). SI to terminate the wiring in camera enclosure. SI to verify data and power requirements prior to camera installation.
• Canopy/Gantry							
Lighting	A	A	A	B	C	C	CITP lighting plans will be used as an example to incorporate consistency.

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LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	1	2	
	Design	Procure	Install and/or Construct

Element/Task/Component/ Sub-system	Developer (CDA)			System Integrator (SI)			Comments Other Responsibility/Information
• Change Make-up Room							
Coin Counting Equipment	A	A	A	D	D	D	
Currency Counting Equipment	A	A	A	D	D	D	
Cash Tray & Storage Cabinet	A	A	A	B	C	C	
Built-in Vault Room, Drop Vault, Change Vault and drop/deposit head/chute	A	A	A	B	D	D	
• Utility & Personnel Accessway (UPA)							
Accessway	A	A	A	C	C	C	
Coin Tube System	B	A	A	A	C	C	SI to provide requirements for ACM coin delivery specific equipment mounts, conduits, j-boxes, power and data wiring requirements for plaza locations. Developer to incorporate accommodations for ACM coin handling into plaza designs.
• Construction Office / Storage Trailer							
Site Grading	A	A	A	C	D	C	
Trailer Hook-ups	A	A	A	C	D	C	
• VES Cameras							
Cameras mounts and enclosures	B	B	A	A	A	B	SI to provide requirements for VES camera locations and mounts. Developer to install conduits, J boxes, power and data wiring. SI to terminate the wiring in camera enclosure. SI shall verify data and power wiring prior to camera installation.

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LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	Design	Procure	Install and/or Construct
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Element/Part/Component/ Sub-system	Developer (CD/A)			System Integrator (SI)			Comments Other Responsibility/Information
VES Illumination mounts and enclosures	B	B	A	A	A	B	SI to provide requirements for VES illumination components locations and mounts. Developer to install conduits, J boxes, power and data wiring. SI to terminate the wiring at each location. SI shall verify data and power wiring prior to installation.
Overhead Lane Mode Signals & LED's	B	B	A	A	A	B	SI to provide Lane Control Signals and LED's. Developer to install equipment, and SI to install control wiring and switching.
• Toll Booths							
Toll Booth sub frame	A	A	A	B	B	D	Toll Booth sub frame to be acquired by Developer. This is required on site prior to Toll Booth.
Toll Booth	A	A	A	B	B	C	Toll Booths to be designed and procured by Developer. Cash trays, cash drawers & cabinets, HVAC & strip heater, and door locks supplied with booth. MLT and Receipt Printers will be installed by the SI, including any attachment to the cabinet.
HVAC & Strip Heaters	A	A	A	B	C	C	Roof top unit supplied with toll booth. SI to coordinate drain routing with Toll Collection equipment mounted to toll booth.

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LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	Design	Procure	Install and/or Construct
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Element/Task/Component/ Sub-system	Developer (C/D/A)			System Integrator (SI)			Comments Other Responsibility/Information
Electrical Supply	A	A	A	B	C	C	SI to provide specific power requirements for Toll Collection System equipment (conditioned, unconditioned, generator backup)
Canopy Over-ride Switch	B	A	A	A	B	B	SI to provide design, size and wiring details for canopy over-ride switch.
CO Sensors	A	A	A	D	D	D	To be provided with Toll Booths and in tunnel by Developer.
• Lanes/Islands							
Vehicle Detection/Classification Sensors	B	B	A	A	A	A	SI to provide the sensor design requirements and installation procedures. SI to provide install loops and provide oversight during cutting and sealing by Developer.
Island Traffic Signal Head Conduit, J Box, Wiring	B	A	A	A	C	C	SI to provide requirements for the Island Traffic Signal specific equipment mounts, conduits, J boxes and wiring. Developer to incorporate into Island design and install.
Gate Conduit, J-Boxes, Wiring	D	D	D	D	D	D	Gates will not be required.
Flashing Warning Lights Conduit/Boxes/Wiring	A	A	A	D	D	D	Not part of the ETC system. Developer to provide if part of overall MTP lighting plan
PROJECT OPERATING SUB-SYSTEM							
Design	A	**	**	B	**	**	
Ducts & Conduits	A	A	A	C	C	C	
Utility Vaults & Junction/Pull Boxes	A	A	A	C	C	C	

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LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	Design	Procure	Install and/or Construct
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Element/Task/Component/ Sub-system	Developer (CDA)			System Integrator (SI)			Comments/ Other Responsibility/Information
	A	B	C	A	B	C	
Communication Conductors & Fiber	A	A	A	C	C	C	
Power Conductors & Wiring	A	A	A	C	C	C	
PROJECT POWER DISTRIBUTION SUB-SYSTEM							
Design	A	**	**	C	**	**	
Conduits/Ducts & Junction/Pull Boxes/ Outlets	A	A	A	C	C	C	Developer to provide necessary conductors, ducts & junction/pull boxes and install.
Generators (MTP & RTP)	A	A	A	B	C	C	SI to provide Toll Collection System loads.
Uninterruptible Power Supplies	A	A	A	B	C	C	SI to provide Toll Collection System (UPS power) loads.
Lightning Protection & Grounding	A	A	A	C	C	C	
INTELLIGENT TRANSPORTATION SYSTEMS (ITS)							
Design	A	A	A	D	D	D	
Conduits/Ducts & Junction/Pull Boxes	A	A	A	B	C	C	SI to provide size, number, terminus points for Toll Collection System elements.
COMMUNICATIONS SUB-SYSTEMS							
Design	B	A	A	A	B	C	SI to provide Plaza specific communications design requirements. Developer to incorporate into the ITS design.
Conduits/Ducts & Junction/Pull Boxes/Outlets	A	A	A	B	C	C	SI to provide specific Communications design requirements for Toll Collection System. Developer to incorporate into the design and install.

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LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	1	2	3
	Design	Procure	Install and/or Construct

Element/Task/Component/ Sub-system	Developer (CDA)			System Integrator (SI)			Comments Other Responsibility/Information
Fibers (including future)	A	A	A	B	C	C	SI to provide requirements for the number and type of fibers to support the Toll Collection System specific network. SI to terminate.
Computer Rack System	B	C	C	A	A	A	
Routers	B	C	C	A	A	A	
Hubs	B	C	C	A	A	A	
Switches	B	C	C	A	A	A	
Firewalls	B	C	C	A	A	A	
Virtual Private Network (VPN)	B	C	C	A	A	A	
Modems	B	C	C	A	A	A	
Patch/Distribution Panels	B	B	B	A	A	A	
Telephone/Intercom Sub-system	A	A	A	B	C	C	
Plazas Phone Service	A	A	A	B	C	C	
TOLL COLLECTION SYSTEMS							
Toll Plaza Host Computer	B	B	B	A	A	A	SI to provide Developer with details of the required equipment racks. Developer to provide conduit, data and power wiring and structure to mount equipment.
Back-up Host Computer	B	B	B	A	A	A	SI to provide Developer with details of the required equipment racks. Developer to provide conduit, data and power wiring and structure to mount equipment.
Support Equipment at CTRMA	B	B	B	A	A	A	SI to provide and install. SI to provide

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LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	1	2	3
	Design	Procure	Install and/or Construct

Element/Task/Component/ Sub-System	Developer (CDA)			System Integrator (SI)			Comments Other Responsibility/Information
Administrative Offices							Developer with the wiring diagrams and equipment rack specifications. Developer to provide conduit, data and power wiring and structure to mount equipment.
Toll Plaza Workstations/Printers	B	B	B	A	A	A	SI to provide toll plaza workstations/printers and install them at the required locations. Developer to provide conduit, data and power wiring and structure to mount equipment.
Toll Plaza In-Lane Processors	B	B	B	A	A	A	SI to provide Developer with environmental requirements and locations. Developer to provide conduit, data and power wiring and structure to mount equipment.
MOMS (Maintenance Online Management System)	B	B	B	A	A	A	SI to provide MOMS server and required workstation at FOB. At least one workstation will be provided at the CTRMA Administrative Offices.
VES Computer	B	B	B	A	A	A	SI to provide Developer with location and environmental requirements. Developer to provide conduit, data and power wiring and structure to mount equipment.
FCC Licenses/Regulations as applies to AVI	C	C	C	A	B	B	SI to provide required documentation to permit the CTRMA to obtain the required licenses to use and or operate AVI

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LEGEND	
Primary Responsibility	A
Support Responsibility	B
Coordination Responsibility Only	C
No Responsibility	D

Work Description	1	2	3
	Design	Procure	Install and/or Construct

Element/Task/Component/ Sub-system	Developer (CDA)			System Integrator (SI)			Comments Other Responsibility/Information
							equipment and components.
Attendant/AVI Lanes	B	B	A	A	A	B	Developer to provide conduit, data and power wiring and structure to mount equipment.
Un-Staffed ACM/AVI lanes	B	B	A	A	A	B	SI to provide Automatic Coin Machine and associated hardware. Developer to provide conduit, data and power wiring and structure to mount equipment.
Express AVI lanes	B	B	A	A	A	B	Developer to provide conduit, data and power wiring and structure to mount equipment.
Lane Toll Collection Enforcement (Cameras and Lights)	B	B	A	A	A	B	Developer to provide conduit, data and power wiring and structure to mount equipment.
Toll Lane Gates	D	D	D	D	D	D	Toll Lane Gates will not be required.
Coded ACM Coin Vaults	B	B	A	A	A	B	Developer to provide conduit, data and power wiring and structure to mount equipment to. SI to install equipment and terminate power and data wiring.