



Toll Systems Integrator CDA Toll Design and Implementation Manual



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1. Introduction

As a division of the Texas Department of Transportation (TxDOT), the Texas Turnpike Authority (TTA) Division is responsible for the overall activities related to planning, development and operations of toll roads as part of the state highway system. These activities involve toll feasibility studies, design, construction, system integration, and operations. In support of these efforts TTA has hired an oversight consultant who works closely with TTA staff to execute this work as well as providing on-going operational support. The *Toll Systems Integrator CDA - Toll Design and Implementation Manual* is intended to provide information to TxDOT Districts and Divisions on TTA's and the General Engineering Consultant's (GEC) role in designing and implementing tolling.

As part of TxDOT's initiative to support toll collection planning and operations, TTA evaluated tolling methods used by other agencies and identified best practices for development and implementation. Although the range of toll collection options includes the traditional approaches such as attended toll collection and automated coin machines, TTA chose to focus on a more technologically advanced method known as all-electronic toll collection (AET), which includes transponder-based only toll collection and video tolling referred to as "Pay By Mail" on TxDOT facilities and others.

On January 27, 2006, TxDOT entered into a Comprehensive Development Agreement (CDA) with Raytheon Company to develop, design, construct, install, integrate, test, and maintain one or more systems for an open road tolling (ORT) collection system, on TxDOT-owned and / or operated toll roads at any time during a five-year period. The CDA can also be used to support any toll facility operated by a Regional Mobility Authority (RMA) or any other toll agency located within Texas.

More specifically, TxDOT's right to designate pilot systems and project segments and to issue project segment supplements (PSSs) and notices to proceed (NTPs) applies with equal force and effect to projects to be built and / or operated by an RMA or another toll agency. In such event, TxDOT has the option, in its discretion, of issuing the PSS and / or NTP on behalf of the RMA or other toll agency, or assigning its right to issue the PSS and / or NTP directly to such RMA or other toll agency, as the case may be.

1.1. Manual Overview

This manual covers the fundamental areas involving TxDOT's toll planning design and implementation. It has been subdivided into the following basic outline:

- Chapter 1** Provides an overview of the tolling design and implementation according to TxDOT standards.
- Chapter 2** Describes the initial steps involved in tolling outreach.
- Chapter 3** Covers project data gathering and reviews in addition to the process for developing draft recommendation memorandums.
- Chapter 4** Presents the PSS planning and execution.
- Chapter 5** Describes the toll system design and review process with regard to document submittals.
- Chapter 6** Describes the construction and installation oversight.
- Chapter 7** Provides information on toll system integration testing.
- Chapter 8** Highlights toll system acceptance.
- Chapter 9** Lays the foundation for operations and maintenance of the toll system.
- Chapter 10** Summarizes the project closeout and transition from developer to owner.

1.2. Purpose

The purpose of this manual is to describe how toll design and implementation fit into the statewide toll program and to explain the roles and responsibilities of the statewide toll program team. As technology changes, the design and implementation of the TxDOT statewide tolls program will continue to evolve, and this manual will be revised as needed to reflect those changes.

2. Tolling Outreach

It is TxDOT’s responsibility to educate and assist local governments with the development of transportation facilities. With the decline of tax-based transportation funding, agencies are exploring alternate funding sources to support new transportation projects. Tolling, as a means to obtain funding, has become more prevalent in recent years. TTA has specific toll planning, execution and operations experience and assists other branches of government where tolling is being considered for new transportation projects. In support of these potential tolling projects, TTA has developed a variety of toll operations support contracts that are available for use by other agencies.

2.1. Initiation of Request for Consultation / Training

Typically, TTA receives a request for consultation or assistance related to tolling an upcoming project. The request may be related to the need for basic education on tolling operations, or a desire to use one of the state-administered toll contracts.

2.1.1. District or Local Toll Agency Request

Often it is the TxDOT District or a local toll agency with primary jurisdiction over a highway facility eligible for tolling that generates requests. Typically these requests are extended before construction begins on the new facility.

2.1.2. TTA Suggestions / Outreach

In some instances, TTA establishes the initial contact with the District or local toll agency and extends an offer to use the services available through TTA’s toll contracts. TTA staff members continuously look to assist the Districts, RMAs, and other agencies by sharing project successes and making available the resources to assist them in the planning and implementation of toll facilities.

2.2. Work Authorization Administrative Efforts

Upon request from TTA staff, the oversight consultant will initiate the process to create a formal work authorization with TTA. This work authorization will require TTA project manager approval of scope, budget, and schedule, which will eventually be incorporated into a work authorization contract document. If a request for support is received directly from a District or RMA, or other toll agency, the oversight consultant will refer those requests to the TTA project manager.

2.2.1. Scope

TTA, in coordination with the oversight consultant, will document the scope of services. The document should capture the essentials of the required work, including the identification of specific deliverables.

2.2.2. Budget

The oversight consultant will use the TTA prescribed Microsoft Excel™ spreadsheet to develop a work authorization budget that matches the scope for each task. To maintain flexibility and minimize unnecessary administrative efforts later, it’s important to include in the budget all potential staff who might be used on each task even if the person’s role

is limited. This helps minimize the need to make formal requests for subsequent changes or additions in personnel if schedules are altered or other unforeseen events occur.

Similarly, all potential expense items should be identified in the budget, as TTA procedures do not permit reimbursement for items not specifically included in the budget. As an example, any potential air travel, rental cars, or outside printing should be included in the budget, regardless of the size of the expense.

In the event of travel, each oversight consultant staff member must obtain prior written approval or “travel authorization” from the TxDOT project manager. Expenses incurred during authorized travel must be submitted in accordance with TxDOT guidelines for reimbursement.

2.2.3. Schedule

A project schedule, showing all tasks referenced in the scope, should be created and included in the work authorization submittal. Frequently this schedule is created in a Gantt chart format using an Excel spreadsheet. The schedule is used to monitor task deadlines and to ensure they do not extend beyond the term of the work authorization and / or contract period.

2.2.4. Work Authorization Execution

Once TTA has completed a review and approval of the oversight consultant’s proposed scope, budget, and schedule; the work authorization is then executed by signature of both TTA and the oversight consultant. Additionally once the primary work authorization has been executed, sub-consultant work authorizations may also then be established by the oversight consultant.

2.3. Research Need / Opportunity

Once a formal work authorization has been established, then project-related research and investigation can begin. This should be accomplished by reviewing existing facility plans, establishing a list of potential issues related to toll implementation, and holding discussions with local transportation staff.

2.3.1. Review Preliminary Facility Plans

When a new transportation project is presented to TTA for consideration, the oversight consultant should obtain copies of any pertinent reports and plans related to the potential toll facility. These documents will provide the team with a better understanding of the proposed project. While it is typically not necessary to redesign the project, a review of toll location placement and strategy should be done to confirm efficiencies and ensure system costs are minimized.

2.3.2. Define and Follow-up on Key Issues

Following the preliminary facility documentation review, the oversight consultant will identify any issues that may influence the implementation and operations of the system. These may include the agencies that could be responsible for administering the toll collection, as well as planning issues related to the type of toll collection philosophy to be pursued, and design issues related to the placement of toll gantries and signage. The oversight consultant should be prepared to perform additional research or design work to

address any project issues identified during the meeting. Such efforts should be covered in the initial scope so that the response can be expeditious and there is no delay in responding to the request.

2.3.3. Follow-up Discussions with Local Staff

Once the oversight consultant has conducted a thorough review, it is useful to have follow-up discussions with local staff about project-specific concerns and unresolved questions. These efforts are coordinated through the TTA project manager.

2.4. Prepare Materials and Plan Meeting

A Microsoft PowerPoint™ presentation template has been developed for use in outreach sessions throughout the state. It provides descriptions of projects already underway or completed, background on toll operations, an explanation of support contracts available to assist Districts and local agencies with toll implementation, details about the toll integrator's toll collection system, and key benefits of using the toll integrator's toll collection system. The presentation template is tailored to include the local project and address any local issues. The detail of the presentation should take into consideration the audience attending.



2.4.1. Determine Potential Meeting Attendees

Through discussions with the local liaison and the TTA project manager, the oversight consultant will document invitees and their roles. The mix of political and technical staff in attendance will determine the type of information to be presented. Similarly, the attendees' pre-existing knowledge of toll operations will also influence the topics and level of detail presented. In some cases, it may be desirable to open the meeting to other agencies that might have a future toll project.

2.4.2. Identify Meeting Place and Time

The oversight consultant works with the local liaison to establish the meeting location, date, and time. In particular, it is important to determine the size and features of the meeting room, including factors such as:

- Room capacity
- Parking availability / location
- Projection screen
- Electrical outlets
- Blackboards and bulletin boards
- Size and shape of room

- Location of restrooms and kitchen / vending machines

TTA is unable to pay for refreshments and meal expenses for meeting attendees. If the meeting extends into a meal time, arrangements should be made to either order in lunch, with the understanding that meeting participants will have to cover their own meal costs, or the agenda should allow for a break during lunch.

2.4.3. Customize PowerPoint Presentation

Depending on the meeting attendees and the issues of most importance to the participants, the presentation should be specialized to the group. Where feasible, the District or local agency staff should present appropriate sections of the presentation. This will provide diversity to the presentation, build relationships, and garner local support.

2.4.4. Create Handouts and Large Size Graphics

Depending on interest levels and the project needs, large-sized graphics may be required to stimulate discussion and explain key features. Paper copies of all slides presented should be provided to the meeting attendees. An electronic copy of the presentation should also be provided to the local liaison.

2.5. Presentation

The oversight consultant makes arrangements for all activities related to the outreach that including travel to the meeting, meeting set-up, and meeting format. Each of these is discussed in the following sub-sections.

2.5.1. Travel

Any meeting-related travel must conform to TTA travel policies. If at all possible, travel should occur the same day as the meeting to reduce costs. Factors such as an early-morning start coupled with substantial travel distance, or the need to conduct additional meetings while making the trip prohibit same day travel. The oversight consultant should coordinate closely with TTA staff traveling to the same meeting in order to make maximum use of available resources and should be limited to essential personnel only. Whenever feasible, videoconferencing and / or teleconferencing should be used.



2.5.2. Set up

Schedules should be set to arrive at the meeting site early enough to set up the room and obtain any last-minute instructions or insights from the local liaison. Make sure the seating in the room is arranged in a manner that facilitates discussion while allowing for a presentation.

2.5.3. Meeting Format

The typical meeting format involves a presentation followed by questions and answers, but should be tailored to local needs. In some instances, a morning workshop has been

held to give elected officials a broad overview of tolling principles, with a more detailed technical presentation being provided to staff during the afternoon.

2.6. Frequently Asked Questions

While each meeting is different, there will probably be some questions that have been asked in previous outreach efforts. For consistency and ease of response, the following frequently asked questions are provided together with the official policy position.

How much of the system's cost does TTA support?

For TxDOT projects, TTA pays for only the roadside system design and the oversight consultant. Districts are responsible for all capital costs, systems testing, and ongoing maintenance and operations expenses.

For local agency projects, the local agency is responsible for all design costs, capital costs, systems testing, and ongoing maintenance and operations expenses. This can be accomplished either through a commission minute order for toll equity or through an inter-local agreement.

Who will be responsible for collecting the tolls?

TxDOT determined that all TxDOT facilities will use AET collections (cashless systems). With advances in electronic toll collection equipment, data collected at any tolling location can be transmitted via the Internet anywhere in the state. For this reason, transactions can be processed through a back office located in the vicinity of the site or through an existing facility operated by TxDOT, Harris County Toll Road Authority (HCTRA), North Texas Tollway Authority (NTTA), or any other emerging toll or regional mobility authority.

How long will it take to implement this system?

Ideally, planning and design start prior to letting a construction contract in order to incorporate some of the tolling features in the final plan set. There also needs to be substantial time for public outreach and toll marketing. Typically, however, a small system of less than 10 gantries can be operational within 9 months from issuance of NTP.

What can be done under existing construction contracts to reduce costs for toll system implementation?

Little can be done under the construction contract that will result in significant savings. In accordance with the terms of the TxDOT Open Road Tolling Collection System (ORTCS) CDA, the toll integrator installs the tolling equipment including cabling and conduit as well as the civil infrastructure such as the gantries, roadside equipment cabinets, metal beam guard fence, and toll signs. The only thing that has proven to provide a cost savings when included in the roadway construction contract is the earthwork for the maintenance areas and possibly the asphalt for the maintenance driveway.

Where will toll gantries likely be located?

As part of the toll planning and coordination process, the oversight consultant will work with TTA to review any available traffic and revenue analyses, including any conceptual toll feasibility to investment grade studies. During this review, the oversight consultant will consider the nuances of the toll integrator's system and look at the recommended locations for the toll gantries. If there are aspects that were not considered in those analyses, the oversight consultant will draft a recommendations memo with new proposed locations for toll gantries. This process does not often result in significant changes. Most often the gantries move slightly to take better advantage of the toll integrator's design.

Should power drops be supplied at each potential gantry location?

Power and communications are typically provided by TxDOT within the right-of-way. It is incumbent upon the toll integrator to connect those facilities to the roadside equipment cabinets and / or toll gantries. If power is not available within the right-of-way, the toll integrator can obtain power and communications outside of the right-of-way under the CDA; however, this increases the cost of the project.

Is signing for the toll system a local responsibility?

With the exception of advanced warning trailblazers, toll signing is typically separated from traditional signage. Signage is covered under the CDA and can be fabricated and installed by the toll integrator. Alternately, signage can be included in general construction contract or done in-house, depending upon local direction. TTA staff coordinates reviews of toll signing layouts with TxDOT's Traffic Operations Division to ensure compliance with the latest toll sign standards.

3. Toll Planning and Coordination

3.1. Gather Data and Review

The initial planning and coordination activities performed by TTA and the oversight consultant consist of gathering all of the relevant project documentation. Important items to review include (1) construction schematics, plans, and as-built drawings, (2) toll feasibility reports and previous traffic and revenue studies, and (3) any tolling policy documents that govern the facility.

The stage of project development or construction will determine the level of documentation that is available. If detail regarding the location of power and communications services shown in the schematics or plans is insufficient, the local utilities will need to be contacted to request up-to-date information.

In addition to gathering written documentation, the oversight consultant will compile a list of TxDOT contacts working on the project. This typically includes TTA staff, local District staff, and any engineers and consultants that previously performed or are currently performing work on the project on behalf of TxDOT.

3.2. Conduct Analysis

Once all of the project documentation has been gathered, a comprehensive analysis is performed of the tolling scheme, the toll-related costs, and any secondary effects of the project such as impact on the TTA customer service center.

3.2.1. Tolling Scheme Analysis

The oversight consultant reviews and analyzes the proposed tolling scheme for accuracy, completeness, and effectiveness. This is done to confirm that all user trips on the facility are tolled and that no leakage occurs. An analysis is performed regarding the location and number of tolling locations to determine if the solution is the most advantageous and cost effective way to conduct tolling (i.e. if efficiencies can be gained by reducing the number of tolling locations or by using more mainline locations and fewer ramp locations). The analysis will also assess whether all user trips are evaluated to maintain a basic level of parity with regard to the toll rate paid per mile.

If the facility includes high-occupancy travel (HOT) lanes and a previous HOT lane policy has been adopted, the rules for declaration, pricing, and high-occupancy vehicle (HOV) enforcement are reviewed. If no policy has been written, recommendations can be developed for how users should declare their HOV status, how tolls are to be set (by time of day or dynamically), and how TxDOT or the local agency should enforce the HOV policy.

3.2.2. Tolling Location Analysis

A field visit to each tolling location is performed to ensure that the area provides enough space for the toll gantry footings, an equipment area with room for a maintenance vehicle to park, and any necessary metal beam guard fence or other type of traffic barrier. If the roadway is a HOT lane facility, the tolling locations will be evaluated to confirm that they can accommodate any necessary declaration and enforcement zones. Finally, the toll locations will also be evaluated for the possibility of toll evasion.

3.2.3. Power and Communications Analysis

The oversight consultant works closely with the TxDOT District and the utility companies to determine the nearest location of power and communications service for each tolling location. This information is used to develop an estimate of the work needed to provide power at each tolling location, and develop a plan for the communications system. Depending on the physical layout of the tolling facility, a complete fiber optic network may be feasible or a combination of fiber optic and wireless systems may be more viable.

3.2.4. Toll Signage

Toll signage will be in accordance with the latest TxDOT Traffic Operations Division (TRF) guidance. Toll sign plans can be prepared by either the District, TTA's oversight consultant, or by the toll integrator. TTA will coordinate reviews of all toll sign layouts and plans with TRF to ensure compliance with current toll sign guidelines. In addition, fabrication and installation of signs can be done by either the District, the roadway construction contractor, or by the toll integrator.

3.2.5. Cost Analysis

A preliminary estimate of construction and toll systems costs is developed based upon the analysis of the tolling scheme, individual tolling locations, and the recommended power and communications solution. Previous TxDOT toll project costs are used as a basis for the estimate and the escrowed CDA Book of Unit Pricing documents, which serve as a guide for toll pricing development. This estimate is used to help plan project costs and to analyze the toll system integrators pricing described in Chapter 4, Section 2.

3.2.6. Traffic and Revenue

The oversight consultant confirms that the toll system assumptions used in previous traffic and revenue reports still apply. If they do not and the changes impact the reports' results, the oversight consultant offers high-level recommendations for making adjustments to the reports.

3.3. Draft Recommendations Memorandum

Following the comprehensive analysis of the project, a draft memorandum is provided to TTA that describes the analysis' findings and recommendations. The memorandum is written with the intent of providing an executive summary-type document to TTA and / or the local agency and a starting point from which the PSS can be developed. The memorandum may include detailed attachments, as needed, such as updated plans and schematics and modified tolling schemes and configurations.

3.4. Developed Plans, Specifications and Estimates

Some elements of the toll systems civil engineering work may be included in the roadway contract's Plans, Specifications, and Estimates (PS&E) in advance of the toll integrator becoming involved. This would typically include the earthwork for the maintenance areas and possibly the asphalt for the maintenance driveway. Approximate locations of items such as the gantries and conduit could be shown in the PS&E as items of work to be performed by others. By doing so, this makes the roadway contractor completely aware

of the extent of the toll work and will put the contractor in a better position to support the efficient completion of both his work and that of the toll integrator. Typically, however, it is best to include the toll integrator in this early planning to ensure the best placement of the tolling locations and roadside equipment.

4. Project Segment Supplement Planning and Execution

4.1. Scope, Schedule, and Budget Development

As discussed under Section 2.2 “Work Authorization Administrative Efforts,” a similar effort may be required to authorize PSS development work if the previous work authorization did not include PSS work. This may be the case when the outreach and preliminary analysis is performed several years prior to implementing tolls or simply because there was no funding available to begin the toll implementation work at the time. Regardless, if there isn’t a current work authorization for the toll implementation portion of a project, a new scope, budget, and schedule is developed to oversee the development of the PSS as well as the construction, installation, and testing of the toll system.

4.2. PSS Document Development

Once planning is complete and there is an active work authorization for the effort, a PSS is developed. The PSS is a supplement to the CDA that is issued by TxDOT and sets forth the development and maintenance requirements for a particular project segment. The PSS must be signed by both an authorized representative of TxDOT and of the toll integrator.

A PSS may be developed and executed through TxDOT or directly between the toll integrator and the local toll agency. Prior to developing the PSS documents, TTA and the oversight consultant will meet with the District or local agency requesting the project development. Regardless of who is executing the PSS, TTA is responsible for initiating the PSS development process in conjunction with the toll integrator.

The oversight consultant should:

- Have an understanding of the project requirements and objectives.
- Gather information from the requesting entity and conduct a due diligence review of the project location, potential design, tolling schemes, and scope of work.
- Draft the PSS for internal review and circulate to TxDOT staff and the Office of General Counsel (OGC) representative to allow sufficient time for corrections, clarifications, and comments.
- Revise the draft and consult with the team as appropriate. The information in the PSS determines the project requirements and is a basis for negotiations with the toll integrator.
- Forward the draft to toll integrator for review and comment.

The draft PSS will include:

- A description of the project segment
- Project segment completion deadlines
- Liquidated damages amounts
- Key personnel designations applicable to the project segment

- TxDOT-provided approvals
- Any necessary project segment-specific modifications to the contract documents

The toll integrator reviews the draft PSS prepared by the oversight consultant and may accept the terms, request more time or information for its review, or provide a counter-proposal.

If the toll integrator indicates that it does not have sufficient time or information to respond to the draft PSS or makes a counter proposal, then the toll integrator must provide additional information if available and alert TTA about the counter and additional time requested. The oversight consultant will perform an assessment of the counterproposal and / or extension request and make recommendations to TTA. The decision regarding the time extension should be communicated in writing to the toll integrator. If TTA considers the counterproposal acceptable, then the document is modified and a final draft is forwarded to the toll integrator. If TTA does not accept the counterproposal, the toll integrator is contacted about the TTA concerns and the oversight consultant assists in negotiating terms acceptable to both parties. If the counterproposal is related to contract compliance issues (as opposed to technical requirements), OGC is consulted as well.

Once an agreement of the terms is reached, the document is finalized the document, circulated internally, and then a hard copy or Portable Document Format (PDF) copy is forwarded to the toll integrator for signature. When the signed document is returned, it is forwarded to TxDOT representatives for signatures along with a white paper summarizing the PSS.

4.3. PSS Form

The PSS template that TxDOT developed outlines the necessary information that TxDOT requires for PSS approval. The PSS should address the following:

4.3.1. Project Segment Pricing

This refers to the project segment price to be paid by TxDOT, or local agency, as full compensation for the work that will be required for the toll integrator to complete the design, construction, installation, integration and warranty of the project segment as well as the maintenance price to be paid as full compensation for the maintenance work. On TxDOT toll projects, TTA is responsible for paying all design costs and consultant oversight fees; the District must pay for the construction (labor and materials) and testing costs as well as ongoing maintenance. TTA will provide the District with a breakdown of all project costs so that they can plan accordingly to program the necessary funds.

4.3.2. Project Segment Completion Deadlines

This reference includes all acceptance deadlines and other milestone deadlines that vary based on the scope of work. Typical milestones include project segment system acceptance (granted once the system is shown to be functioning properly), project segment punch list acceptance (granted once all punch list items have been completed), and project segment final acceptance (granted once the toll integrator demonstrates the system can meet the performance requirements for 30 consecutive days). These milestone dates and other critical dates in the PSS such as the second NTP if one exists are closely

coordinated with the District or local agency based on the progress of the roadway construction and coordination with other contractors doing work in the area.

4.3.3. Liquidated Damages

This includes liquidated damages payable that are calculated based on a specific value per day. During the first year of operation, liquidated damages are calculated using TxDOT's most current traffic and revenue data for the applicable project segment as the difference between projected annual gross revenue and projected annual operations costs. This includes liquidated damages payable that are calculated based on a specific value per day. This number is then divided by the number of revenue days per year used in the data plus a \$3,000 per day facility service cost (which is intended to cover TxDOT's anticipated additional internal overhead and administrative costs, and anticipated additional outside consultant costs). For all subsequent years, the previous years' data (using actual revenue and cost information) will be used in the formula in lieu of the traffic and revenue data. The formula is as follows:

$$\frac{(Annual\ Gross\ Revenue) + (Annual\ Operations\ Costs)}{(Revenue\ Days\ Per\ Year)} + \$3,000 = Liquidated\ Damages$$

4.3.4. Project Segment-Specific Modifications to Contract Documents

This includes project segment-specific modifications to the contract documents and applies only to the particular project segment. TTA may find that certain modifications in one PSS are appropriate or applicable to other project segments. Modifications from one PSS should not be incorporated by reference to another PSS document. For example, the federal prevailing wage requirements, which are applicable to the project segment work being performed based on the county in which they are located, may not apply elsewhere.

4.3.5. Reference Documents / Owner Design Documents

This section should include any information in reference / owner design documents that TxDOT has provided to the toll integrator in connection with the project segment. These types of documents are usually provided in design-build type projects since the road design is being finalized as it is being built. In most cases, however, where the road is nearly constructed or completely constructed, there will be no reference documents.

4.3.6. TxDOT-Supplied Project Approvals

This section includes approvals supplied by TxDOT for the project segment. It is the toll integrator's responsibility to obtain all other required governmental approvals. An example might be approvals required from the Federal Highway Administration (FHWA) or any of the railroad companies.

4.3.7. Key Personnel

This includes all toll integrator key personnel applicable to the project segment. The toll integrator provides a complete list of names and position titles on the TxDOT-provided form.

4.3.8. Toll Integrator’s Representations, Warranties and Covenants

In this section the toll integrator’s representations, warranties and covenants with respect to the project segment.

4.3.9. Terms of Agreement

All terms and conditions, rights and obligations of the CDA are outlined in this section, unless otherwise modified by the PSS.

4.3.10. Pricing Sheet

As part of the original contract, the toll integrator should submit a price proposal that includes unit prices and personnel hourly rates for the work that will be delivered under the CDA. The price proposal is comprehensive and includes costs for mobilization and insurance, installation work and products, design work, and construction management. The toll integrator is responsible for indicating the quantities and the prices for direct reimbursable costs such as insurance and start-up costs. For instance, mobilization that will be required for the particular project segment would be included. Once the pricing sheet is complete, it becomes part of the PSS.

4.3.11. CDA Amendments

A CDA amendment is a modification to the original contract terms. Because an amendment to the CDA would apply to all subsequent project segments, an amendment should not be proposed if it has a limited application and it can be addressed in a PSS as a project-specific modification. A project-specific modification does not amend the CDA provisions of other project segments.

Amendments must be in writing and signed by both parties to the contract. If TTA and the toll integrator determine that it is necessary and appropriate to amend the CDA contract terms, support documents and draft language will be prepared to amend the contract. If a project-specific modification is repeatedly included in PSS, or in the case of a change in conditions that affect the overall contract, such as bonding, insurance, or change order processing, TTA and OGC will determine whether a contract amendment may be appropriate.

Upon determining that a contract amendment is appropriate, the toll integrator will be notified and provided a draft copy of the proposed amendment for review and comment. TTA will also coordinate reviews and comments with FHWA. Once the reviews have been completed and all comments have been satisfactorily resolved, the contract amendment is circulated to the toll integrator and then to TxDOT for signatures.

4.3.12. Technical Provisions

The ORTCS CDA contains Technical Provisions (TPs) to which the toll integrator must adhere. These TPs are the base toll system specifications, including construction, maintenance and functional requirements for project segment development. The TPs affect all subsequent project segment requirements. The TPs can be modified in each PSS for project-specific issues such as reduced testing time for fast-track projects. In other words, a contract amendment to modify the TPs is not necessary if the modification can be addressed in the project specific PSS or through a change order.

4.4. Price Reasonableness and Negotiation

Any proposed pricing revision to the draft PSS should be developed using the same estimating, cost, schedule, risk assessment, assumptions, and overhead and profit principles used to develop the CDA price proposal. Further, any proposed pricing revisions must be based upon differences between the original assumptions and CDA requirements and the variation in the project segment requirements. The PSS proposed price is reviewed taking into consideration the original price proposal and other CDA requirements, as well as any particular factors applicable to the project segment, such as material differences in required quantities or labor needs that affect the toll integrator's purchasing power or project acceleration requests. The toll integrator is contacted for clarification and justification of any proposed price that are inconsistent with the CDA price proposal.

If necessary, such as in the case of the inability to reach an agreed price, the oversight consultant will coordinate with TTA for permission to request the toll integrator's back-up for quantities, labor and work effort estimates, as well as the Escrowed Procurement Documents (EPD) and other materials submitted by the toll integrator with its proposal. The oversight consultant will review the information and draft a memorandum to TTA regarding the evaluation of the PSS proposed price and recommendations as to whether or not the price is reasonable.

4.5. White Paper

Once TTA and the toll integrator have agreed to the PSS terms, the oversight consultant drafts a white paper to provide an overview of the project as well as to show a diagram of the proposed tolling locations and outline key milestone dates. This is used as the cover page for the PSS package submitted for signature.

4.6. Signature Process

The PSS package is forwarded to FHWA for review and approval. Once FHWA approval is received two original copies of the PSS are forwarded to the toll integrator for signature and then both originals are returned to TxDOT for final signature.

4.7. Notice to Proceed Issuance

Before issuing the NTP, it's important that TTA and the oversight consultant confirm that the toll integrator met the following contract requirements:

- Delivered the applicable performance bond or rider
- Delivered the applicable payment bond or rider
- Delivered the applicable letter of credit or amendment
- Delivered any required guaranty of toll integrator's obligations
- Provided the insurance policies, certificates of insurance, riders to its existing insurance policies or other evidence reasonably required by TxDOT
- If applicable, TxDOT has approved any changes to the key personnel

- If applicable, toll integrator has submitted all EPDs used in connection with the project
- TxDOT has obtained all required environmental approvals
- The Texas Transportation Commission has approved the facility for tolling
- The source code escrow has been placed into escrow and is in full force and effect
- Toll integrator has provided any other documents, things or assurances reasonably required by TxDOT

The oversight consultant will draft an NTP letter for TTA to review and approve that will accompany the final PSS. Once approved by TxDOT the NTP letter is sent to the toll integrator along with the toll integrator's original PSS. If the toll integrator is unable to provide all the required documents immediately, or there is another issue that prohibits the toll integrator from beginning work, TTA may issue NTP to begin work at a later date. The oversight consultant will monitor NTP compliance and coordinate with the toll integrator to address any outstanding issues so that they may be resolved as quickly as possible.

4.8. Disadvantaged Business Enterprise Coordination

The oversight consultant reviews the Disadvantaged Business Enterprise (DBE) reports for compliance with the CDA participation goal. The toll integrator is responsible for completing and submitting the appropriate forms and information outlined in the contract. When developing the PSS, the oversight consultant will work with TxDOT and the DBE program representative to determine the appropriate DBE participation goal. Each DBE participation goal for each project segment may vary at TxDOT's discretion, which will be specified with TxDOT's issuance of each NTP. While the individual DBE participation goals specified for each project may be greater than the CDA DBE goal, the overall DBE participation required for the CDA shall not exceed the CDA DBE participation goal.

4.9. Reporting and Invoicing

The toll integrator is responsible for the work related and project-related documentation outlined below. Specific reporting requirements are described in the CDA.

4.9.1. Construction Monthly Reports

During the construction phase, the toll integrator submits a monthly report on project segment work. The monthly progress report will include the toll integrator's detailed schedule for executing the work and all information and reporting required to support the project schedule, and should include only resources actually available to the toll integrator. Monthly reports are submitted to both TTA and the oversight consultant. The oversight consultant is responsible for forwarding copies to the designated review team. The review team then makes sure the report includes the correct information about the project such as:

- Updated progress for the current period for all PSS activities
- Actual start and actual finish dates of work and percentage complete

- Days remaining for work in-progress

The monthly progress reports shall reflect forecast finish for in-progress project activities, and reforecast early dates and late dates for remaining project activities. The monthly reports *should not* include any changes in project activity durations, logic ties, or restraints without approval from TxDOT. Along with the monthly progress reports should be an electronic copy of the project schedule file used for the monthly schedule update.

4.9.2. Maintenance Monthly Reports

Once the system is accepted, the toll integrator discontinues construction monthly reports and begins submitting maintenance monthly reports. The maintenance monthly report will include details on project work and system activities by project segment for the life of the maintenance periods.

At a minimum, the monthly management reports include a summary of the month's activities, highlighting any special events and incidents; a summary of performance achieved; accuracy and functional availability report; and such other information as may be required by the CDA or requested by TxDOT. It's important that toll integrator keep detailed maintenance records and inventory data so that TxDOT can verify the toll integrator's compliance with the CDA requirements. The maintenance records include a summary of interruptions to normal functional availability and accuracy, and explain the duration and cause of such interruptions. The toll integrator must provide copies of the maintenance records and inventory data upon TxDOT's request. The toll integrator is responsible for developing and providing the procedures and forms for such recordkeeping, which must be approved by TxDOT in advance and as a condition to any final acceptance related to the particular project segment.

If any deficiencies are noted during the review of the monthly reports, the toll integrator must correct those deficiencies and resubmit its monthly progress reports. TxDOT may withhold payments from the toll integrator until the monthly progress report changes have been made to the satisfaction of TxDOT.

4.9.3. Project Schedule Updates

During the construction phase, the toll integrator will identify and promptly report to TxDOT all project schedule and progress delays during the prosecution of the work. However, no changes to the project schedule will be made without the prior written approval of TxDOT. If it becomes necessary to modify the project schedule to reflect changes to the Work Breakdown Structure (WBS), work sequences, or to further subdivide and resource-load the necessary labor, equipment, and materials, the toll integrator must submit a written request. Until TxDOT approves a change, all project schedule submittals should be tracked against the previously approved project schedule. Accepted revisions are then incorporated into the project schedule and become the project schedule of record.

Schedule Contents. Revised project schedule submittals are to include a comprehensive listing of all project activities added or deleted along with a complete listing of all logic and project activity changes, and any change in the allocation of a price among project activities. All changes in the project schedule must be fully described in an accompanying narrative. Changes in the project schedule that extend the completion

deadline or final acceptance deadline require a TxDOT-approved change order and are subject to the requirements of the CDA. Upon review and acceptance by TxDOT of a proposed change order affecting the project schedule and / or a recovery schedule, the project activities should be incorporated into the current project schedule as a revised project schedule submittal. If it is necessary to revise the project schedule, the toll integrator should also prepare and submit an associated revised maximum payment curve for inclusion in the change order covering the revision(s) to the project schedule.

Recovery Schedule. If the toll integrator is behind according to its most current project schedule, regardless of the cause, a recovery schedule should be developed. If this occurs, the toll integrator must submit the recovery schedule with the next monthly schedule update. The oversight consultant then reviews the schedule and alerts TxDOT of any issues prior to approval. If approved, TxDOT confirms receipt of the recovery schedule prior to processing any milestone payments.

4.9.4. TxDOT Construction Materials Testing

Various materials used in the construction of a toll zone require materials testing through the TxDOT Construction Division (CST). Some materials are fabricated at TxDOT-certified fabrication plants such as guard rail or anchor bolts, but other materials require certification of each item fabricated such as overhead sign bridges. Items needing certification are typically inspected by TxDOT-approved inspectors at the fabricators facility prior to delivery to the job site. The toll integrator will coordinate this effort as part of the delivery of the toll system. For materials fabricated at a TxDOT-certified fabrication plant, TTA must contact CST to locate the materials testing invoice. This should be initiated immediately following notification of fabrication as the quantities invoices are generally very small and sometimes difficult for CST to track.

4.9.5. Construction Draw Requests

During the construction phase, the toll integrator submits a separate draw request per PSS for labor and / or materials that the toll integrator and / or its subcontractors provided. The toll integrator prepares the request on a TxDOT approved form. The oversight consultant will verify the draw request contains the required information. The oversight consultant must expeditiously review the draw request in order to meet the contract payment deadline. From receipt of the draw request, TxDOT has fifteen days to remit payment to the toll integrator, without interest. If there is a problem with the draw request, immediately notify the toll integrator, providing an opportunity to correct the problem.

4.9.6. Maintenance Draw Request

Upon final acceptance of the particular project segment, the annual maintenance price for each project segment is paid in equal monthly installments. Since separate maintenance draw requests are required for each project segment, the oversight consultant may be required to process multiple requests within a limited timeframe. The CDA determines when the maintenance draw request should be submitted, the required number of copies, and all information to be contained in or attached to the request.

Draw requests are submitted to TTA and then circulated for internal consultant review and comments to confirm calculations, certifications, and other contract compliance that

must be met in order to process a draw request. If the draw request is complete, the oversight consultant will forward the draw request back to TTA with a memorandum recommending approving the request.

Additional documents may also be required with the maintenance draw request including approved system updates, as-built documents, changes to the maintenance plan and procedures, and proof of escrowed software source code.

4.10. Software Escrow

As a condition of payment for certain draw requests and system acceptance for a project segment, the toll integrator must place all software source code owned by or licensed to the toll integrator in connection with the system or the project in an escrow. The toll integrator and / or the software suppliers are not required to disclose directly to TxDOT the software source code, which is considered to be a pre-existing work (software not owned by TxDOT). In the event the toll integrator and / or the software suppliers are not available to provide the requisite software support, TxDOT can access the source code through the escrow agent to protect its ability to continue to operate its toll system(s).

The designated escrow agent must be mutually agreeable to TxDOT and the toll integrator. The oversight consultant reviews and confirms the qualifications of the escrow agent. Additionally, the oversight consultant ensures that the escrow agreements contain the provisions set forth in the CDA to protect TxDOT's interest.

4.11. Document Management

The toll integrator is responsible for the documentation of all project-related activities. Design documentation (including preliminary, final and as-built) shall be submitted to TTA in both hard-copy and electronic versions. The toll integrator may use e-mail; however, e-mail messages should be formatted as plain text rather than using rich text or hypertext mark-up language. Sensitive or confidential materials should not be sent via e-mail.

TxDOT has designed and implemented an enterprise-wide Electronic Document Management System (EDMS) in order to manage all records, regardless of format, into a centralized management system. FileNet has been chosen as the software platform for TxDOT's EDMS. As a result, any EDMS or document control software procured or developed by the toll integrator must be fully compatible with the FileNet software. The oversight consultant ensures the toll integrator is aware of TxDOT document management and retention requirements.

All project related electronic files maintained by the toll integrator should be partially backed up daily and fully backed up weekly. The backed-up tapes or compact discs should be stored in a secure area off site. The oversight consultant may visit the proposed site and confirm whether the toll integrator has maintained and has available for TTA review, at a minimum, one orderly and complete set of files including, but not limited to:

- Contracts
- Subcontracts and supplier contracts

- Change orders
- Working drawings and plans
- Shop drawings
- Milestone payments
- Minutes of meetings and communications
- Review comments
- Governmental approvals
- Request for information
- Claims
- Safety, injury, damage and incident reports
- Hazardous material manifests
- Calculations
- Reports
- Insurance policies, correspondence and terms
- Tests, studies, and investigations
- Drawings (one set shall not be marked on, and the other shall be used as the master copy for as-built control records)
- System design documentation

4.11.1. Contract Documents

4.11.1.1. Programmatic Documents

Programmatic documents are those that are general in nature and are applicable to the toll system regardless of project-specifics. For the ORTCS, programmatic documents include, but are not limited to:

- Project Management Plan
- Software Development Plan
- Software Specification
- Configuration Management Plan
- Preliminary Design Documentation
- Detailed Design Documentation
- Maintenance Plan and Procedures Manual

4.11.1.2. Project Specific Documents

It is the toll integrator's responsibility to maintain at all times one complete set of:

- Engineering design and toll system design and construction contracts and subcontracts
- Calculations
- Reports
- Studies and investigations
- Plans
- Communications
- Minutes of meetings
- Review comments
- Governmental approvals
- Change orders and claims;
- Insurance policies, correspondence and terms
- Engineering design and toll system design documents
- Software source code (in escrow)

As a condition of final acceptance, the toll integrator must deliver at the completion of the project one copy of these listed documents to TxDOT for its retention and use.

4.11.2. Version Tracking

The toll integrator must maintain version control for all approved documents. Changes to approved documents can only be made with the approval of TxDOT after the oversight consultant reviews them.

4.11.3. Review and Approval

As documents are developed and go through the revision process, the oversight consultant and TTA are typically allowed ten business days to review and comment on the document. The toll integrator will incorporate all comments received by both parties and produce a final document to be delivered to TxDOT as the official revision version. It should be noted that, in some instances, the TTA review time may be adjusted. For example review of PS&E documentation typically takes 15 to 20 days.

4.11.4. Archiving

The toll integrator must maintain all records and documents relating to the work, including copies of all original documents delivered to TxDOT and the project in Austin, Texas until five years after the later of (1) the expiration of the maintenance term, or (2) the termination of the CDA. The toll integrator must notify TxDOT where such records and documents are kept, and make these records and documents available for audit and inspection by TxDOT, at the toll integrator's offices in Austin, Texas, at all reasonable times, without charge. The toll integrator may not assess a fee against TxDOT to make copies of such documents. If approved by TxDOT, photographs, microfilm, or other authentic reproductions may be maintained instead of original records and documents.

4.12. Project Status / Planning Calls

The toll integrator is responsible for coordinating all portions of the project work. Nonetheless, the toll integrator is required to meet with TTA and the oversight consultant during periods when work is underway. Meetings should be weekly during periods of construction or installation, bi-weekly during periods of design or development and monthly at all other times. In addition to the periodic meetings, the toll integrator and TTA should meet as needed to discuss project-related or long-term strategy issues. These meetings are held with TTA and / or its designee to discuss Work progress, issues, and planned Work for all phases of Work. The agendas are developed by either the toll integrator or the oversight consultant depending on the meeting and the audience. The standard agenda and objective for these meetings is to discuss ongoing project construction and system installation, PSS development, and the status of any additional oversight consultant efforts directed by TTA.

4.12.1. Toll Integrator Coordination

As described above, it is the toll integrator's responsibility to perform and coordinate all aspects of the work to be performed under the CDA. This includes any necessary planning and or scheduling not only related to execution of a project segment but also any preliminary project work as deemed necessary by TTA.

As it may relate to any project segment work, the toll integrator is typically responsible for coordinating all status meetings with TTA including scheduling, location, conference call information, etc. Additionally, the toll integrator is required to coordinate with not only its own subcontractors, but any other field or on-site contractors as well. This may also include coordination with utility companies.

4.12.2. ORTCS CDA Project Status Update

Throughout the progress of a project there is a need to conduct periodic status meetings with various parties involved with the associated work. These status meetings typically occur at varying levels depending on the degree of detail expected and the parties involved. At a higher level an ORTCS CDA project status update meeting is held between TxDOT and the oversight consultant. The standard agenda and objective for these meetings is to discuss current ongoing projects that may be in progress with the toll integrator, PSS development, and or the status of any additional oversight consultant efforts directed by TxDOT. These updates occur monthly, but could be more frequent depending on the magnitude and volume of work being performed.

4.12.3. Weekly Construction Status / Call

During construction activities, the toll integrator and its subcontractors will facilitate a weekly construction call to go over the previous week's activities, planned activities for the current week, and any other issues that may need to be addressed with TxDOT. Issues that may need to be addressed include coordination with other contractors in the area, delays in equipment or material delivery, testing coordination, or weather delays.

4.13. Stakeholder Coordination

TTA and the oversight consultant will need to maintain communication with a number of stakeholders during the implementation process. TTA typically takes responsibility for

these discussions, and is responsible for coordination with a particular stakeholder throughout the process in order to maintain consistency.

4.13.1. Developer

There are two basic types of CDA delivery methods, a concession CDA and a design-build CDA. For a concession, TTA and the oversight consultant will provide support to the TxDOT CDA work group during the procurement process, including review and analysis of the Proposers' toll plans. For a design-build, the involvement of TTA and the oversight consultant is very similar to a typical design-bid-build project. In other words, a PSS is developed by the toll integrator and the oversight consultants and executed by TTA. Once the roadway is substantially complete, NTP is given and the toll integrator installs the toll equipment. The only difference in the design-build process is that typically the roadway plans are not completely finalized when the toll integrator develop the price. If significant design changes are made, then the toll system design could be impacted, resulting in change orders.

4.13.2. Local Districts and Agencies

Local TxDOT Districts often provide construction supervision, as well as needing to be kept abreast of work progress for public information purposes. In a similar fashion, other local agencies that might have some jurisdiction over (or interest in) the segment will need to be involved in the process.

4.13.3. Regional Mobility Authorities

When an RMA chooses to have the authority of the ORTCS CDA assigned to it, then TxDOT has no liability or obligations to the toll integrator for payment or performance by the applicable RMA. In this case, the toll integrator will execute and deliver to the RMA a separate agreement, identical in all material respects to ORTCS CDA. When this new agreement is mutually executed, it will substitute for and replace the assumption of TxDOT's rights and obligations under the ORTCS CDA.

4.13.4. Finance Division

Coordination with Finance Division (FIN) is usually only needed when a concession type agreement is being considered. In this case, FIN representatives will be part of the TxDOT CDA Work Group.

4.13.5. Construction Division

The CST provides materials testing of various fabricated materials and invoicing which must be reimbursed by the District or local agency. Following materials fabrication during a PSS, TTA should maintain a monthly contact with the CST until all materials testing invoices are submitted to TTA for review and payment.

4.13.6. Traffic Operations Division

Toll signage for a PSS may or may not be included with the toll integrator's scope of work. This is dependent on the TxDOT roadway project which the toll system is being installed on and if the original construction project accounts for toll signage. Regardless of whether or not toll signage is included within the PSS, TTA must coordinate with the TRF during the plan review period to ensure the plans are in accordance with existing and near future toll signage standards.

While some Districts or local agencies prefer to perform some portion of the toll signing in-house or through existing contracts, it is preferable to include this work with the toll integrator's scope. This is beneficial for many reasons, most importantly that the toll integrator, the oversight consultant, and TTA have familiarity with the TRF standards regarding toll signing. Toll signing standards have evolved over time and the oversight consultant, along with TTA and the toll integrator, are in close contact with TRF, and have continued to update their designs in order to remain in compliance with the latest details. Finally, the toll integrator knows best its schedule for delivery and installation of the toll system and by including the toll signing in their scope so that all of this work can be coordinated and accomplished in the most efficient way possible.

4.13.7. Other Tolling Agencies

In some cases HCTRA or NTTA could be involved in the toll collection process for a segment by performing Customer Service Center (CSC) operations for toll revenue collection. As a result, it will be necessary to coordinate activities with them so that the appropriate agency staff is involved in design of communication systems and protocols, as well as in the testing process. Furthermore, these agencies may need to coordinate traffic control strategies if the project segment is near an existing toll facility not operated by TxDOT so that it may prepare for changes in traffic patterns that will result from construction and / or the opening of new TxDOT facilities.

4.14. Contract Compliance Verification

TTA has delegated the responsibility for continually monitoring the toll integrator for contract compliance to the oversight consultant. The oversight, spot checks, inspections, verifications, audits, tests, reviews, acceptances and approvals conducted by TTA and others do not constitute acceptance of the materials or work inspected or waiver of any warranty or legal or equitable right with respect to the work or materials. TTA may request remedies for nonconforming work and / or identify additional work which must be done to bring the project into compliance whether or not previous oversight, spot checks, inspections, verifications, audits, tests, reviews, acceptances or approvals were conducted or waived.

4.15. Change Orders

Any amendments to the terms and conditions of the contract documents are considered a change order and must be in writing. Also the change order must be developed and executed in accordance with the CDA provisions. Generally, there are two types of change orders: (1) TxDOT unilateral change orders; and (2) toll integrator-initiated change orders. Change orders may be issued for the following purposes:

- (1) to modify the scope of the work; (2) to revise a completion deadline; (3) to revise a price; or (4) to revise other terms and conditions of the contract documents.

Except for the TxDOT unilateral change order, the toll integrator is required to develop the change order and the oversight consultant is instrumental in guiding the process and ensuring that it contains the required information, documentation, and signatures. When TxDOT initiates the change order, the oversight consultant must determine the extent of the change order required and typically will work with the toll integrator in advance of

the final change order issuance to develop the revised scope, price, or terms in such detail with mutual understanding to allow the toll integrator to be successful. The oversight consultant completes the form and gathers the necessary documentation. When the change order is ready for signatures, the oversight consultant then forwards it to the toll integrator and then to TxDOT along with a memorandum that briefly summarizes the change order.

4.16. PSS Process for RMAs

The oversight consultant will be available to RMAs to offer technical assistance to RMA staff as they negotiate with the toll integrator or to provide the assistance outlined in previous sections. However, it should be noted that TxDOT does not have a contractual mechanism for such work with the RMAs, so the oversight consultant would still report to TxDOT through the Statewide ORTCS CDA oversight contract.

5. Toll System Design and Review

5.1. Over-the-Shoulder Review

To make sure that the toll integrator is following design criteria and requirements of the contract, TxDOT can conduct “over-the-shoulder” reviews of the toll integrator’s work to assess if the requirements and design criteria of the contract documents are being followed and if all quality control measures outlined in the quality plan are undertaken. These reviews may include any aspect of the design documents, professional services documents, or toll system service documents.

For any standard over-the-shoulder reviews, TxDOT and the toll integrator will conduct a series of workshops to establish workflows and procedures to be conducted during the review process. The default review process under the toll integrator’s contract for professional services documents includes shop drawings, 50 percent, 100 percent, and as-built drawings.

5.2. Preliminary Design Review

As part of the toll integrator's design process and as a requirement of the CDA, a preliminary design needs to be presented to TxDOT to ensure that the toll system design is in accordance with the PSS and related TPs. It is a requirement of the CDA that the toll integrator will hold a Preliminary Design Review (PDR) to formally present their preliminary design documentation. The topics for the PDR and associated documentation shall include, but shall not necessarily be limited to, the following:

- Schedule
- Organization
- Methodology
- Overall system architecture
- Requirements for each system or subsystem
- Project management plan, quality assurance plan, software development plan, developer organization, schedule configuration management plan
- Civil work plan
- Examine and assess alternatives, where appropriate, for each subsystem or component
- Assess design issues and associated risk
- Risk mitigation
- Assess design alternatives
- Status of environmental testing for system components

5.3. Detailed Design Review

As a follow up to the PDR process, the toll integrator is also required to present a Detailed Design Review (DDR) to formally present their detailed design documentation.

The toll integrator will provide functional narrative text, system and subsystem block diagrams, data flow diagrams, data structure diagrams, schematics and any other graphic illustrations to demonstrate the technical adequacy of the system design approach and compliance for system hardware and software with quality assurance, reliability, maintainability, software development, and other requirements of the specifications.

5.4. Facility Types

The CDA requires that the toll integrator provide a variety of Open Road Tolling (ORT) system configurations ranging from a one-lane ramp to a six-lane divided highway (three lanes in each direction with a depressed median). These facility types include configurations of standard tollways, whereby all lanes are tolled; as well as HOT lanes, whereby only certain managed lanes are tolled while adjacent lanes remain free. (See Appendix A for more information).

5.4.1. Standard Tollway

A standard tollway is a TxDOT owned roadway which a patron pays to use. With the use of a TxTag (or any interoperable transponder), a motorist can travel a tollway without the need to stop and physically pay the toll. The other technology that is available for payment utilizes cameras to take pictures of the vehicles' license plates to facilitate the issuance of an invoice.

5.4.2. High Occupancy Toll Lanes

HOT lanes employ the concept of utilizing unused capacity of HOV lanes by charging a toll to non-HOV users. Since HOT lanes are adjacent to other free lanes, special consideration must be given to how HOV users declare themselves eligible for the reduced or free toll and how that declaration is enforced. One common method is to include declaration areas within the roadway design which involves the physical separation of traffic into two lanes, an HOV lane and a single occupancy vehicle (SOV) lane. The other critical piece is enforcement. Current regulations typically require eyewitness enforcement on the roadway since photographic images of the occupants cannot be recorded or used in violation processing for this purpose.



5.5. Civil Plan Review and Shop Drawing Approval

Generally, all construction specifications produced by the toll integrator must conform to TxDOT Standards. All final engineering design documents will require the approval, signature, and seal of a Texas Registered Professional Engineer prior to acceptance and delivery to TxDOT.

At TxDOT's discretion, the toll integrator may host a formal document review presentation or distribute the documentation to TxDOT through the mail for review. The toll integrator shall prepare and distribute all applicable review documentation at least ten days prior to the review presentation.

Due to the design-build nature of the contract, the comments provided by TxDOT should only refer to any instance when the design documents do not conform to existing TxDOT standards, policies, or specifications.

5.5.1. 50 Percent Plan Submittal

The toll integrator submits the initial 50 percent plan submittal before the construction and installation work begins. TxDOT submits one copy of the submittal to the local TxDOT District Engineer and any other District or Division representative at TxDOT's discretion. An example may be to provide a copy to TRF due to toll signage in the plan set. TxDOT's oversight consultant conducts a mechanical, electrical, structural, and civil review of the documents provided by the toll integrator.

TxDOT submits all comments and marked up plan sheets to the oversight consultant who compiles all comments using a standard comment form. The mark-ups are consolidated within a single plan set, scanned, and saved in a PDF format. The oversight consultant then submits the comment form and marked up plan set to TxDOT for final review. Upon final review, the oversight consultant submits the completed comment form and plan set to the toll integrator. The toll integrator reviews all comments, provides responses to comments as necessary, and submits the form back to TxDOT. The toll integrator may begin incorporating any changes into the design documents while TxDOT reviews and provide counter-responses to the toll integrator's original responses.

5.5.2. 100 Percent Plans Submittal

The 100 percent plan submittal review process is similar to that of the 50 percent review. To ensure TxDOT has adequate review time before construction begins, the toll integrator must submit the 100 percent plan set to TxDOT in advance of any planned field work. The oversight consultant shall include all unresolved comments from the 50 percent review process in the 100 percent review comment form before it is distributed internally. Construction should only be delayed when an error or omission is found within the plan submittals. When the plans are ready to be signed, the toll integrator will work with the oversight consultant to obtain the District Engineer's signature on the title sheet. The title sheet with the District Engineer's original signature is then provided to TTA for signature by the Turnpike Design Engineer. After all signatures are obtained, TTA coordinates with TxDOT GSD to post the entire plan set to TxDOT *Plans Online*.

5.5.3. Shop Drawings Submittal

The shop drawing submittal review is similar to the 50 percent review, although TxDOT only submits the shop drawings to the local district as needed. The oversight consultant and TxDOT review the shop drawings and follow the comment and plan mark up process as described in the 50 percent review process.

Delay or failure to review the shop drawings by TxDOT shall not encumber the toll integrator from procuring or fabrication of materials. The review is provided as an over-the-shoulder review. The toll integrator prepares shop drawings that describe the methods

of construction proposed to be used for the work although TxDOT will not review or regularly receive copies of drawings unless specifically requested.

If any critical design defect is found within the shop drawing submittals and the toll integrator fails to correct the shop drawings before construction begins, the oversight consultant will draft a letter to TxDOT outlining the defect(s) found, the toll integrator's response to the defect, any actions taken to resolve the defect, and a formal recommendation of how to correct the defect by a Texas Registered Professional Engineer. It is at TxDOT's discretion to address this issue with the toll integrator.

5.5.4. As-Built Plan Submittal

As a condition to final acceptance, the toll integrator will provide TxDOT as-built drawings depicting all the final completed work, including all changes. The as-built plan submittal review is similar to the 50 percent review. The oversight consultant and TxDOT review the as-builts and follow the comment and plan mark up process as described in the 50 percent review process. The oversight consultant will include all unresolved comments from the 100 percent review process in the as-built review comment form before it is distributed internally.

The toll integrator will incorporate any changes to the 100 percent plans into the as-built plans before final acceptance may be awarded.

5.6. Toll System Plan Review

Just as the civil components are designed to some degree for each project, the toll system has to be designed for each project. Many times TxDOT does not request any specific design change, but there have been cases where this occurred and there could be additional cases like this in the future.

5.6.1. 50 Percent Plan Submittal

Unless there are significant changes to the toll system, the design should be nearly complete. Things that won't be included at this stage are such items as specific network or communication configurations. The oversight consultant will review the plans and comment. These comments are made by marking up the plan sheets and filling out the spreadsheet similarly to the procedures used for the civil design elements.

5.6.2. 100 Percent Plan Submittal

This process is very similar to the civil design process in that the 50 percent comments are addressed and the 100 percent plans are produced. They are not signed and sealed; however, they are presented as final documents as part of the civil package.

5.6.3. As-Built Plan Submittal

Once the construction is complete and the construction walk-through (described in more detail in Section 6) has been conducted, the toll integrator will create and submit a set of as-built plans. These plans will correct any differences between what was planned and what was actually built. Upon review and comment of the preliminary as-builts, the toll integrator will revise them as appropriate and submit final as-builts.

5.7. FCC Licensing

In order to operate a tolling facility with radio frequency identification technology, Federal Communication Commission (FCC) licensing is required. FCC licensing is acquired specifically for each PSS where an initial temporary license is granted and ultimately a permanent license. The application process is the responsibility of the toll integrator and licensing is obtained on behalf of TTA. The oversight consultant will work closely with the toll integrator to ensure that the TRF Radio Operations group is involved in every step of the process.

5.8. Maintenance Plan and Procedures Review

As part of the CDA, the toll integrator is required to submit as a deliverable both a maintenance plan as well as maintenance service manuals. These documents are typically required for submittal prior to acceptance of the toll system and commencement of maintenance warranty activity. An original plan and service manual will have been previously reviewed and accepted but with each additional project segment supplement the documents are modified per specifics of the PSS and re-submitted for review and approval.

6. Toll System Construction and Installation Oversight

6.1. Toll System Installation Oversight

During toll system installation, the oversight consultant will conduct on-site visits of the project area to ensure all installation efforts are being performed according to the CDA and detailed design documentation.

6.1.1. Over-the-Shoulder Inspection

As part of the CDA, TTA and or its representatives are permitted to conduct over-the-shoulder reviews during the toll system design, development and installation phases. These reviews permit TTA to visit the toll integrator's office(s) or site locations and oversee any of the work being conducted.

6.1.2. Toll System Walk-through

Once the toll system has been installed and site acceptance testing completed successfully per the CDA, the system will be inspected by the oversight consultant to ensure all equipment is in place and functioning.

6.1.3. Punch List

During the walk-through a punch list shall be compiled of outstanding issues that need to be addressed before system acceptance is granted. Development of the punch list must be completed and submitted by the toll integrator for approval by TxDOT. The toll integrator must complete the punch list items within the number of days identified in the PSS as a condition of final acceptance.

6.2. Construction Oversight

The oversight consultant supports TxDOT in the role of over-the-shoulder inspection, project walk-throughs, and the punch list development and review.

6.2.1. Civil Inspection

6.2.1.1. Over the Shoulder Inspection (third-party inspector)

The oversight consultant provides a third-party inspector to provide on-site over-the-shoulder oversight and inspection of the materials and methods during construction. The third-party inspector participates in all civil-related design reviews, kick-off meetings, weekly construction meetings, periodic civil construction walk-throughs, and development and completion of the punch list.

The third-party inspector fills out daily diary reports in order to record the toll integrator's progress on the project, including materials testing. The inspector also takes periodic photographs of the work performed. The inspector scans and transmits the previous week's daily diary reports on a regular basis. The photos taken are backed up on digital media (e.g. CD-ROM) and submitted to the oversight consultant on a monthly basis.

When a discrepancy is observed between the plans and the toll integrator's materials and methods, the inspector contacts the oversight consultant to discuss the discrepancy. The oversight consultant gathers the information and any applicable photos from the

inspector, includes them in an e-mail or a memo, and submits it to TxDOT. It is at TxDOT's discretion to address the discrepancy with the toll integrator.

6.2.1.2. Civil Walk-through

Periodically, TxDOT and / or the oversight consultant may visit the project site to perform a walk-through during construction or for the punch list walk-through. TxDOT and / or the oversight consultant may notify the toll integrator and third-party inspector before the visit is scheduled to give adequate time for the toll integrator to participate in the site walk-through. The purpose of the walk-through is to provide an opportunity for TxDOT to observe the toll integrator's progress, gain familiarity with the project site, and verify in person any issues which may have occurred during construction. If TxDOT does not attend the walk-through, the oversight consultant takes photos of the project at the time of the visit, develops a summary memo including current status of the work and any noted issues or discrepancies, and distributes the memo with accompanying photos to TxDOT for review.

6.2.1.3. Punch List

The punch list is developed during the civil walk-through following system acceptance of the project and must be completed before final acceptance. Since major issues are identified and corrected before system acceptance is issued, the punch list is limited to items of the work that are necessary to correct minor imperfections and deviations from the project documentation and requirements, but which have no material or adverse effect on the use, safety or operability of the project. The punch list is performed following System Acceptance of the project and must be completed before Final Acceptance. The punch list is drafted during a civil walk-through. The required attendees include the oversight consultant, and the toll integrator; TTA may attend at its discretion. Generally, the toll integrator gives two weeks' notice to schedule the punch list walk-through to allow adequate time to make travel arrangements.

As the project team walks through the project site(s), the team notes discrepancies from the plans and specifications while the toll integrator tracks the changes within a newly created punch list. Following the completion of the punch list walk-through, the toll integrator, the oversight consultant, and the inspector review the punch list for accuracy. Upon consensus, the toll integrator will draft the formal punch list and submit to TTA for review and approval. The toll integrator has 30 days to correct the work on the revised punch list. Upon completion of the punch list, the toll integrator drafts a letter to TTA requesting certification of Punch List Acceptance.

6.2.2. Reporting

6.2.2.1. Weekly QA / QC Report

As directed within the TPs, the toll integrator completes a weekly Quality Assurance (QA) / Quality Control (QC) report that includes the previous week, the current week, and the following week's work. This document is due no later than Friday following described week's work.

6.2.2.2. Daily Diary Report

As directed within the TPs, the toll integrator completes a daily diary report that includes the date, weather, staff on hand, material placed, and any testing performed that day. The toll integrator submits the reports via e-mail on a weekly basis to TxDOT.

6.2.2.3. Daily QC Report

As directed within the TPs, the toll integrator completes a daily quality control report ensuring that the work is delivered in accordance with the system design and 100 percent plans.

6.2.2.4. Materials Testing Report

The toll integrator's QA inspection staff checks compliance of all material, equipment, installations, and operations. The QA inspection staff shall distribute all test reports to TxDOT within 24 hours of the test results.

6.2.2.5. Weekly Audit Statement

As directed within the CDA, the toll integrator issues a weekly statement that all construction forms and documents have been reviewed for acceptance. The toll integrator submits this form via e-mail to TxDOT.

6.2.2.6. Final Audit Statement

As directed within the CDA, the toll integrator issues a final statement that all construction forms and documents have been reviewed for acceptance. This document is provided upon final completion of civil construction and complete punch list. The toll integrator submits this form via e-mail to TxDOT.

7. Toll System Integration Testing

7.1. Test Plan and Procedure Review

The toll integrator is required to submit a variety of testing documentation. As an overall CDA requirement a test plan is to be developed by the toll integrator that outlines, at a high level, the various testing components and activities required for system validation throughout the term of the CDA, and any subsequent PSS. This test plan includes environmental certification, functional tests, performance tests, and all other necessary tests. At the conclusion of any testing activity, the toll integrator submits a written report, along with all other supporting data produced during the testing and documenting the results for all tests performed and comparing them to the requirements in the TPs.

Prior to performing any factory, pilot, or system acceptance testing, the toll integrator is to develop and submit for approval by TTA any test scripts that are to be followed during testing. These scripts should be reviewed to ensure that sufficient testing will be performed to represent the operational adherence of the toll collection system to the requirements in the PSS and TPs.

7.2. Factory Acceptance Test

For any new system configuration not previously tested, the toll integrator may be required to conduct a Factory Acceptance Test (FAT) of the new toll system to demonstrate the functional ability to meet the requirements. The tests are performed in accordance with the test plan and are witnessed by the toll integrator's quality control staff, the oversight consultant, and TxDOT (at its discretion). Issues and problems that occur during the FAT, which result in a design or process change are reported to TxDOT by the oversight consultant.

7.3. Site Acceptance Test

After completion of a toll gantry being installed at a specific location, a site acceptance test is conducted by the toll integrator and, at TxDOT's option, witnessed by the oversight consultant to verify that the installed toll equipment is operating and performing in accordance with the TPs and detailed design documents. A site acceptance test should not be confused with a system acceptance test.

Note: It is the intent of the site acceptance test to serve as the toll integrator's internal verification process ensuring that each component of the toll system has been installed properly.

7.4. System Acceptance Test

Once installation of the toll system is complete and has passed the site acceptance test, the toll integrator may then begin the system acceptance test. It is during the system acceptance test that the system is validated for operational readiness and is available to begin collecting revenue. As a secondary result, testing may also identify items, which may need to be addressed or corrected, but may not necessarily prohibit the beginning of revenue service. Several steps in the system testing process include submittal for review and approval of the test scripts, performance of the acceptance testing, development and review of the test report, and ultimately system acceptance.

Upon completion of the system acceptance test the integrator is to produce a report summarizing the test results identifying performance measures both achieved and failed. The report is submitted to TTA for review and approval.

Assuming that the test report indicates all system functionalities have been achieved and TTA concurs, system acceptance may be granted. This indicates the ability for the toll system to begin revenue collection service.

7.5. Operational Test

The operational test is a 90-day evaluation period after the entire project segment has been installed and system testing has been completed, during which the system will be observed for functional availability and performance adherence.

During the operational test, the system should operate reliably and perform in accordance with the specifications and requirements. The system shall operate without equipment failure and in accordance with the functional and performance requirements for the last 30 days of the 90-day evaluation period or the operational test shall be extended until 30 days operation without major equipment failure and in accordance with the functional and performance requirements is achieved.

7.6. Integration with the CSC

While the toll integrator provides the in-lane toll hardware and software and the communications link to the CSC, the CSC vendor provides the hardware and software to process the transaction data and handle account management activities for the toll system. Typically, the toll integrator's responsibility ends with the Project Host Server (PHS), which is located at the CSC. The PHS is the main computer where all the lane data from a single project is transmitted. At this point the transaction information is processed through the PHS and transmitted to the CSC vendor for further processing and posting against TxTag or Pay By Mail accounts. As part of the integration with the CSC vendor, the toll integrator is also required to periodically develop and / or update Interface Control Documents (ICD), which define the protocols for transfer of data between the CSC vendor and each PHS.

7.6.1. Toll Site Naming

During the project segment design process the oversight consultant develops preliminary suggestions for naming toll sites. These are typically designated by roadway, location, direction of travel, and lane. TxDOT approves the naming of the toll sites and provides this information to the toll integrator for incorporation into the toll system software.

7.6.2. Toll Rate Setting

Toll rates are set by the Texas Transportation Commission if it is on the state highway system. When the Commission establishes the rates, a minute order will be issued and TTA is responsible for ensuring those rates are entered into the system prior to the effective date. The TTA toll operations and quality assurance program coordinators are the only staff with access to enter or modify toll rates in the system and will initiate, oversee, and confirm that the correct rates are entered into the system accurately. Upon receiving notice of the Commission's approval, TTA's toll operations or quality

assurance program coordinator will notify the CSC system administrator and coordinate a date on which the rates will be entered into the system.

7.6.3. CSC Vendor Coordination

The toll integrator and the CSC vendor will coordinate the setup of the testing environment, integration testing, user acceptance testing, and the deployment to “live mode.”

7.6.3.1. Set Up Testing Environment

The toll integrator will work with the CSC to set up a test environment that will satisfy the test scripts approved by TTA.

7.6.3.2. Coordinate Integration Testing

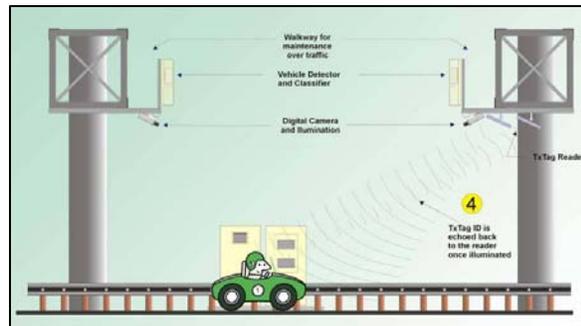
The toll integrator provides a host server that will be set up to communicate with the CSC test environment to satisfy the test procedures approved by TTA.

7.6.3.3. User Acceptance Testing

The CSC vendor, the toll integrator, the oversight consultant, and TTA coordinate to conduct a User Acceptance Test (UAT) for each lane (or location) to test that transponder and video transactions are collected, transmitted, and processed properly all the way through the CSC.

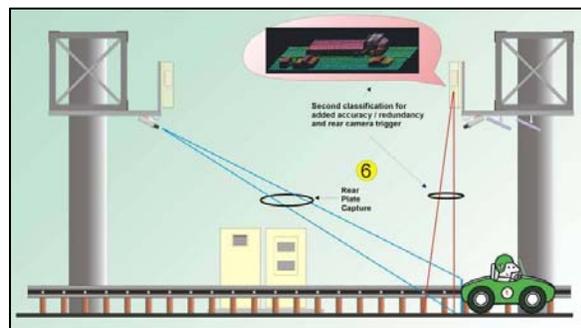
7.6.4. Transponder Processing

Once a vehicle passes beneath one of the toll integrator’s gantries with a valid transponder, all pertinent data is captured to create a transaction. This includes information such as gantry name, time of day, transponder ID, etc. This information is then assembled in the transaction and image processor and sent to the PHS to be picked up by the CSC vendor for posting to an account.



7.6.5. Image Processing

If a vehicle passes beneath a gantry without a valid transponder, the system will capture pertinent image data to create a transaction. This includes the gantry name, time of day, images of the front and / or rear license plates, etc. This information is then assembled in the transaction and image processor and sent to the Project Host Server (PHS) to be picked up by the CSC vendor for posting to an existing account or for creation of a new image-based account.



7.7. Annual Performance Audit

The toll integrator is required to conduct a performance audit annually for each operational tolling zone to verify that system reliability and accuracy has not degraded over time and the tolling system continues to satisfy the functional and performance requirements in the PSS and TPs.

System transaction data and reports, plus Maintenance Online Management System (MOMS) data for at least the 30 days preceding the performance audit, are utilized in the analysis. In addition, controlled tests are conducted by utilizing test vehicles mixed with real-life traffic. TxDOT may choose to perform ad hoc operational testing as part of the performance audit.

8. Toll System Acceptance

In general, system acceptance can be achieved only when (1) all required system acceptance testing is successfully completed; (2) the work associated with the project segment is completed; (3) the project site may be opened to traffic; and (4) the project segment functions accurately and reliably in accordance with the performance requirements. System acceptance consists of three review stages that involve the issuance of a certificate of system acceptance, followed by a review and documentation for punch list and final acceptance.

8.1. Confirm Toll Integrator Compliance with System Acceptance Requirements

Part of accepting the project is to ensure all requirements are met. The toll integrator is responsible for providing written notice to TxDOT regarding the status of the project system and its readiness for system acceptance. Throughout the project development, the oversight consultant will have received the documentation required to meet the various acceptance milestones. Upon confirmation of compliance with the system acceptance requirements, the oversight consultant prepares a certificate of system acceptance that is issued to the toll integrator by TxDOT.

8.1.1. Toll Integrator's Notice

Toll integrator provides written notice to TxDOT when all of the prerequisites to system acceptance have occurred.

8.1.2. TxDOT Verification

The oversight consultant conducts such inspections, verifications, surveys and / or testing as it deems appropriate. If such inspections, verifications, surveys and / or tests disclose that any of work does not meet the requirements of the contract documents, the oversight consultant should promptly advise both TTA and the toll integrator of what is required to meet acceptance. When the issue is resolved the toll integrator must provide a second written notification to TxDOT. Depending on the issue, particularly if it relates to system operations or a road safety issues, the oversight consultant will conduct or arrange for additional inspections, verifications, surveys, or testing. This procedure is repeated until TxDOT finds that all prerequisites to system acceptance have been met.

8.1.3. System Certification

TxDOT will issue a certificate of system acceptance upon finding that all requisite conditions have been satisfied. Issuance of this certification does not indicate project acceptance. The toll integrator is still required to complete punch list items and final acceptance procedures.

8.2. Confirm Toll Integrator Completion of Punch List Items

8.2.1. Punch List Items

The toll integrator must provide written notice to TxDOT when all of the items of work listed on the punch list have been completed. The punch list should be limited to items of the work that are necessary to correct minor imperfections and deviations from the

requirements of the contract documents, governmental approvals, applicable law, and design documents, but which have no material or adverse effect on the use, safety or operability of the project segment.

8.2.2. Certification

TxDOT will issue a certificate of Punch List Acceptance at such time as (1) toll integrator has delivered to TxDOT the written notice; (2) all inspection and testing of punch list work as described in the TPs have been completed, and (3i) TxDOT finds that all errors identified as prerequisites to Punch List Acceptance have been corrected.

8.3. Confirm Toll Integrator Compliance with Final Acceptance Requirements

In order to achieve final acceptance, toll integrator must have performed all of the work relating to the project segment to the satisfaction of TxDOT and in accordance with the contract documents, including ensuring that all equipment, materials, facilities, improvements, structures and components have been properly tested. The oversight consultant will draft and TxDOT will issue a certificate of final acceptance when it finds that all of the requisite conditions have been satisfied

The occurrence of any final acceptance does not relieve the toll integrator of any of its continuing obligations under the contract documents, including warranty and maintenance obligations, or constitute any assumption of liability by TxDOT.

8.4. Process Final Milestone Payment

Upon final acceptance of the project segment, the toll integrator must prepare and submit a proposed final draw request to TxDOT showing the total amount due, including any additional amounts due to change orders. The toll integrator must also submit (1) information regarding the status of all existing or threatened claims, liens and stop notices of subcontractors and laborers against toll integrator or against TxDOT, (2) evidence of the consent of any guarantors and surety to final payment, (3) the release of claims, and (4) such other documentation required by TxDOT.

8.4.1. Claims or Liens

If a final draw request lists any existing or threatened claims, liens and stop notices of subcontractors, laborers, or utility owners or railroads against toll integrator or against TxDOT, or if any is thereafter filed, the oversight consultant alerts TxDOT and may recommend whether to withhold the amounts in question or any such sum that would be appropriate to protect TxDOT's interest. That sum may include the costs to complete or remediate uncompleted work or nonconforming work.

8.4.2. Release of Claims or Liens

The oversight consultant and / or TTA inform the toll integrator of what steps are necessary to release the claim or lien. The notice to the toll integrator should include when the claim or lien should be resolved and the consequences if it is, such as the withholding of payment.

8.4.3. Draw Request Review

The oversight consultant reviews the toll integrator's proposed final draw request. Any changes or corrections should be forwarded to the toll integrator for correction. TxDOT will then pay any undisputed amounts, less (1) any losses that have accrued as of the date of the final payment of the price, (2) the costs to complete or remediate uncompleted work or nonconforming work, and (3) any other deductions permitted under the contract. Final payment may not be approved and granted prior to final acceptance of the project segment.

8.5. Release Retainage

On an individual project segment basis, TxDOT will withhold funds, also called a reserve, from each payment made to toll integrator. This reserve is held by TxDOT to cover work necessary to achieve final acceptance in the event the toll integrator cannot fulfill its contractual obligations. The reserve is an amount equal to 5 percent of the payment amount, after subtracting any amounts for engineering professional services. The toll integrator must apply in writing for the release of any reserve due from the particular project segment.

Once the toll integrator has satisfied the PSS or contract conditions, TxDOT will release the reserve held with respect to the particular project segment as described in the CDA.

9. Operation and Maintenance

9.1. System Operation

Once final acceptance has occurred and the toll segment has either opened to the public or is ready to open to the public, operation and maintenance of the system will begin.

9.1.1. Interface Control Document

This document defines the interface between a Toll Management System (TMS) host and the CSC system interfaces. The toll integrator must follow the guidelines set in the ICD for conformity with the CSC.

9.1.2. Code-Offs

Code-offs consists of transactions for which TxDOT will not or cannot collect revenue. Code-offs fall into two categories: vendor code-offs and non-vendor code-offs.

Vendor code-offs. Vendor code-offs are a result of blurry images, images that are too light or too dark, camera timing or alignment issues, etc. These types of code-offs are tracked monthly by the oversight consultant and are included in the toll integrator's monthly performance analysis.

Non-vendor code-offs. Non-vendor code-offs are a results of government plates, no plates, obstructions, no vehicle in image, etc. These types of code-offs are tracked monthly by the oversight consultant and not counted included in the toll integrator's monthly performance analysis, but are used to indicate if there may be a problem that needs to be addressed through other means.

9.1.3. Optical Character Recognition and Adaptive OCR

9.1.3.1. Optical Character Recognition

Optical Character Recognition (OCR) is utilized by the toll integrator to provide TxDOT with a system that reads vehicle license plates and converts it to a printable form or text format. This process greatly reduces the need for image reviewers by providing a valid "read" of the license plate from the roadside to the CSC.

9.1.3.2. Adaptive OCR

Adaptive OCR is an algorithm that takes analyzes the number of times an OCR value matches a manual review on the same license plate within a defined number of days. Based on this analysis and once specific requirements are met, the system issues that plate an electronic certificate. This electronic certificate tells the system to process the transaction without human review for that specific plate if it is detected again prior to the expiration of the certificate.

9.2. Maintenance

9.2.1. Weekly Status Report

The oversight consultant produces a Weekly Status Report (WSR) and provides it to TxDOT. In an easy-to-read summary, the report includes any issues from the roadside toll system.

9.2.2. Maintenance Online Management System

The toll integrator provides a maintenance online management system that allows for monitoring and reporting of equipment failures of all equipment within a tolling zone. All tolling system maintenance activities including routine preventive and corrective maintenance, real-time monitoring, repair calls, report generation, etc. is handled by the MOMS.

9.2.2.1. Trouble Ticket Software

The toll integrator maintains a system that will generate a trouble ticket in the event that there is an issue on the roadside. An e-mail message is generated by the MOMS if any monitored component fails to respond, within a predefined time period, to the system health monitor. These trouble tickets are also tracked and maintained within the MOMS and can be viewed from any computer with the proper credentials over the Internet.

9.2.2.2. System Health Monitor

A system health monitor is made available to TxDOT and the oversight consultant and provides a real-time system status. This system can be viewed from any computer with the proper credentials over the Internet.

9.2.2.3. Equipment Inventory

The toll integrator provides a system to track all of the equipment in the toll management system. This is an online system and will be available online for any computer with the proper credentials over the Internet. This system is directly connected to the trouble ticket system and the toll integrator updates the inventory as replacements occur in the field.

9.2.3. Preventive Maintenance (Equipment)

Preventive maintenance is performed on the equipment at regular intervals as described in the CDA. Various devices will require different frequencies of preventive maintenance depending on the location and the type of device. The maintenance of the system is designed to provide system uptime (availability) that meets performance requirements.

9.2.4. Emergency Maintenance (Equipment)

Emergency maintenance is performed on the equipment when unexpected failures cause the system to miss its performance or functional availability requirements are identified.

9.2.5. System Maintenance (Software)

Preventive maintenance will be performed on the software at regular intervals as suggested by the toll integrator or recommended by the software provider.

9.2.6. Coordination with Maintenance Crews

The oversight consultant often coordinates with the toll integrator's maintenance staff to ensure that issues are addressed in a timely manner. If the toll integrator subcontracts the Level 1 maintenance to others, the oversight consultant's contact is usually with the toll integrator's maintenance manager.

Additionally it is also the toll integrator's responsibility to coordinate any required interaction with TxDOT and local Districts as it may involve roadway activities such as maintenance of traffic, road closures, or other related support.

9.2.7. District Maintenance

The toll integrator is responsible for coordinating with the District any Level 1 maintenance, consisting of Level 1a and Level 1b, which is required to meet the performance requirements.

Level 1a maintenance includes scheduled routine / preventative maintenance during off-peak traffic hours. Routine maintenance tasks include activities such as filter replacements, cameras and VDAC cleaning, inspections and monitoring.

Level 1b maintenance includes corrective maintenance actions to remedy problems at tolling sites. These tasks include low priority, high priority and urgent / emergency corrective maintenance, component replacement, first-level troubleshooting, support up for second-level troubleshooting if required, cable replacement, and coordination with the utility company for resolution of power issues or utility supplied lines.

Additionally, the toll integrator is responsible for coordinating with other vendors and contractors that are involved with the system, including power and network providers. The oversight consultant facilitates this coordination and assists as necessary or at TTA's direction.

9.3. Quality Assurance

9.3.1. Daily Verification of Transactions Reaching CSC

The oversight consultant verifies report data reconciling all transactions that come from the roadside.

9.3.1.1. Roadside Data

The toll integrator provides a daily report that details roadside transaction data to TxDOT and the oversight consultant for a true count of the transactions at the roadside.

9.3.1.2. Transaction Files Compared to Roadside Data

The transaction files (.tr files) from the PHS that are received at the CSC are compared to the roadside data counts to verify that the numbers match by the oversight consultant.

9.3.1.3. Verify Violations at CSC

The CSC vendor provides a report to the oversight consultant that shows all video and Electronic Toll Collection (ETC) transactions by date that is used to reconcile the roadside counts.

9.3.2. Periodic Lane Audits

Lane audits are performed at the roadside to verify proper performance of the system. These audits concentrate on accurate vehicle counts, identification, and classification of vehicles. A video camera is utilized to capture traffic footage, which is used to verify the roadside audit.

9.4. Performance Monitoring and Stipulated Damages

The toll integrator, oversight consultant, and TTA are each responsible, at varying levels, to monitor the toll system for availability and performance. The functional availability and performance requirements stipulated within the CDA are a measurement of the uptime of each of the subsystems, as well as how they are performing. The performance requirements also guarantee that the toll system will correctly and accurately collect toll revenue.

9.4.1. Functional Availability

The toll integrator's monthly maintenance report includes functional availability calculations for the four groups as specified in the CDA. The four groups are:

1. Video detection, electronic toll collection tag read capability and transaction processing
2. Video image capture capability
3. Automatic vehicle classification capability
4. Optical Character Recognition

The toll integrator reports on the actual percentage of time for each month each toll zone is available, any exceptions, and justification for the exceptions. When one or more availability groups for one or more toll zones are outside the allowable threshold, then TTA will request the toll integrator to clarify the time and details of the loss of availability. The period of no availability will be calculated against either actual transactions counts or estimated transactions counts based on the previous month's data. One exception is within the first 12 months of operations for the specific toll zones. In this case, traffic and revenue data is used to calculate the estimated lost revenue when the system falls outside the availability or performance thresholds.

9.4.2. Performance Requirements

Performance is measured through five groups, which include a total of 14 specific requirements. The five groups are:

1. Vehicle detection, electronic toll collection tag read capability and transaction processing
2. Video image capture capability
3. Automatic vehicle classification capability
4. Optical Character Recognition
5. Data transmission and processing requirements

Generally the performance of the toll system is verified through the monthly availability report or the annual performance audit report. TTA's oversight of the system and interaction with the CSC may also recognize errors in data transmission, data quality, or data accuracy.

When TTA or the oversight consultant is either notified or recognizes the system has failed to perform within the requirements, the oversight consultant documents which performance requirements have been affected and to what extent. Some requirements may not be reasonably tracked or calculated either because the performance requirement is a theoretical amount or the potential loss of revenue is considerably less than the effort

required to verify the system performance. The period of lost revenue will be calculated against either actual transactions counts or estimated transactions counts based on average monthly data. One exception is within the first 12 months of operations for the specific toll zones. In this case, the traffic and revenue data must be used to calculate the estimated lost revenue when the system falls outside the availability or performance thresholds.

9.4.3. Stipulated Damages

Following verification of the toll integrator's failure to meet functional availability and / or system performance requirements and a determination of the total amount of lost revenue, TTA has the ability to assess stipulated damages. If TTA assesses stipulated damages, the method of calculation, the time period of lost revenue, and the total amount of revenue due to TTA is included within a letter to the toll integrator. The stipulated damages amount is then deducted from the draw request for the reporting period in which the failure occurred.

9.5. Price Adjustments

The prices for each PSS may be adjusted from the hypothetical scenarios prices upon the second anniversary of the signing of the CDA for project segments for which an NTP has not yet been issued. Labor price adjustments are based upon the consumer price index and material price adjustments are based upon the electrical machinery and equipment index and the metals and metal products index. The weighting of each index within the project pricing to determine a composite index is calculated by the toll integrator to match the actual distribution within the toll integrator's pricing, as approved by TTA.

For project segments for which an NTP has already been issued, only the maintenance prices may be adjusted according to the method as described above.

The toll integrator must deliver a statement to TTA showing the adjustment calculations for approval. The adjustment cannot exceed 5 percent in any given year.

10. Final Project Close Out / Transition

Once a project segment is complete, including any maintenance terms and extensions, one of four things may happen.

1. The maintenance of the project segment toll system may be reprocured through a competitive process
2. The maintenance of the project segment toll system may be transferred to another toll systems integrator
3. The maintenance of the project segment toll system may be transferred to the TxDOT District or local agency that has jurisdiction over the road
4. The project segment toll system may be replaced though a competitive process including a new maintenance term

In all of these cases, the oversight consultant will prepare the necessary documents including directive letters, change orders, cost estimates, and other supporting documents as necessary.

10.1. End-of-Term Maintenance Activities

Assuming that the project segment toll system is functioning well and meeting the needs of TxDOT, it is likely that the toll system will be turned over to others to maintain. Prior to this turn over, the toll integrator is required to perform certain end of term maintenance activities as described in the CDA. These activities include:

1. Provide training for TxDOT or Authority personnel to maintain the project segment
2. Ensure that spare parts, equipment, expendables and consumables inventory shall be fully stocked and complete
3. Ensure that the toll system is in a state of good operating condition and repair.

The oversight consultant assists in the coordination of the required maintenance training and help to ensure that the appropriate individuals are in attendance. Additionally, the oversight consultant will conduct a thorough inspection of all spare parts, equipment, and expendables to ensure that all items are stocked and complete. Finally, the oversight consultant will conduct a walk-through inspection with the toll integrator and TxDOT so that the operating condition of the toll system can be fully assessed.

10.2. Transition from Developer to Owner other than TxDOT

In some cases, TxDOT accepts the responsibility to fund, build, and maintain the project segment until such time as a local or regional agency can accept the maintenance responsibility. When this occurs, the maintenance responsibility of both the roadway and the toll system are turned over to that agency. The oversight consultant will appoint a transition lead to head up the effort of coordinating the end-of-term maintenance activities with the agency. In most cases, the agency will want information regarding preventive maintenance history, work order history, and so on. Additionally, depending on what the agency plans to do with the toll system, there could be additional signing work, equipment upgrades or replacements, or even toll gantry relocations to coordinate.

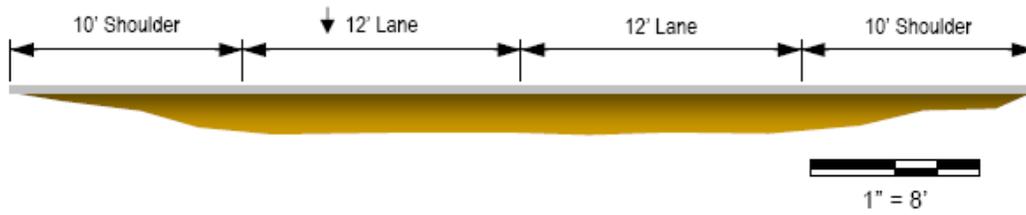
Appendix A – Roadway Configurations

The types of tolled road segments that TxDOT may elect to have developed under the Agreement and that Developer's system design shall meet the requirements as described herein. Where geometry of the roadway is described, the anticipated worst case for the Tolling Zone equipment has been listed.

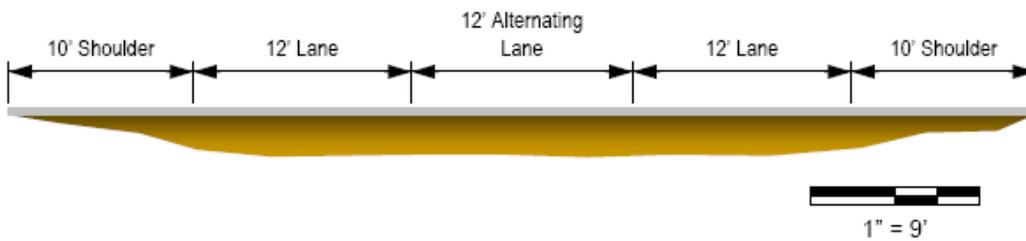
- a. **Two lane -- two way highway:** Two-lane wide highway with one 12-ft. lane in each direction, no divider (only paint separates opposing traffic lanes) and 10-ft. shoulders. Roadway will be striped for no passing in the vicinity of the Tolling Zone.
- b. **Super 2 highway:** Three-lane highway with one-lane in each direction, alternating dedicated direction passing lane throughout (Middle lane serves as passing lane in one direction only), and three 12-ft. wide traffic lanes with ten foot shoulders on each side. Roadway will be striped to disallow vehicles from crossing to the lanes carrying vehicles in the opposed traffic direction.
- c. **Four Lane divided highway with flush median:** Two 12-ft. lanes in each direction with 10-ft. outside shoulders and 4-ft. inside shoulders with a concrete traffic barrier separating opposing traffic.
- d. **Four Lane divided highway with depressed median:** Two 12-ft. lanes in each direction with 10-ft. outside shoulders and 4-ft. inside shoulders, and 40-ft. or wider median separating opposing lanes of traffic.
- e. **Six Lane divided highway with flush median:** Three 12-ft. lanes in each direction with 10-ft. outside shoulders and 10-ft. inside shoulders, with a concrete traffic barrier separating opposing traffic.
- f. **Six Lane divided highway with depressed median:** Three 12-ft. lanes in each direction with 10-ft. outside shoulders and 10-ft. inside shoulders, and 40-ft. or wider median separating opposing lanes of traffic.
- g. **Reversible Managed Lanes (one lane wide):** One 12-ft. wide Managed Lane with a 4-ft. shoulder on one side and a ten foot shoulder on the other, a concrete traffic barrier, and either a 4-ft. or a 10-ft. wide shoulder separating the Managed Lane from two to four adjacent 12-ft. general-purpose traffic lanes.
- h. **Reversible Managed Lanes (two lanes wide):** Two 12-ft. wide Managed Lanes with a 10-ft. shoulder on each side, a concrete traffic barrier, and either a 4-ft. or a 10-ft. wide shoulder separating the Managed Lane from two to four adjacent 12-ft. general-purpose traffic lanes.

- i. **Buffer Separated Managed Lanes (concurrent flow):** One or two 12-ft. wide Managed Lanes separated from two to four general-purpose traffic lanes by a 4-ft. wide buffer lane with a 10-ft. shoulder on the left, and a concrete traffic barrier separating opposing directions of Managed Lane traffic.
- j. **Barrier-Separated Managed Lanes (concurrent flow):** One or two 12-ft. wide Managed Lanes with a 4-ft. shoulder on the left, a 10-ft. shoulder on the right, and is separated from the general-purpose lanes and opposing directions of Managed Lane traffic by concrete traffic barriers.
- k. **One Lane ramps:** One 14-ft. lane with a 2-ft. inside shoulder and an 8-ft. outside shoulder.
- l. **Two Lane ramps:** Two 12-ft. lanes with a 10-ft. shoulder on the right side and a 4-ft. shoulder on the left side.
- m. **Two Lane ramps:** Two 12-ft. lanes with a 10-ft. shoulder on the right side and a 4-ft. shoulder on the left side. One lane is tolled and the other is a free lane.

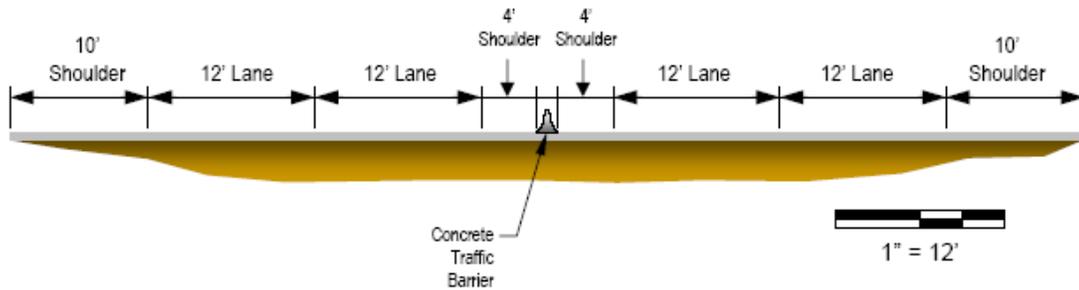
a. Two Lane – Two Way Highway



b. Super Two Highway

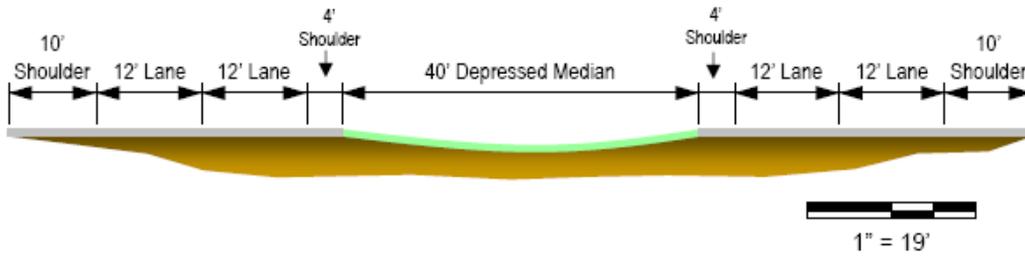


c. Four Lane Divided Highway with Flush Median

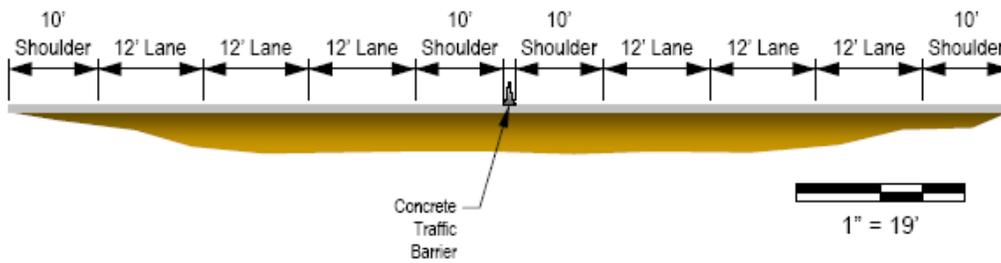


PROJECT SEGMENT ROAD CONFIGURATION TYPES

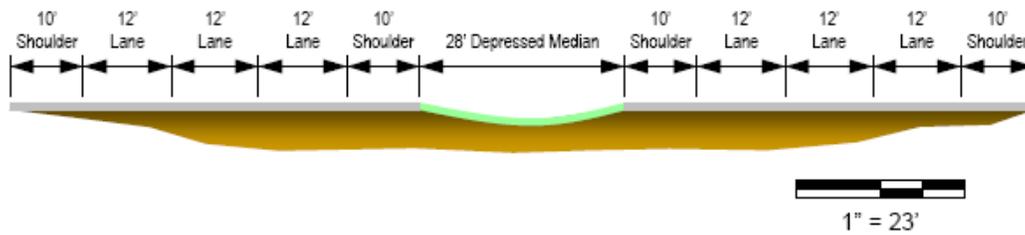
d. Four Lane Divided Highway with Depressed Median



e. Six Lane Divided Highway with Flush Median

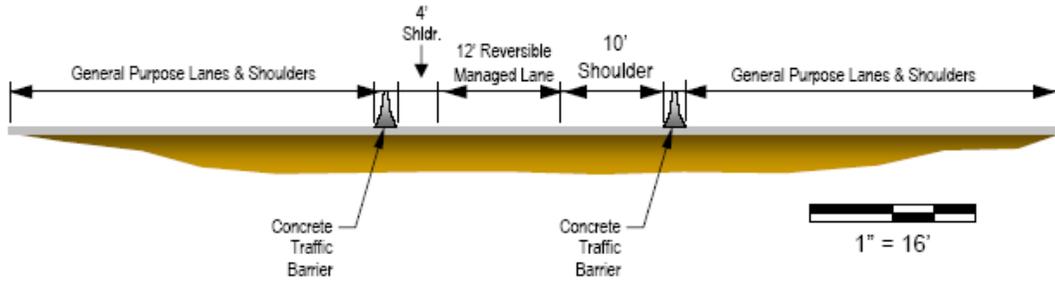


f. Six Lane Divided Highway with Depressed Median

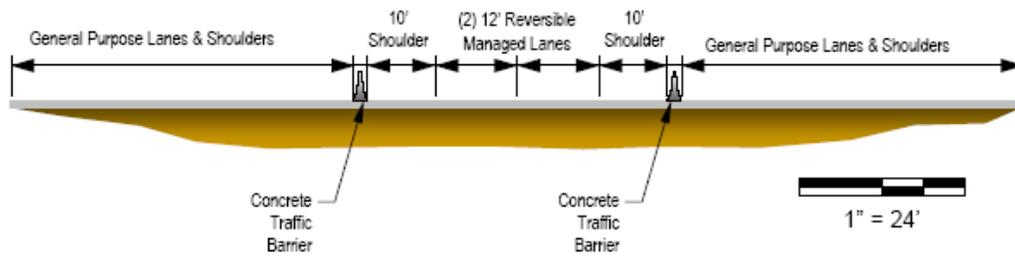


PROJECT SEGMENT ROAD CONFIGURATION TYPES (CONTINUED)

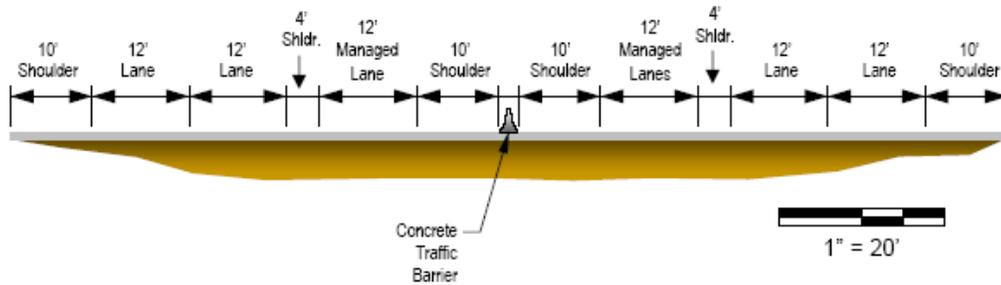
g. Reversible Managed Lanes (One Lane Wide)



h. Reversible Managed Lanes (Two Lanes Wide)

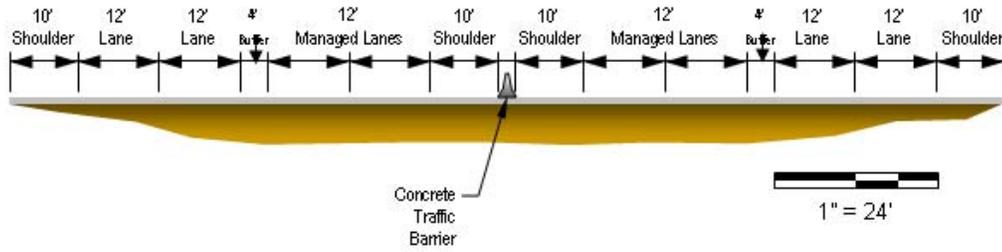


i(1). Buffer Separated Managed Lanes (Concurrent Flow)

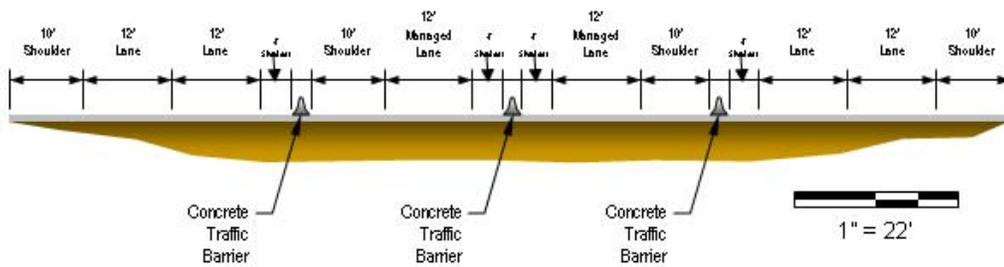


PROJECT SEGMENT ROAD CONFIGURATION TYPES (CONTINUED)

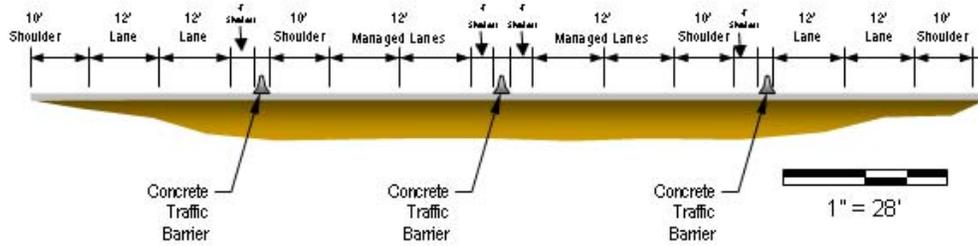
i(2). Buffer Separated Managed Lanes (Concurrent Flow)



i(1). Barrier Separated Managed Lanes (Concurrent Flow)

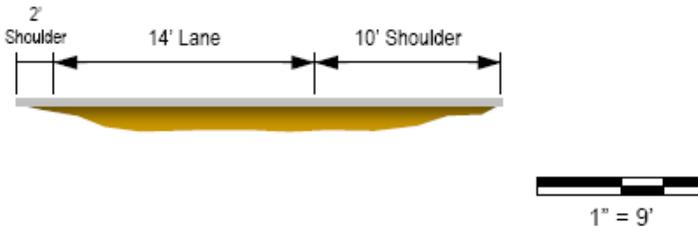


i(2). Barrier Separated Managed Lanes (Concurrent Flow)

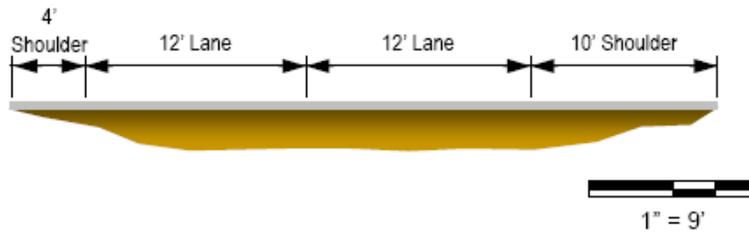


PROJECT SEGMENT ROAD CONFIGURATION TYPES (CONTINUED)

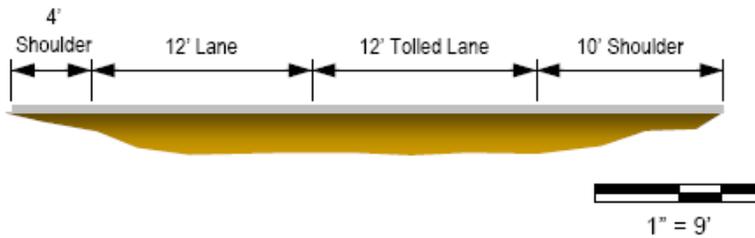
k. One Lane Ramp



l. Two Lane Ramps



m. Two Lane Ramps



PROJECT SEGMENT ROAD CONFIGURATION TYPES (CONTINUED)

Appendix B – Acronym List

AET	All-Electronic Toll Collection
CDA	Comprehensive Development Agreement
CSC	Customer Service Center
CST	Construction Division
DBE	Disadvantaged Business Enterprise
DDR	Detailed Design Review
EDMS	Electronic Document Management System
EPD	Escrowed Procurement Documents
ETC	Electronic Toll Collection
FAT	Factory Acceptance Test
FCC	Federal Communication Commission
FHWA	Federal Highway Administration
FIN	Finance Division
GEC	General Engineering Consultant
GSD	Government Services Division
HCTRA	Harris County Toll Road Authority
HOT	High-Occupancy Travel
HOV	High-Occupancy Vehicle
ICD	Interface Control Document
MOMS	Maintenance Online Management System
NTP	Notice to Proceed
NTTA	North Texas Toll Authority
OCR	Optical Character Recognition
OGC	Office of the General Counsel
ORT	Open Road Tolling
ORTCS	Open Road Tolling Collection System
PDF	Portable Document Format
PHS	Project Host Server
PRD	Preliminary Design Review
PS&E	Plan, Specifications and Estimates

PSS	Project Segment Supplement
QA	Quality Assurance
QC	Quality Control
RMA	Regional Mobility Authorities
SOV	Single-Occupancy Vehicle
TMS	Toll Management System
TP	Technical Provisions
TRF	Traffic Operations Division
TTA	Texas Turnpike Authority Division
TxDOT	Texas Department of Transportation
UAT	User Acceptance Test
VDAC	Vehicle Detection and Classification
WBS	Work Breakdown Schedule
WSR	Weekly Status Report