

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

**RESOLUTION NO. 17-015**

**APPROVING A WORK AUTHORIZATION NO. 14 WITH KAPSCH TRAFFICCOM  
USA FOR TOLL SYSTEMS INTEGRATION SERVICES FOR  
THE SH 45 SW PROJECT**

WHEREAS, the Central Texas Regional Mobility Authority ("Mobility Authority") entered into a contract with Caseta Technologies, Inc. dated April 27, 2005, for the design, procurement, and installation of a toll collection system on the Authority's turnpike system (the "Contract"); and

WHEREAS, Kapsch TrafficCom USA (formerly Schneider Electric Mobility NA) is the successor in interest to the Contract with Caseta Technologies, Inc., and all rights and obligations of Caseta Technologies, Inc. under the Contract are now the rights and obligations of Kapsch TrafficCom USA ("Kapsch"); and

WHEREAS, the Executive Director and Kapsch have discussed and agreed to a proposed work authorization for Kapsch to provide toll system integration services and intelligent transportation system services for development of the SH 45 SW project (the "Project"); and

WHEREAS, the Executive Director recommends that the Board approve proposed Work Authorization No. 14, a copy of which is attached to this resolution as Exhibit A.

NOW THEREFORE, BE IT RESOLVED that the proposed work authorization with Schneider for toll system integration services and intelligent transportation system services for the Project is hereby approved; and

BE IT FURTHER RESOLVED that the Executive Director may finalize and execute on behalf of the Mobility Authority the proposed work authorization in the form or substantially the same form provided to the Board as agenda backup information.

Adopted by the Board of Directors of the Central Texas Regional Mobility Authority on the 29<sup>th</sup> day of March, 2017.

Submitted and reviewed by:

  
\_\_\_\_\_  
Geoff Petrov, General Counsel

Approved:

  
\_\_\_\_\_  
Ray A. Wilkerson  
Chairman, Board of Directors

**Exhibit A**

# CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

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## WORK AUTHORIZATION

### WORK AUTHORIZATION NO.14

#### TOLL SYSTEM IMPLEMENTATION

#### STATE HIGHWAY 45 SOUTHWEST PROJECT

**THIS WORK AUTHORIZATION (“WA No. 14”)** is made pursuant to the terms and conditions of Article 1 of the GENERAL PROVISIONS, Attachment A, to the original Contract for Toll System Implementation, dated April 27, 2005 (the Contract) entered into by and between the Central Texas Regional Mobility Authority (the “Authority” or “CTRMA”), and Kapsch TrafficCom Transportation NA, Inc. (the “Contractor,” also referred to in attachments to this WA No. 14 as the “System Integrator” or “SI”).

**PART I.** The Contractor will perform toll implementation services generally described in the Scope of Work attached hereto as **Attachment A**. The Contractor’s duties and responsibilities are further detailed in: (1) the SH 45 SW Project Layout included as **Attachment B**, (2) the Toll Facility Responsibility Matrix included as **Attachment C**, and (3) the Fixed Price Tolling Standards included as **Attachment D**.

**PART II.** The maximum amount payable under this WA No. 14 is \$2,364,252.06. This amount is based upon the pricing obtained, and is documented by the fee schedule set forth in **Attachment E**.

**PART III.** Payment to the Contractor for the services established under this WA No. 14 shall be made in accordance with the Contract.

**PART IV.** This WA No. 14 shall become effective on the date both parties have signed this WA No. 14. This WA No. 14 will terminate on the SH 45 SW Toll Lanes substantial completion date or upon payment of the maximum amount payable in **Part II**, whichever date is first, unless extended as provided by the Contract. The work shall be performed in accordance with the project Schedule and Milestones as set forth in **Attachment F**.

**PART V.** This WA No. 14 does not waive any of the parties’ responsibilities and obligations provided under the Contract, and except as specifically modified by this WA No. 14, as such responsibilities and obligations under the Contract remain in full force and effect.

**IN WITNESS WHEREOF**, this Work Authorization No. 14 is executed in duplicate counterparts and hereby accepted and acknowledged below.

THE CONTRACTOR: Kapsch TrafficCom Transportation NA, Inc.

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Signature

Date

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Typed/Printed Name and Title

**CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY**

Executed for and approved by the Central Texas Regional Mobility Authority for the purpose and effect of activating and/or carrying out the orders, established policies or work programs heretofore approved and authorized by the Texas Transportation Commission.

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Signature

Date

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Mike Heiligenstein, Executive Director

Typed/Printed Name and Title

**LIST OF ATTACHMENTS**

Attachment A	Scope of Work
Attachment B	SH 45 SW Toll System Layout
Attachment C	Toll Facilities and ITS Responsibility Matrix
Attachment D	Fixed Price Tolling Standards
Attachment E	Fee Schedule/Budget
Attachment F	Preliminary Project Schedule and Milestones

## ATTACHMENT A

### *CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY* **TOLL SYSTEM IMPLEMENTATION** **State Highway 45 Southwest Project**

#### **SCOPE OF WORK for SYSTEMS INTEGRATOR**

#### **A1.0 General**

##### **A1.01. Background**

The Central Texas Regional Mobility Authority (CTRMA) is developing the State Highway (SH) 45 Southwest (SW) Project (“Project”), which will construct a new 4-lane toll facility, approximately 3.6 miles in length, between FM 1626 and Loop 1 (MoPac), extending onto the existing the SH 45 roadway south of Escarpment Boulevard. Once complete, the project will offer drivers and residents in Northern Hays and Southern Travis counties less congested local roads and improved travel times.

The Texas Department of Transportation (TxDOT), along with Hays and Travis Counties, provided funding and right-of-way for the project, and TxDOT lead environmental impact studies, including related environmental documentation and coordination of public outreach. CTRMA is responsible for the project design, permitting, and infrastructure construction, in addition to the procurement, design, installation, testing and commissioning of the Toll Collection System (TCS). Additionally, SH 45SW will require the implementation of a Traffic Management System (TMS).

Upon substantial completion, CTRMA shall operate and maintain toll lanes on the Project, which will include the collection of tolls, setting toll rates, servicing customers, toll enforcement, facilities and toll collection system maintenance, repairs and capital improvements to the toll lanes, toll facilities, and related equipment.

##### **A1.02. Summary Scope of Work**

The Scope of Work for Work Authorization No. 14 consists of two (2) components: (1) Toll Collection System Implementation and (2) Traffic Management System Implementation. A description of the scope of work for each component is described below.

##### **A1.02.A. Toll Collection System Implementation**

Part A of the Scope of Work for Authorization No. 14 provides for the procurement, installation, testing, and implementation of a complete and fully operational TCS for the Project by the Systems Integrator (SI). This includes, but is not limited to, all of the required communications and systems interfaces, as well as design, coordination, and project interface activities to facilitate the design and construction of the toll system infrastructure facilities by others on the SH 45 SW Project.

This Work Authorization also authorizes the SI to establish and maintain relationships with a wide variety of third parties, and to coordinate the designs for the proposed TCS with the entire SH 45SW Project to ensure that the construction of the toll system infrastructure facilities will be fully compatible and meet the requirements for the CTRMA’s TCS. In this role, the SI will work closely with CTRMA, and various designers and roadway contractors in developing the required complete TCS and network infrastructure.

### **A1.02.B Traffic Management System**

Part B of the Scope of Work for Work Authorization 14 provides for the procurement, installation, testing, and implementation of a complete and fully operational TMS for the Project by the Systems Integrator (SI). Scope shall include, but not be limited to, coordination and project interface activities to facilitate the design and construction of the TMS infrastructure facilities by others.

This Work Authorization also authorizes the SI to establish and maintain relationships with a wide variety of third parties, and to coordinate the designs for the proposed TMS with the entire SH 45SW Project. This coordination will help to ensure that the construction of the TMS infrastructure facilities will be fully compatible and meet the requirements for the CTRMA's Traffic Management System. In this role, the SI will work closely with CTRMA, various designers and roadway contractors in developing the required complete Intelligent Transportation System (ITS), and network infrastructure.

### **A2.0 General Description – Toll Road Infrastructure and Site**

The SH 45 SW Project limits in Southern Travis County and Northern Hays County will extend from FM 1626 to Loop 1 (MoPac), utilizing the existing the SH 45 roadway south of Escarpment Boulevard. The project length is approximately 3.6 miles.

#### **Proposed Facility:**

The SH 45 SW Project will be a new four-lane, divided tollway consisting of: two (2) twelve-foot lanes in each direction, a ten-foot outside shoulder and a four- or five-foot inside shoulder with varying median widths. The project includes a ten-foot-wide, ADA-compliant shared use path, separated from the roadway for the entire length of the project, except over the Bear Creek Bridge. The shared use path will serve as part of the future Violet Crown Trail, and will have a trailhead under the bridge structure at SH 45SW and MoPac.

The following bridges are included in the design of the project:

- Overpass of Bliss Spillar Road and water quality pond
- Overpass of Bear Creek and water quality pond
- Overpass of Danz Creek, water quality ponds, and MoPac
- Direct connector for westbound SH 45SW to northbound MoPac over Danz Creek
- Widening of the existing SH 45 and MoPac bridges over Danz Creek

The Toll Collection System for the Project will be all Electronic Toll Collection (ETC). The project will consist of one Toll Site that provides Open Road Tolling for both the NB and SB lanes and shoulders. A two Gantry solution will be provided for this site at the locations listed in Table 1 below.

**Note:** The location of the gantries are approximate and may be subject to change.

The SH 45 SW Project will be a limited-access tollway with entrances and exits to the facility provided at the following locations:

- FM 1626
- Bliss Spillar Road
- Loop 1 (MoPac)
- SH 45, west of Loop 1

*Table 1: Gantry Locations and Lane Counts*

Approximate Station Location	Direction of Travel	No. of Lanes	No. of Shoulders (8' or greater)	Comments
256+00	Northbound	2	1	The design plan typical section includes one (1) 10 foot shoulder in each direction of travel. However, the typical section may be different if the location of the gantry is revised.
256+00	Southbound	2	1	The design plan typical section includes one (1) 10 foot shoulder in each direction of travel. However, the typical section may be different if the location of the gantry is revised.
Total Gantry		4	2	

Refer to the SH 45SW Project Layout included as **ATTACHMENT B** for the general project layout.

### **A3.0 General Requirements - Toll Collection System and Traffic Management System**

#### **A3.01 General Requirements - Toll Collection System**

The Central Texas Roadway System, which is being designed and implemented through a series of separate work authorizations for the various segments of the proposed Toll Road System, generally will be fully compatible with the TCS that has been designed and implemented on the 183A Toll Road, US 290, SH 71 and the Manor Projects. The TCS installed on SH 45 SW shall utilize automatic vehicle identification and classification technology, a Violation Enforcement System (VES) with an integrated camera and triggering systems to capture referenced digital images of license plates, and a Remote Online Management System (ROMS). It is required that the TCS be interoperable with the other Texas ETC systems.

The Customer Service Center (CSC) is located in a facility at 12719 Burnet Road, Austin, Texas, developed and administrated by the Toll Operations Division (TOD) of TxDOT. The CTRMA contracts with the members of the Texas Statewide Interoperability Task force for CSC services for its customers. Expansion of CTRMA's TCS to serve the SH 45 SW Project includes coordination and design of appropriate interfaces with the TxDOT CSC. Appropriate communications links between, and interfaces to (where necessary), CTRMA's various toll facilities, including: the Central Texas Roadway System, Administrative Offices, Traffic Management Center (TMC) at the Field Operations Building(s), and the Violation Processing Center (VPC) are part of the requirements of the TCS design/implementation work.

**Note:** The VPC is located in a separate facility, and is currently being administrated by the Municipal Services Bureau, Inc. under contract to the CTRMA. Development of CTRMA's TCS will included coordination and design of the appropriate interfaces with the VPC.

The general locations, layouts, and implementation schedule for the toll facilities for the SH 45 SW Project, as currently proposed, are indicated in the attached Exhibits. The Exhibits are based upon the latest information currently available, and they are intended for informational purposes only. The locations are subject to change, and it should be anticipated that refinements and adjustment to the locations and layouts indicated will be required as designs for the TCS are developed further.

### **A3.02 General Requirements – Traffic Management System**

The Intelligent Transportation System for SH 45 SW Project includes a concrete encased duct bank consisting of twelve, 2-inch conduits along the length of the project, closed-circuit television (CCTV) surveillance cameras, dynamic message signs (DMS), vehicle detectors, and communication hub enclosures. The ITS duct bank shall be in accordance with the guidelines included in the *Austin District Guidelines for Developing Freeway Corridor Traffic Management System*.

The Project design shall include ITS components, consistent with the overall location and quantity of ITS components in the “*ITS Schematic*.” The general locations, layouts, and implementation schedule for the TMS for the SH 45 SW Project, as currently proposed, are based on the latest information currently available, and they are intended for informational purposes only. The locations are subject to change, and it should be anticipated that refinements and adjustment to the locations and layouts indicated will be required as designs for the TMS are developed further.

The SI shall design and install a Traffic Management System that is compatible with the Austin Regional ITS Architecture for both control of devices and reception of images and data. The proposed system shall be seamlessly integrated into the existing CTRMA TMC, all devices shall be compatible with the current TMC Video Management Software (VMS), DMS software and Traffic Detector Database. Access to any cameras, DMS or RVSD by a third party will be facilitated by a Memorandum of Understanding and Agreement (MUA) between CTRMA and third party. The database administrator at the TMC will add the new device addresses to the already functioning tables. Note that the fiber trunk line will eventually tie into the fiber system along MoPac once constructed and installed. The SI shall furnish and install appropriate communications links between, and interfaces to, CTRMA’s various toll facilities, including: the Central Texas Roadway System, Administrative Offices, TMC at the Field Operations Building(s), and the VPC as part of the requirements of the TMS design/implementation work.

## **A4.0 Equipment and Installation**

### **A4.01. Gantries and Roadside Equipment for ETC Systems**

For a complete, tested, and operating TCS under this Work Authorization, the SI will be required to provide and install the toll equipment, hardware and software systems at all TCS field installations on the SH 45 SW Project. The SI’s principle items of work and primary components of the TCS at each toll location will include, but are not limited to:

- Furnishing and installing lane controllers and ancillary devices
- Furnishing and installing ETC lane components, including: Automatic Vehicle Detection System (AVDS), Automatic Vehicle Classification (AVC), Violation Enforcement System (VES), and Automatic Vehicle Identification (AVI) systems and hardware
- Furnishing and installing all ETC lane equipment wiring and cable, hardware, brackets, and fasteners required to attach the ETC equipment to the gantries and toll hangers provided by others
- Furnishing, installing and configuring ROMS for all ETC and ITS site equipment (e.g. ETC Equipment, ITS Equipment AVDS, AVC, AVI, VES, HVAC, generators, power, communications equipment, etc.)
- Furnishing and installing communication system communication system and network components (e.g. fiber optic cable, terminations, splices, network switches, routers and other network devices as required by CTRMA)
- Furnishing and installing master ground system connected to the master ground bus bar



provided by others

- Furnishing and installing lightning surge suppression system and components for AVI, communication network, VES, Uninterruptible Power Supply (UPS), and service/feeder power
- Furnishing and installing backup electrical power, including emergency generators, fuel tanks, and automatic transfer switches
- Furnishing and installing wiring, cable, hardware, and ROMS interface
- Furnishing and installing In-Lane Processor (ILP) enclosure, with HVAC for appropriate environmental protection and climate controls for electronic equipment.
- Furnishing and installing site surveillance cameras and security systems to monitor each ILP and gantries
- Providing power from the electrical service to the toll and ITS locations
- Preparing and submitting Federal Communication Commission (FCC) license(s)
- Providing complete testing, certification and acceptance of all systems for the complete, fully integrated and operational TCS, furnished and installed

The procurement, fabrication and installation of gantries and other civil infrastructure for the TCS to be located on the Project shall be completed by others contracted by CTRMA. It is the responsibility of the SI, nevertheless, to work closely with CTRMA, their various designers and roadway contractors to establish the precise location for the gantry structure and to provide the roadway contractor(s) with detailed information regarding the installation for the TCS equipment at each location.

#### **A4.02 ITS System Design**

For all TMS field installations on the SH 45 SW Project, the SI will be responsible for the final ITS systems design, as well as the purchase and installation of the ITS equipment. The principle items of work and primary components of the TMS at each location will include, but not limited to:

- Duct Banks: Furnish and install the fiber optic cabling required for the ITS and Tolling systems. The duct bank and its laterals shall be constructed by others.
- CCTV Cameras: Furnish and install the cameras, communications, and equipment enclosures. Installation of foundations, conduits and conduit laterals, grounding, lightning protection, camera poles, and electrical services shall be provided by others.
- DMS: Furnish and install the DMS, communications and equipment enclosures. Installation of foundations, conduits and conduit laterals, grounding, DMS support structures, and electrical services for DMS (at the location specified by the SI) shall be completed by others.
- Vehicle Detectors: Furnish and install radar vehicle detectors, communications and equipment enclosures. Installation of foundations, conduits and conduit laterals, grounding, vehicle detectors support structures, and electrical services for vehicle detectors (at the location specified by the SI) shall be completed by others.
- Communications enclosure: Design, furnish, and install the enclosures. Design and construction of the enclosure support slab shall be constructed by others.

As indicated above, elements of the ITS infrastructure will be the responsibility of others. Nevertheless, it is the responsibility of the SI to work closely with CTRMA, various designers and roadway contractors to establish the precise locations for the elements above and to provide the Roadway Contractor(s) with detailed information as needed.

## A5.0 Coordination and Project Interface

All TCS/ITS infrastructure facilities along the SH 45 SW Project will be provided by others as indicated in **Section A6.0 and Section A7.0** below. The SI is required to participate and coordinate with contractors and designers of the SH 45 SW Project, enabling them to obtain specific, detailed information regarding the proposed design of the TCS and TMS, location of the TCS and TMS components, technical requirements of the system, as well as all documents necessary in order for them to complete the design/construction of the appropriate toll infrastructure.

The SI is responsible for ensuring that the toll gantry is located and configured properly to accommodate the SI's own particular system components as required to meet the CTRMA TCS and TMS performance and accuracy requirements. It is also the responsibility of the SI to ensure the construction of the toll system infrastructure facilities will be fully compatible with, and meet the requirements for, the CTRMA's TCS and TMS.

The SI will be responsible for maintaining relationships with a wide variety of third parties, including designers, roadway contractors, and various suppliers. In this role, the SI will work closely with CTRMA in developing the required network. The work related to this Work Authorization No. 14 generally will include, but not be limited to:

- Providing design input and detailed information, including: TCS and TMS component details, dimensions and layout configurations, and specific technical requirements for elements of the proposed TCS and TMS
- Preparing construction/installation guidelines for various components of CTRMA's TCS and TMS
- Reviewing construction documents prepared by others, including conducting "over-the-shoulder" reviews, as necessary or requested by CTRMA
- Attending and participating in coordination meetings as determined by the project schedule and/or as requested by CTRMA

**Note:** This includes attending design coordination meetings, construction meetings, and issue resolution meetings as necessary to resolve outstanding comments.

- Submitting installation plans and installation drawings to the CTRMA for review and approval
- Providing input into the development and maintenance of the project schedule as it relates to coordination with civil infrastructure contractors, the coordination of civil site turnovers, and the installation and testing of the toll system

**Note:** The SI will be expected to review the project baseline schedule prepared by the contractor for review and acceptance.

Prior to deploying any toll collection equipment or technology on the SH 45 SW Project, the SI shall certify to CTRMA that the technology complies with the interoperability rules that are in effect on the date of the issuance of the NTP for this WA.

All TCS infrastructure facilities will be provided by others as indicated in Section A6.0 and Section A7.0 hereof.

## A6.0. Work by Others

### A6.01 Civil/Roadway Construction – Toll Collection System

The CTRMA, through its roadway construction contracts, will provide a minimum of 60 linear feet of jointed concrete pavement in each of the areas designated for toll collection facilities. The pavement will be reinforced with Glass Fiber Reinforced Polymer (GFRP) bars. Transverse joints and longitudinal joints will be placed at positions equal to lane width and as shown on the CTRMA details. Power and communication lines to support the Wide Area Network (WAN) will be provided by others and terminated at an ILP enclosure in an area within 500 feet of ILP. The SI is responsible for the communication links between the TCS Host, the TxDOT CSC, the VPC, the TMC, and all express toll location facilities. It is the responsibility of the SI to coordinate with 3rd parties for leased communication services along the corridor.

Except as may be expressly indicated elsewhere, all toll system infrastructure required for the TCS at the designated TCS Location(s) will be provided and installed by others contracted by CTRMA. The principle items of work and primary components of the TCS infrastructure shall include, but are not limited to:

- GFRP Bar Reinforced Pavement Section
- Retaining Walls and Coping Details
- Drainage Features
- Civil Site Work, including Grading, Access Driveways, and Fencing
- All toll gantry procurement and installations, including foundations and gantry structures
- All conduit and ground boxes are to be provided by the civil contractor
- ILP concrete foundation slab with a perimeter security fence

**Note:** The ILP's are to be provided with appropriate environmental protection and climate controls for housing the electronic equipment by the SI.

- Toll Equipment concrete foundation slab
- Conduit and ground boxes providing connections between the ILP's and the ETC lane equipment installations

**Note:** It is the responsibility of the SI to coordinate with the roadway contractor(s) for the placement and installation of these elements to ensure that the construction is acceptable for the TCS as designed.

- Gantry and ILP enclosure lightning protection, air terminal, down conductors, and ground electrodes
- Power up to the location of the proposed ILP enclosures
- Concrete foundations for emergency generators and associated fuel tanks
- Installation of natural gas lines, if necessary

**Note:** The SI is to coordinate and provide generator requirements, including locations for gas feeds for the emergency generators.

- All signing, pavement markings, traffic barriers and other roadway appurtenances required at each remote express toll location

Refer to the Fixed Price Tolling Standards that were issued by the CTRMA on November 2013, which is

included as *ATTACHMENT D*.

#### **A6.02 Civil/Roadway Construction – Traffic Management System**

Except as may be expressly indicated elsewhere, all required TMS infrastructure will be provided and installed by others. The principle items of work and primary components of the TMS infrastructure shall include, but limited to:

- ITS layouts
- Duct Bank
- Foundations
- Conduits
- Electrical Services
- Grounding circuits
- Support Structures

#### **A7.0 Toll Facilities Responsibility Matrix**

For this work authorization, the SI is responsible for design and coordination of the various aspects of the TCS, as identified in *ATTACHMENT C - Toll Facilities and ITS Responsibility Matrix*, and shall work with the CTRMA, roadway designers and contractors, and others as described herein.

#### **A8.0 Project Schedule**

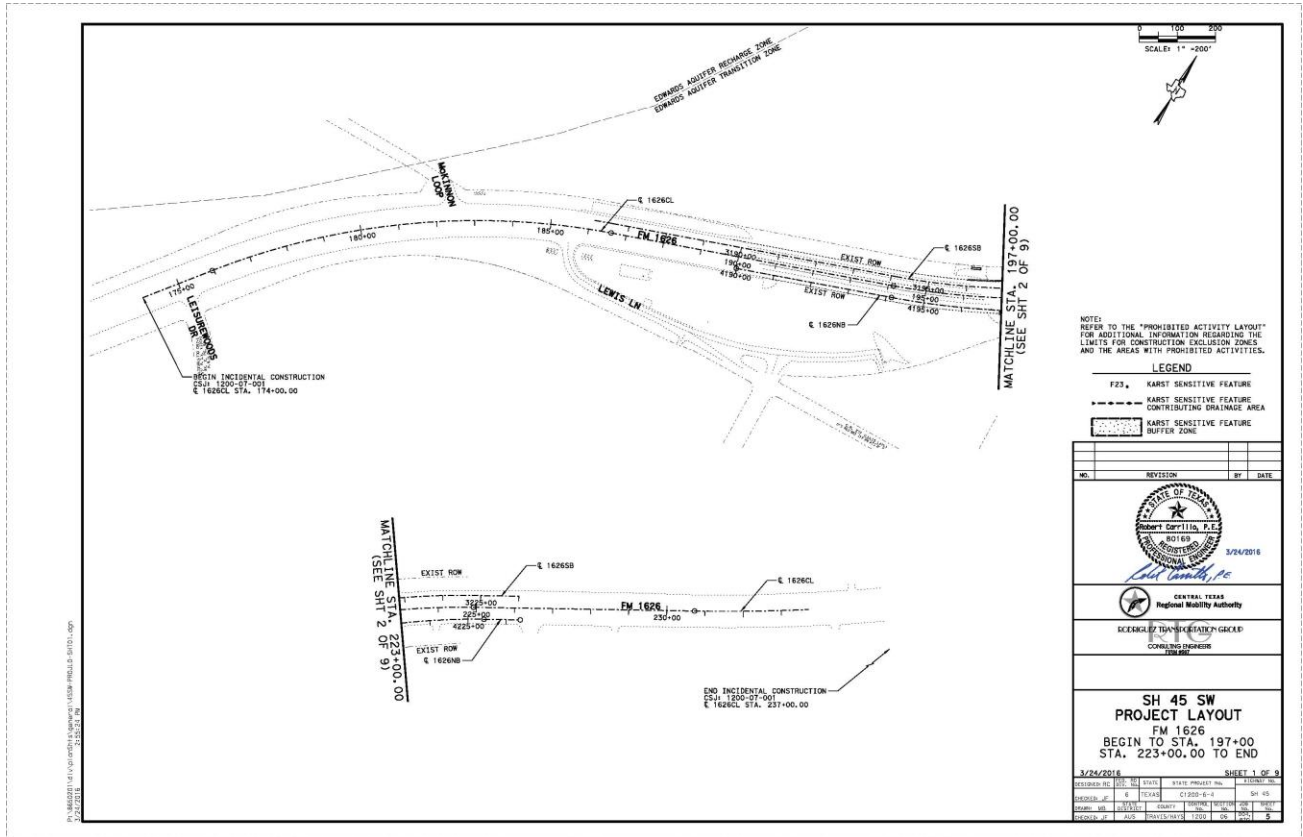
The Project Schedule shall be developed to incorporate the milestone dates established for this Work Authorization No. 14 as presented in *ATTACHMENT F*.

[END OF SECTION]

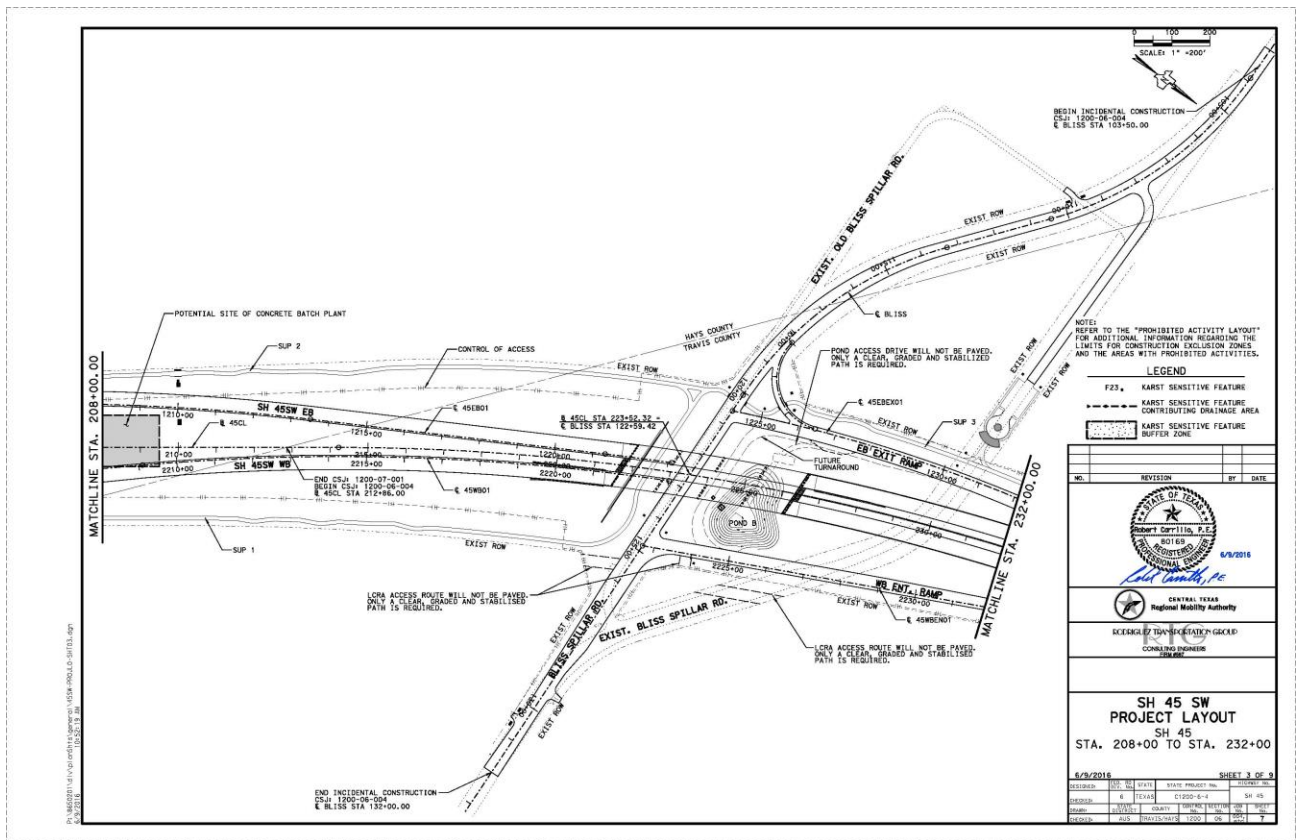
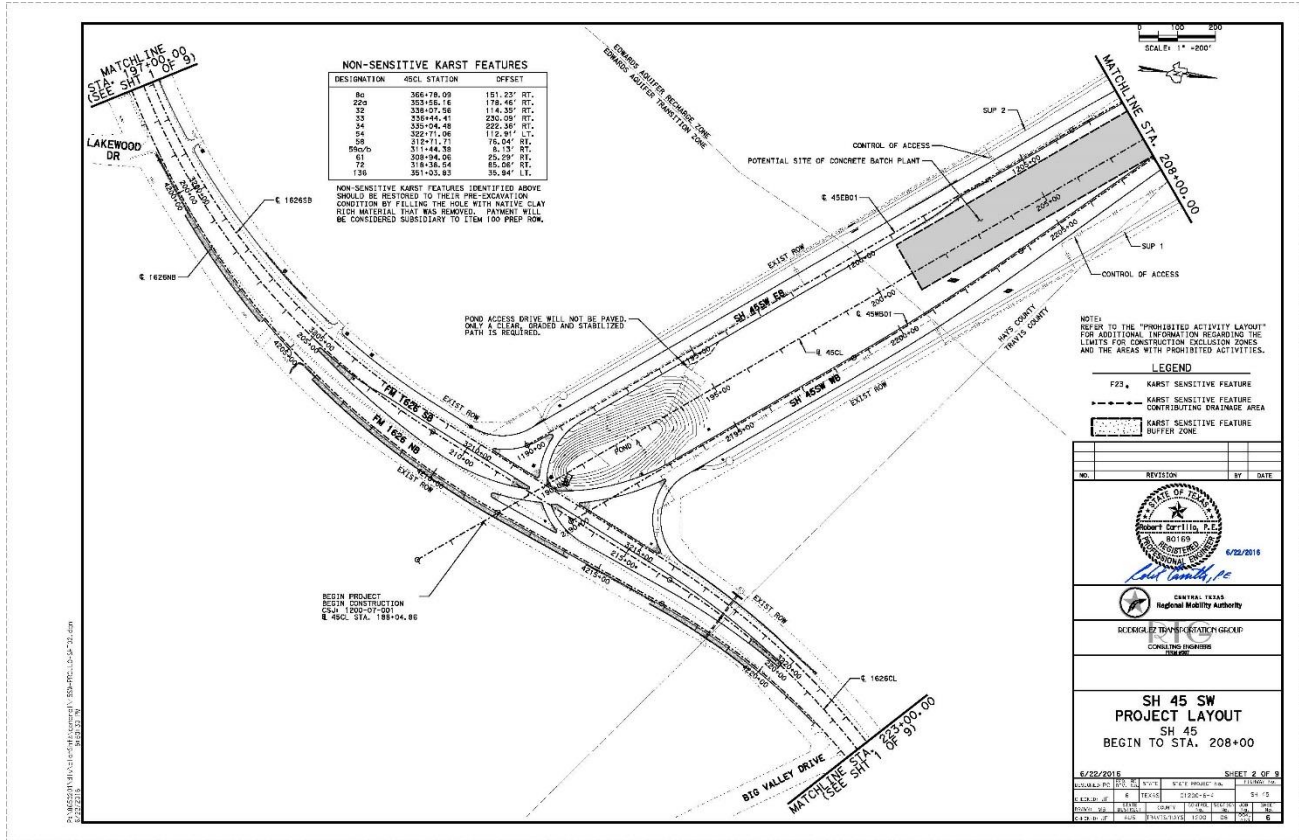
# ATTACHMENT B

## Toll System Layout

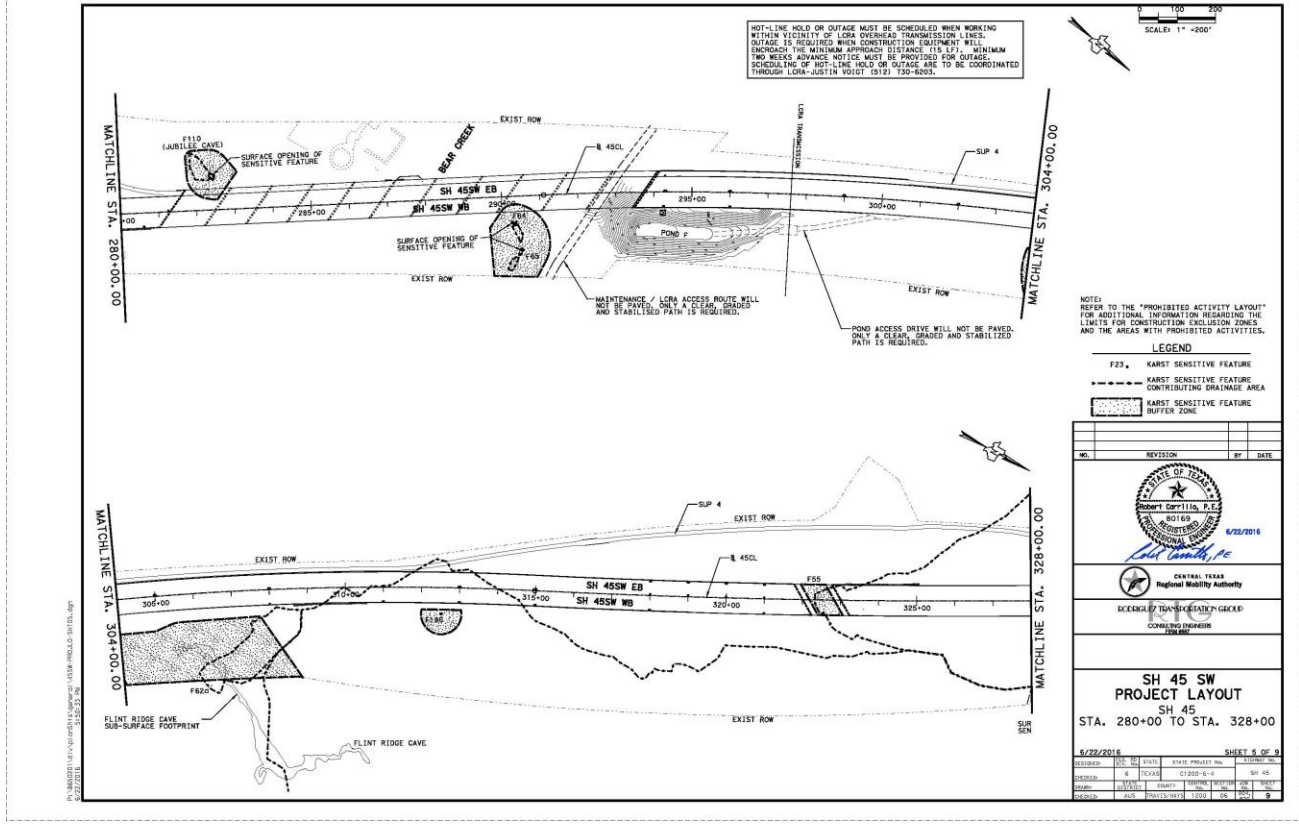
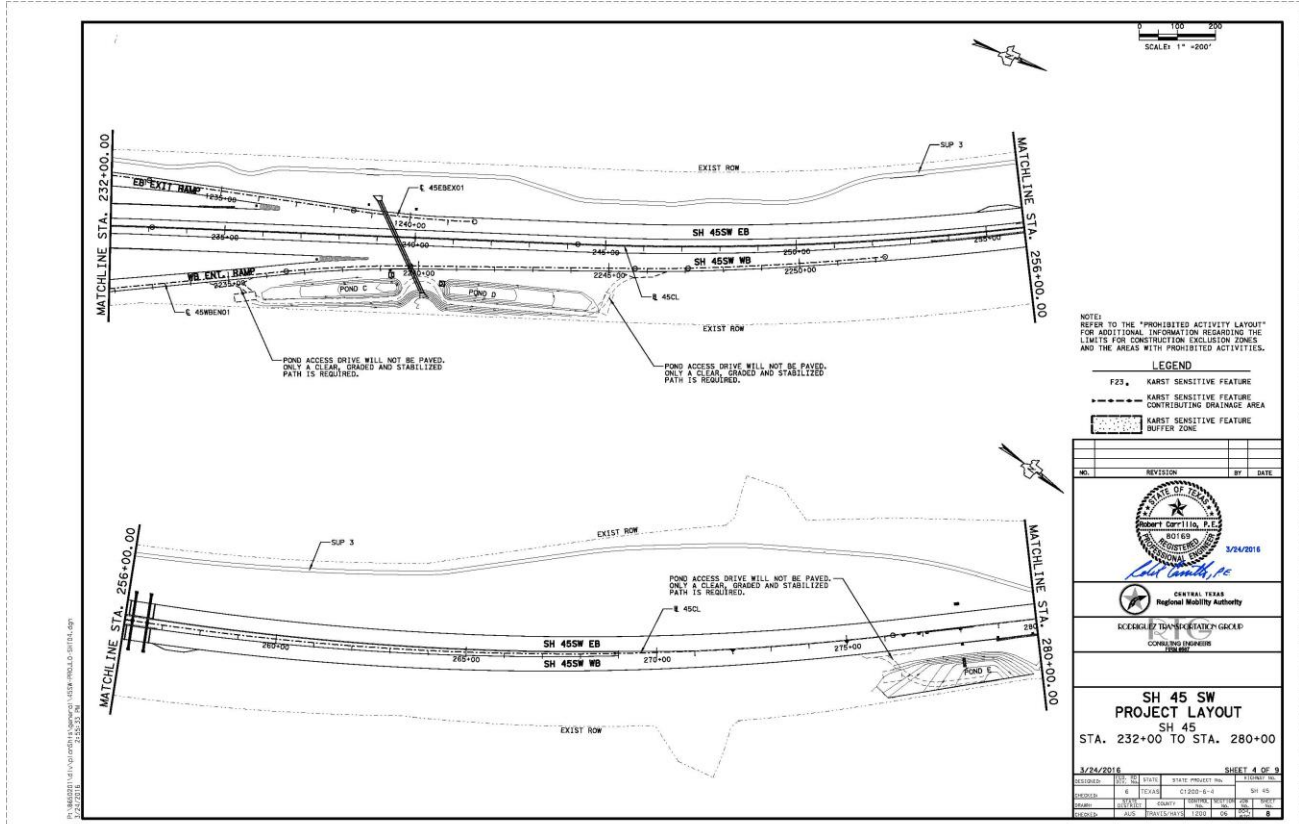
### State Highway 45 SW Project



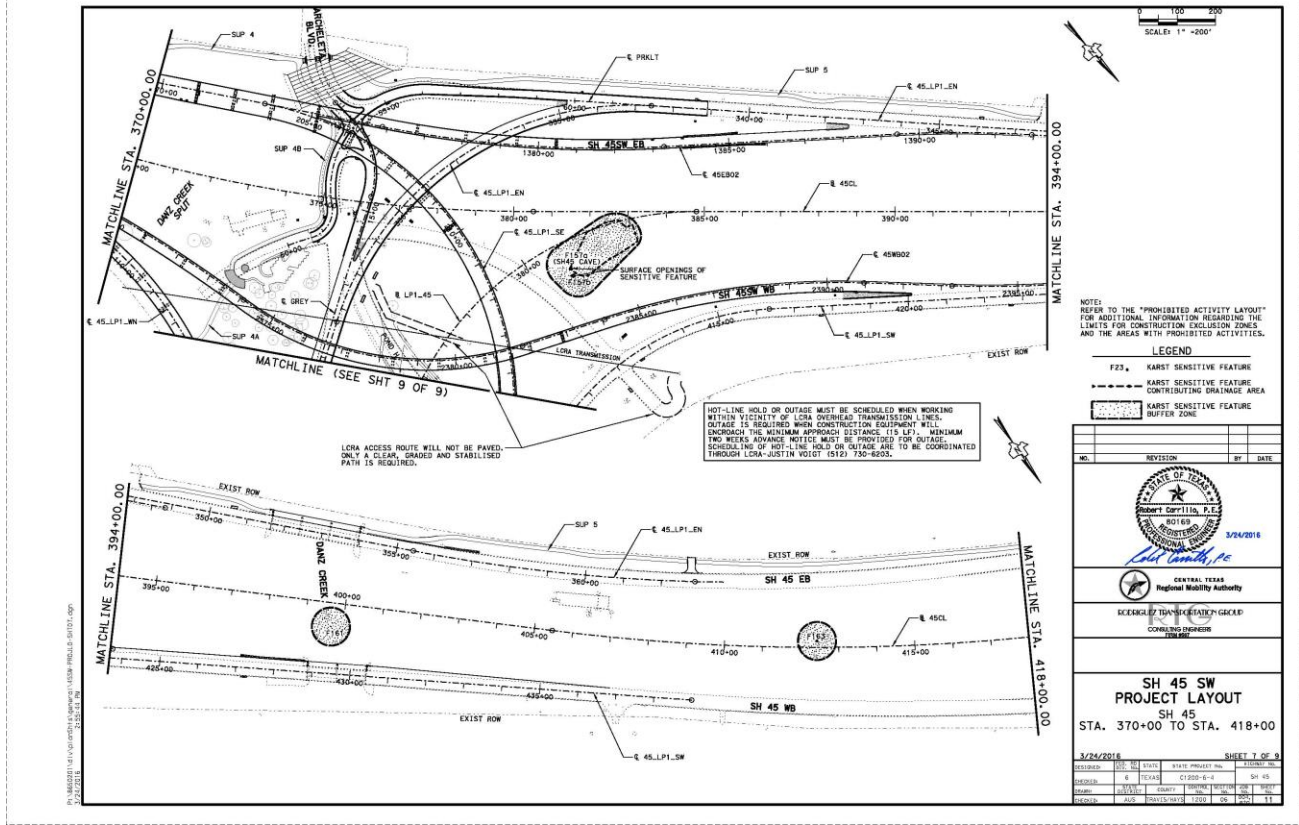
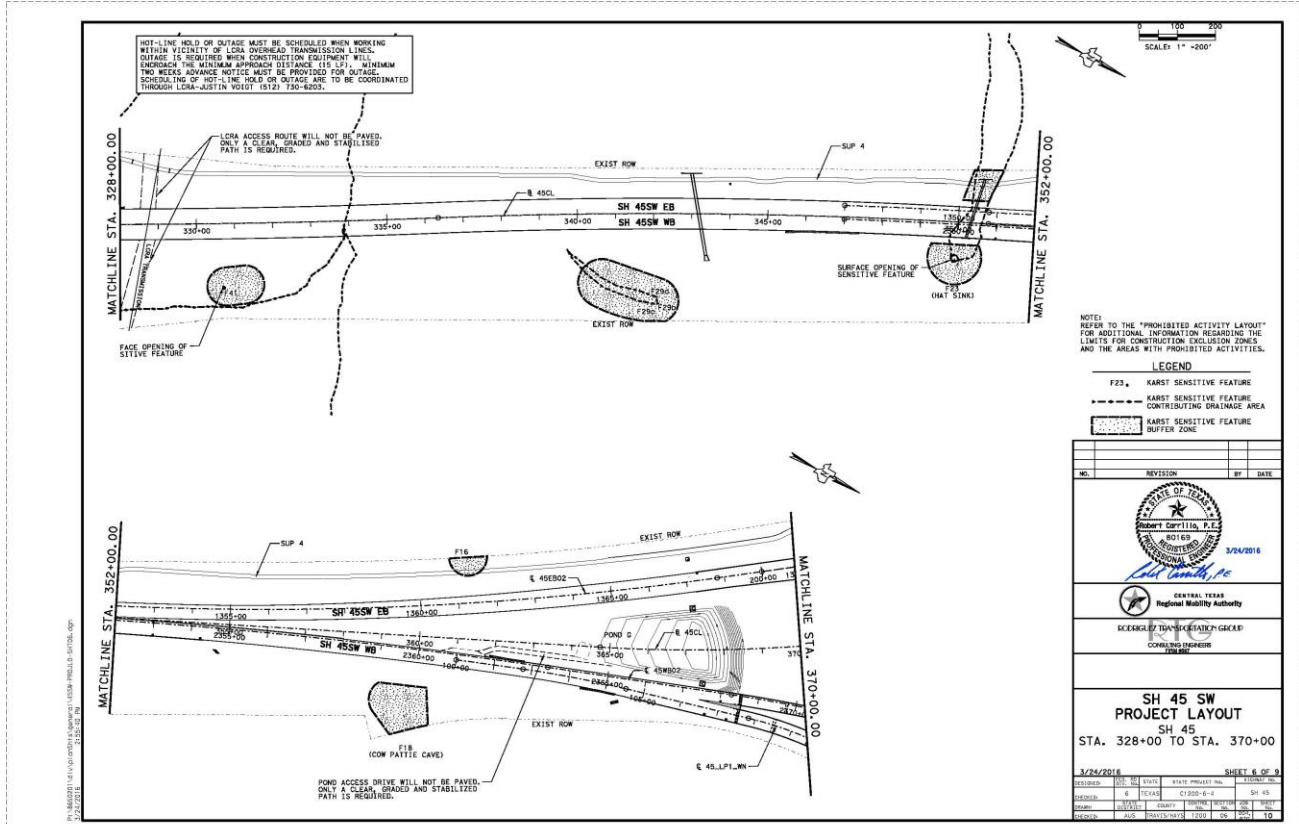
# Toll System Implementation Work Authorization No.14



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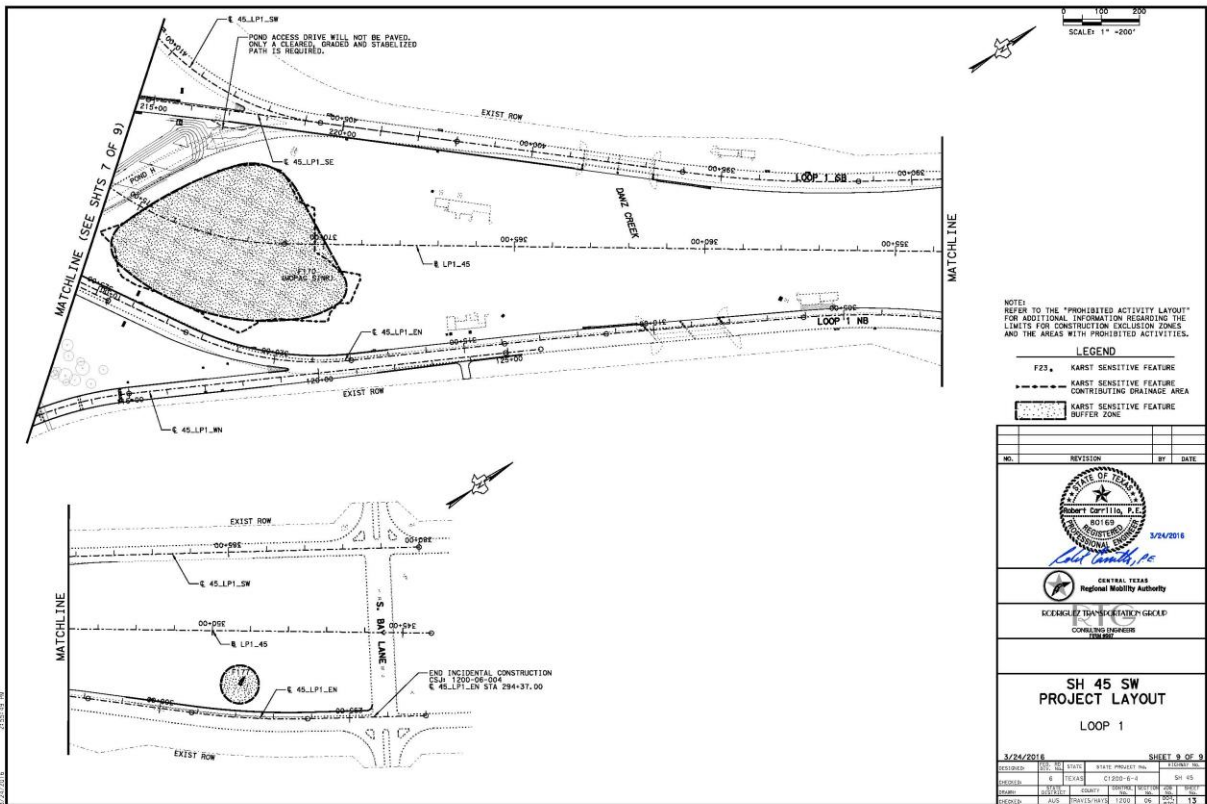
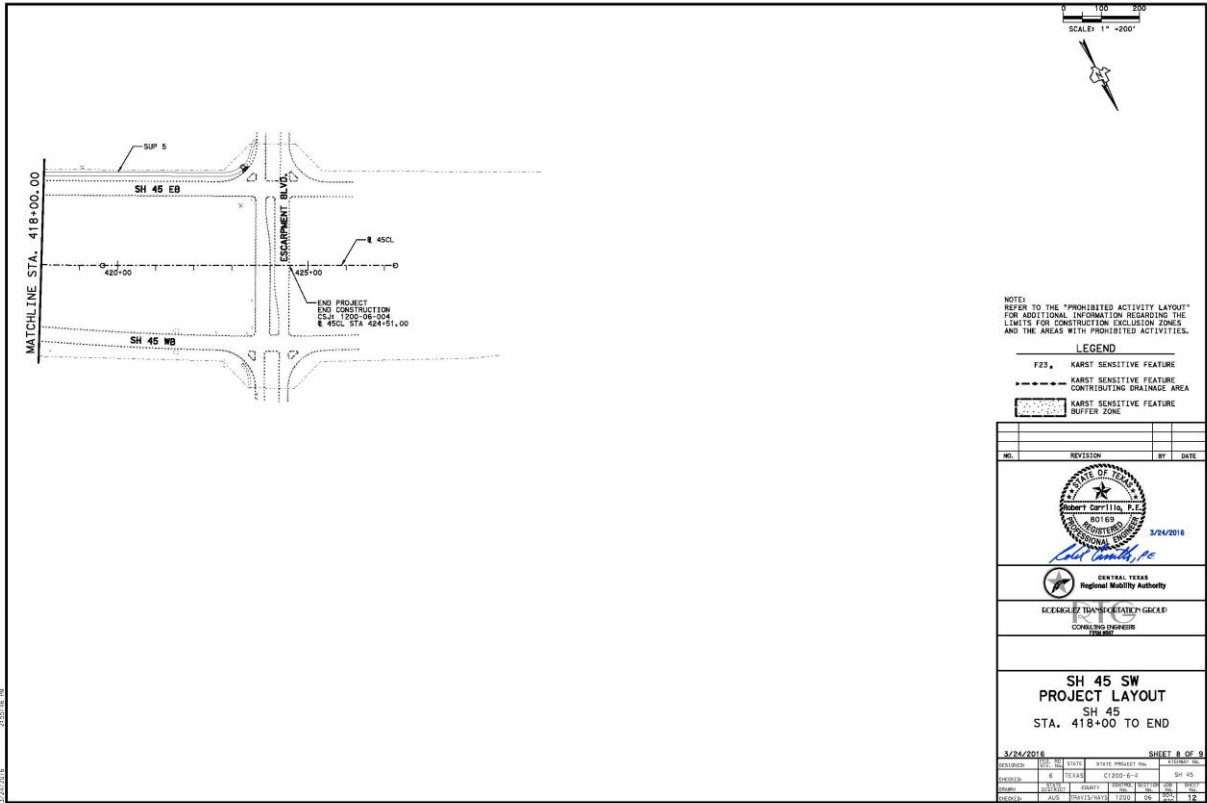


# Toll System Implementation Work Authorization No.14





# Toll System Implementation Work Authorization No.14



**ATTACHMENT C**

**Toll Facilities and ITS Responsibility Matrix**

State Highway 45 SW Project

Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S		Coordination Responsibility Only: C			No Responsibility: N	
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	

GENERAL REQUIREMENTS							
Schedule	N	P	P	S	S	S	Contractor must accommodate and incorporate the SI scheduled activities into the project schedule. All schedule changes or updates which impact the SI tasks must be agreed to by the SI prior to submittal to CTRMA. A weekly schedule must be distributed and incorporate any SI updates or changes.
Request for Early Opening	N	P	P	S	S	S	The SI must be able to match schedule request for early opening. SI must be allowed early unencumbered access in order to meet early opening request.
Design Package – Installation and Electrical Design and Plans	P	P	P	C	N	C	Designer to incorporate all SI requirements and specifications into Structural and Electrical Design Packages. Contractor will coordinate installation activities with SI.
Grading	N	P	P	C	N	C	
Drainage		S	P	C	N	C	No culverts or pipes under tolling zones.
Utilities/Electrical Services	P	P	P	S	C	C	SI to provide specific power requirements for the Toll System to the Contactor. The contractor is to incorporate the toll facilities design and construct power utilities interface, and all power infrastructure. Contractor to provide power to the Toll System pad and ITS locations. SI to terminate power to their sites.”
Traffic Control/Safe work zone	N	P	P	S	N	C	SI to provide contractor detailed lane closure requirements and schedule for installation and testing.
Signing	N	P	P	C	N	S	All toll signing must be coordinated with and approved by CTRMA.
Striping	N	P	P	S	N	C	SI to coordinate striping with pavement loop locations. Contractor to coordinate with SI for loops installation and striping sequencing.
Lighting		P	P	S	C	S	Roadway and toll location lighting provided by contractor. SI to provide lighting requirements in vicinity of toll locations and locations of other Toll System equipment. Contractor to confirm that lighting does not obstruct toll

Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S	Coordination Responsibility Only: C			No Responsibility: N		
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	
							related signing or impede the Toll System.
Landscaping	P	P	P	C	N	N	
Fencing/Guardrail/Bollards /Concrete Barrier	P	P	P	S	C	C	SI to provide requirements for specific equipment clearances for Toll System. Designer to incorporate into roadway design. SI to confirm that design plans meet requirements.
<b>TOLL SYSTEM: LOCATIONS, LAYOUTS, STRUCTURES, MOUNTS/BRACKETS</b>							
Locations and Layouts	P	P	P	S	C	C	SI to provide specific locations for the Toll System. SI to provide requirements for specific lane and facility layouts. Designer to incorporate into Design Packages. The contractor will coordinate with SI during the installation activity.
Gantries/Foundation/Trusses/Junction boxes/Conduits/Grounding	P	P	P	S	C	S	SI to provide requirements for conduits (for SI installed power and communications cables, including specific requirement for below ground conduits for the loops), junction boxes, and power needs for the Toll System. The Designer to incorporate into structural design, including electrical grounding, bonding. Contractor to provide and install junction boxes and conduit pull strings and bell ends for all conduits up to one foot above pole and gantry foundation. The contractor will require SI to sign off on below ground conduits for the loops prior to installation of special pavement structure.
Gantries/Foundation/Trusses/Junction boxes/Conduits/Grounding	N	P	P	S	C	S	Contractor will provide conduits/wire ways on all the toll gantries for all the SI equipment.
Equipment Mounts on Brackets/Frames	S	N	P	P	P	P	SI to procure and install all Toll System equipment mounts, and related cable and wiring, including communications from roadside cabinets to the equipment mounted on the gantries. SI to provide requirements for all brackets and frames needed to attach SI procured equipment. Contractor to furnish and install necessary brackets (i.e. Trapeze) as per

Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S			Coordination Responsibility Only: C			No Responsibility: N
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	
							SI requirements
Equipment Brackets/Frames on Gantries	S	P	P	S	N	S	<p>The contractor is to provide and install all brackets and frames needed to attach all SI procured equipment.</p> <p>SI to provide locations for installation to the contractor.</p> <p>SI to provided requirements for hanger and orientation of hanger mount to Gantries</p>
Pavement structure, including special nonferrous zones and conduit stub-outs for in-pavement sensors/loops	P	P	P	S	N	C	SI to provide requirements for special pavement structure at toll gantry areas. SI shall coordinate joint spacing to avoid conflicts with loop placement and sign off on riser locations before concrete pour. Contractor to assure ferrous objects (i.e. rebar, grates, pipes, etc.) are not in toll revenue collection detection system(s) zone of influence. Contractor to located loop risers after pavement is poured.
<b>EQUIPMENT CABINETS</b>							
Toll Equipment Cabinets	C	C	S	S	P	P	SI to provide size and number of cabinets needed for Toll System. Contractor shall incorporate location into site grading and drainage. SI to procure and install environmentally controlled cabinets. The environmentally controlled enclosures provided by SI must comply with the America Society of Heating, Refrigeration, and Air Conditioning Engineers: Thermal Guidelines for Data Processing Environments. Contractor to provide traffic control devices and safe working conditions for SI during installation of all toll equipment.

Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S			Coordination Responsibility Only: C			No Responsibility: N
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	
Toll Equipment Cabinets Site (TEC) and Roadside Equipment Cabinet Base Slabs	P	P	P	S	N	S	SI to provide requirements for specific equipment weight and anchorages for cabinets to the Contractor. Contractor to incorporate into Roadway Design. Contractor to install slabs with conduit plumbing.
Security Communications at Toll System locations	C	N	C	P	P	P	SI to provide security communications for all toll system equipment. Contractor to provided physical security fence as required by SI around TEC/Generators and Auxiliary fuel tanks
Facility Security	P	P	P	S	C	C	Designer to incorporate into the Roadway Design. Contractor to provided physical security fence as required by SI around TEC/Generators and Auxiliary fuel tanks
<b>TOLL SUB-SYSTEMS</b>							
Automatic Vehicle Identification (AVI) Antennas and Readers	N	N	S	P	P	P	SI to provide AVI System Mounts, Wiring and Cables. SI will perform all AVI system installation and terminations, and to make the connections to the electronics in the cabinets.
Automatic Vehicle Classification and Detection (AVC) and (AVD)	N	N	S	P	P	P	SI to install, connect and terminate AVC and/or AVD System mounted on the gantries and/or installed in the pavement to the electronics in the cabinets.
In-Pavement Sensors/Loops	N	N	S	P	P	P	SI to saw cut pavement, procure, install, and seal pavement sensors with approved sealant. Contractor to assure ferrous objects (i.e. rebar, grates, etc.) are not in toll collection detection system(s) zone of influence. Contractor to assure longitudinal and Transverse pavement joints in the non-ferrous pavement section in the Toll Zone do not conflict with SI conduit stub-up array in pavement section.
Video Capture Sub-System (VCS/VES) Cameras, Illumination, Sensors and Servers	N	N	S	P	P	P	SI to provide, install, terminate all Video Capture Sub-System (VCS/VES) equipment.
In-Lane Processing Servers and Electronics	N	N	N	P	P	P	SI to provide, installs, connects, and terminates all electronics in the cabinet and assures proper communications to the devices on the gantry and/or in the pavement.

Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S	Coordination Responsibility Only: C			No Responsibility: N		
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	
<b>POWER DISTRIBUTION SUB-SYSTEM</b>							
Metered power service at each location:	N	P	P	C	N	C	SI to provide power requirements and special requirements for construction of utilities near each Toll System. Contractor to provide and install necessary conductors, ducts and junction/pull boxes, bell ends/pull strings and disconnect switch/fuse at the meter. Contractor is responsible for wiring up to the ATS.
Metered power service at each toll location:	C	N	C	P	P	P	The SI shall provide and install all other wiring, switches, surge protection/suppression, etc. for power from the ATS at the toll pad for the Toll System equipment. SI will terminate all power wiring for all branch circuits off the Service Panel to the Toll Site.
Generators and Automatic Transfer Switches (ATS)	S	N	C	P	P	P	SI to provide generators, ATS, generator cabinets, wiring, connect and terminate all power at the Toll System sites.
Generator Power Source is propane	S	N	C	P	P	P	The SI shall provide, and install the propane tank for the generator. Contractor will provide pad and conduit feed for propane fuel tank (10' minimum from generator).
Uninterruptible Power Supplies (UPS)	S	N	C	P	P	P	SI to provide and install Uninterruptible Power Supply Systems (UPS) in the cabinets. UPS will be required for the Toll System.
Lightning Protection and Grounding	N	P	P	S	C	C	SI to provide specific requirements for equipment lightning protection and grounding. Contractor to furnish and install required lightning protection and grounding.
<b>COMMUNICATIONS SUB-SYSTEMS</b>							

Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S	Coordination Responsibility Only: C			No Responsibility: N		
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	
Conduits/Ducts and Junction/Pull Boxes/Outlets	C	P	P	S	C	S	SI to provide specific Communications design requirements including location of long-radius sweep conduit bends. Contractor to incorporate into the roadway design. The contractor will install including conduits, junction boxes, bell ends with pull strings. The Contractor shall verify that all ducts bank and conduits are clear and have pull strings prior to the beginning of the Toll System installation.
Fiber Optic cabling in conduits for Toll System	S	S	S	P	P	P	SI to provide fiber requirements for Toll System. Contractor to incorporate into design of backbone and laterals. SI to furnish and install along the corridor from communication hub to cabinets.
Toll Hardware in Cabinets	C	N	C	P	P	P	SI to provide and install all toll hardware within the cabinets. Equipment must be installed in a clean and organized manner and must not be affected by the environmental controls. The SI must provide and install the redundant environmental controls.
Routers	C	N	C	P	P	P	SI to provide, install and configure the routers for connection from hub locations to the Mobility Authority's Traffic Management Center. (TMC)
Hubs	N	N	C	P	P	P	If applicable.
Switches	N	N	C	P	P	P	SI to provide, install and configure the switches for connection from tolling to hub locations.
Firewalls	N	N	C	P	P	P	SI to provide, install and configure the necessary firewall for the toll system
Patch/Distribution Panels	N	N	C	P	P	P	SI to provide and install all the necessary patch and distribution panels to provide Fault Tolerant Single Mode Fiber Optic IP-Based Communication System.
Corridor Communications System	S	N	C	P	P	P	SI to provide Fault Tolerant Single Mode Fiber Optic IP-Based Communication System for Toll Revenue Collection Systems.



Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S		Coordination Responsibility Only: C			No Responsibility: N	
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	
Corridor to Traffic Management Center(TMC)	N	N	N	P	P	P	SI to provide Fault Tolerant IP-Based Communication System to the TMC for Toll Revenue Collection Systems.
Data/Communications Service to each Tolling Location	N	N	N	P	P	P	SI to install any power and communications cable required to interface between the Toll Cabinet and the Communications Service Provider's POI. Contractor is responsible for the conduit infrastructure to provide a raceway from the Toll Pad to the Service POI
<b>SYSTEMS SERVERS AND SPACE</b>							
Toll Collection Systems Computer(s)	N	N	N	P	P	P	
Support Equipment at CTRMA Offices	N	N	N	P	P	P	SI to provide data and power wiring schematics, equipment rack/cabinet requirement, and elevations, layouts, floor plans, air flow diagrams, and environmental controls load calculations, electrical power distribution, including grounding, bonding, lightning protection, panel boards, TVSS, circuit breakers conduit, conductors, j-boxes, receptacles.
Systems Servers and Workstations	N	N	C	P	P	P	SI to provide, install and configure all system servers and workstations required at the TMC to support the operations and management of the Project.
Federal Communication Commission License Preparation and Submission	C	N	N	P	P	P	SI to provide all information necessary to acquire FCC Licensing to the Mobility Authority.

Responsibility Assignment Legend							
Primary Responsibility: P	Support Responsibility: S	Coordination Responsibility Only: C			No Responsibility: N		
Element/Task/Component/ Sub-system	Designer	Contractor		Systems Integrator (SI)			Comments Other Responsibility/Information
	Design	Procure	Install/ Construct	Design	Procure	Install / Construct	

DUCT BANK AND INTELLIGENT TRANSPORTATION SYSTEMS (ITS)							
New Duct bank	P	P	P	C	C	C	SI to provide requirements for new duct bank. Designer to incorporate into roadway design. SI to confirm that design plans meet requirements.
Fiber Installation	N	C	C	P	P	P	SI to provide, install and test the fiber.
Traffic Detection System (TDS) and CCTV Cameras: Pole/Post-Mounts, supports, wiring and cables	N	C	S	P	P	P	SI to provide requirements for traffic detection ground radar system mounts, conduits, power and data wiring, and cables. SI to procure, install and terminate TDS and CCTV Cameras including all communication and power wiring from the Contractor provided disconnect switch/fuse.
TDS and CCTV Cameras: Pole/Post-Mounts, cabinets, supports, wiring and cables	N	P	P	C	C	S	Contractor to provide and install poles , equipment cabinets, conduits, junction boxes, mounting supports, power wiring to a disconnect switch/fuse located in the base of the pole/post-mount. Contractor to provide pigtails at end of conduit runs.
DMS foundations, conduits, grounding, DMS support structure, and electrical services	P	P	P	S	C	C	
DMS, communications, and equipment enclosures	S	N	S	P	P	P	

**ATTACHMENT D**

**Fixed Price Tolling Standards**

State Highway 45 SW Project

ATTACHMENT D  
FIXED PRICE TOLLING STANDARDS



**CENTRAL TEXAS  
Regional Mobility Authority**

FIXED PRICE TOLLING STANDARDS  
2 - 4 LANES

ISSUED: NOVEMBER 2013

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# Toll System Implementation Work Authorization No. 14

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STANDARD PLANS & GUIDELINES

INDEX OF SHEETS

3	GN-1	GENERAL NOTES
4	ABB-1	ABBREVIATIONS
5	S-1	SYMBOLS USED
6	TC-1	TERMS AND CONDITIONS
7	ETC-1	EXAMPLE ETC CONFIGURATION
8	ETC-2	EXAMPLE ETC CONFIGURATION
9	ETC-3	EXAMPLE ETC CONFIGURATION
10	TES-1	TOLL EQUIPMENT SITE PLACEMENT DETAILS
11	P1-ML	MAIN LANE PAVEMENT JOINTING PLAN AND GROUND BOX LAYOUT
12	P1-RMP	RAMP PAVEMENT JOINTING PLAN AND GROUND BOX LAYOUT
13	P2-ML	GROUND BOX PLACEMENT AND CONDUIT RISER LOCATION (MAIN LANES)
14	P2-RMP	GROUND BOX PLACEMENT AND CONDUIT RISER LOCATION (RAMPS)
15	G1-ML	MAIN LANE GANTRY CROSS-LANE TANGENT ELEVATION VIEW
16	G2-RMP	RAMP GANTRY CROSS-LANE TANGENT ELEVATION VIEW
17	MG-1	TOLL GANTRY MISCELLANEOUS DETAILS
18	LP-1	LIGHTNING PROTECTION SYSTEM DETAILS
19	A1-A4	CONDUIT RISER DETAILS
20	DETAIL E1	TOLL GANTRY ELECTRICAL SINGLE-LINE DRAWING
21	DW-1	DRIVEWAY DETAIL
22	TAJ-1	TERMINAL ANCHOR JOINT - JOINTED
23	CATD-1	CONCRETE TO ASPHALT TRANSITION DETAIL
24	JC-1	JOINTED CONCRETE PAVEMENT

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P.E. Serial No.:	93753
Date:	15-NOV-2013

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CENTRAL TEXAS Regional Mobility Authority	
<b>FIXED PRICE TOLLING STANDARDS INDEX OF SHEETS</b>	
DESIGNED BY:	FEDERAL AID PROJECT NO.
6	2
DRAWN BY:	COUNTY
DW	TEXAS    AUS
CHECKED BY:	JOB    HIGHWAY NO.
KK	

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**GENERAL NOTES**

- 1 REFERENCE SHEET: THE SYSTEM INTEGRATOR SHALL PROVIDE A SUMMARY STATION AND OFFSET TABLE FOR ALL OF THE FOLLOWING FOR EACH GANTRY LOCATION:  
 AVDS & AVC ENTRY, MIDDLE, EXIT, AND AXLE CONDUIT RISERS (IF NECESSARY)  
 AVDS & AVC ENTRY, MIDDLE, EXIT, AND AXLE LOOPS (IF NECESSARY)
- 2 REFERENCE SHEET: THE DESIGN BUILDER SHALL PROVIDE A SUMMARY STATION AND OFFSET TABLE FOR ALL OF THE FOLLOWING FOR EACH GANTRY LOCATION:  
 GANTRY COLUMNS & TRUSSES  
 PAVEMENT SECTION JOINTS (JOINTS SHALL BE DESIGNED SO THAT NO LOOP CROSSES ANY JOINT)
- 3 TXDOT ELECTRICAL DETAIL SHEETS SHALL APPLY.
- 4 NATIONAL ELECTRIC CODE (NEC), NFPA 780, NESC REQUIREMENTS SHALL APPLY
- 5 TXDOT ITEM 618 SHALL GOVERN FOR ALL CONDUIT REQUIREMENTS
- 6 TXDOT ITEM 620 SHALL GOVERN FOR ALL ELECTRICAL CONDUCTOR REQUIREMENTS
- 7 TXDOT ITEM 624 SHALL GOVERN FOR ALL GROUND BOXES. HS-20 LOAD RATING REQUIREMENTS SHALL GOVERN IN ALL LOCATIONS SUBJECT TO TRAFFIC LOADING.
- 8 TXDOT ITEM 628 SHALL GOVERN FOR ALL ELECTRICAL SERVICES. THE DESIGN BUILDER SHALL CONTACT RESPECTIVE UTILITY FOR LOCATION OF ELECTRICAL SERVICE.
- 9 SITE CONDITIONS MAY REQUIRE MODIFICATION TO THE JCP TO EXISTING PAVEMENT TRANSITION.
- 10 DETAILS ARE SUBJECT TO REVISIONS PERIODICALLY AS REQUIRED BY SYSTEM INTEGRATOR TECHNOLOGIES.

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**FIXED PRICE  
TOLLING STANDARDS  
GENERAL NOTES**

GN-1

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DR	TEXAS	AUS	
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KK			HIGHWAY NO.

# Toll System Implementation Work Authorization No. 14

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## ABBREVIATIONS

ACI	AMERICAN CONCRETE INSTITUTE	LPS	LIGHTNING PROTECTION SYSTEM
ANT	AVI ANTENNA	LO"X"	LANE "NUMBER X"
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS	MSE	MECHANICALLY STABILIZED EARTH
ATS	AUTOMATIC TRANSFER SWITCH	NEC	NATIONAL ELECTRICAL CODE: NFPA 70
AVC	AUTOMATIC VEHICLE CLASSIFICATION	NESC	NATIONAL ELECTRIC SAFETY CODE
AVDS	AUTOMATIC VEHICLE DETECTION	NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
AVI	AUTOMATIC VEHICLE IDENTIFICATION	NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
AWG	AMERICAN WIRE GAUGE	N.T.S.	NOT TO SCALE
CCTV	CLOSED CIRCUIT TV	OSB	OVERHEAD SIGN BRIDGE
COMM	COMMUNICATIONS	PVC	POLYVINYL CHLORIDE CONDUIT
COSS	CANTILEVER OVERHEAD SIGN SUPPORT	RCP	REINFORCED CONCRETE PAVEMENT OR PIPE
C&G	CURB & GUTTER	RMC	RIGID METAL CONDUIT; SHD 40; GALVANIZED
CRCP	CONTINUOUSLY REINFORCED CONCRETE PAVEMENT	S1	LEFT SHOULDER LANE
EPEC40	EXTRUDED POLYETHYLENE ELECTRICAL CONDUIT NEMA TC-7 SCHEDULE 40	SCH 40	NEMA TC-2 NOMINAL PIPE SIZE SCHEDULE 40 CONDUIT
EPEC80	EXTRUDED POLYETHYLENE ELECTRICAL CONDUIT NEMA TC-7 SCHEDULE 80	SCH 80	NEMA TC-2 NOMINAL PIPE SIZE SCHEDULE 80 CONDUIT
GAL	GALVANIZED	SSTB	SINGLE SLOPE TRAFFIC BARRIER
GB	GROUND BOX	STA	CHAIN BASE ALIGNMENT STATION
GB"X"	GROUND BOX "X"	TEC	TOLL ELECTRONICS CABINET
GEN	GENERATOR	TDS	TRAFFIC DETECTION SYSTEM
GFRP	GLASS FIBER REINFORCED POLYMER	TVSS	TRANSIENT VOLTAGE SURGE SUPPRESSOR
ETC	ELECTRONIC TOLL CONFIGURATION	UL	UNDERWRITER LABORATORY
FOC	FIBER OPTIC CABLE	UPS	UNINTERRUPTABLE POWER SUPPLY
HDPE	HIGH DENSITY POLYETHYLENE CONDUIT	VES	VIOLATION ENFORCEMENT SYSTEM / VIDEO TOLLING
HMAC	HOT MIX ASPHALTIC CONCRETE		
HS-20	AASHTO TRUCK LOADING REFERENCE MODEL		
HSS	HIGH STRENGTH STEEL		
KW	KILOWATT		
JCP	JOINT REINFORCED CONCRETE PAVEMENT		
LP	LIQUEFIED PETROLEUM (GAS) / NATURAL GAS OR DIESEL MAY BE SUBSTITUTED FOR PROPANE (250 GALLON TANK)		

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<b>FIXED PRICE TOLLING STANDARDS ABBREVIATIONS</b>			
ABB-1			
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6	4		4
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DW	TEXAS	AUS	
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KE			HIGHWAY NO.







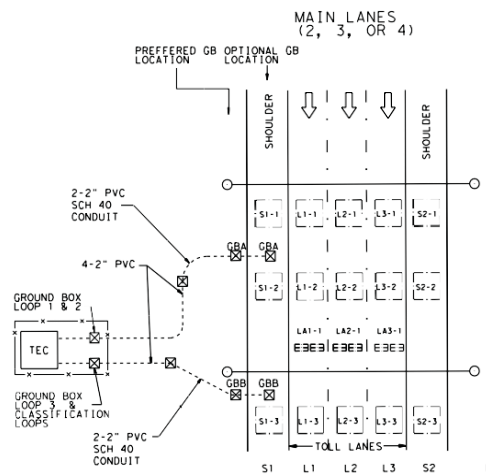


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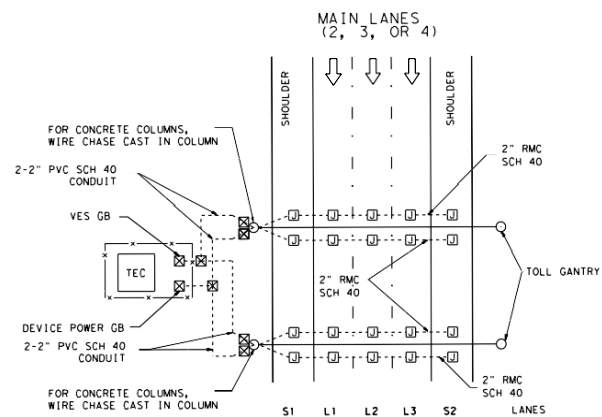
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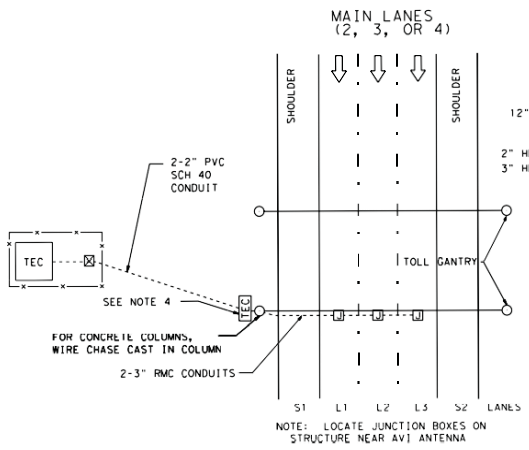


**DETAIL C-1  
MAINLANE VEHICLE DETECTION SCHEMATIC**  
NOTE: LOOP QUANTITY AND LOCATION TO BE SPECIFIED BY SYSTEM INTEGRATOR

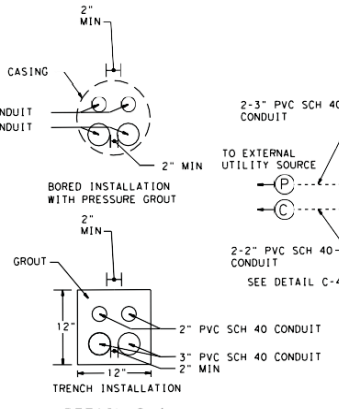


**DETAIL C-2  
VES CONFIGURATION**  
NOTE: LOCATE JUNCTION BOXES ON STRUCTURE OVER VES CAMERA

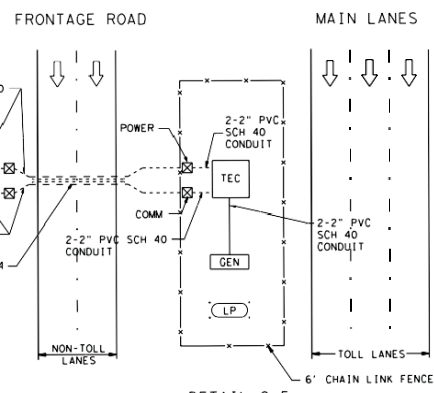
- NOTES:**
- 1) BORES SHALL BE PLACED AS SHOWN IN PLANS OR AS DIRECTED BY THE ENGINEER.
  - 2) RETAINING WALL SECTIONS SHALL REQUIRE 4-4" SCH 80 PVC CONDUITS FROM ROADWAY SHOULDER PULL BOX TO A PULL BOX LOCATED ON THE GROUND AT FACE OF RETAINING WALL.
  - 3) DETAIL C-1: MAXIMUM CABLE LENGTH FROM S1-1 AND S1-3 TO TEC SHALL NOT EXCEED 300'
  - 4) TEC TO BE MOUNTED ON COLUMN FOR STANDARD T800 STEEL COLUMNS. TEC TO BE MOUNTED ON CONCRETE PAD ADJACENT TO COLUMN FOR AESTHETIC COLUMNS. DESIGN BUILDER TO VERIFY LOCATION WITH MOBILITY AUTHORITY AND SYSTEM INTEGRATOR.
  - 5) FOR DETAILS OF TOLL COLLECTION SYSTEMS CONFIGURATION, COORDINATE WITH SYSTEM INTEGRATOR.
  - 6) GROUND BOXES LOCATED IN PAVEMENT SHALL BE PRECAST CONCRETE HS-20 LOAD RATED WITH REMOVABLE BOLTED COVER. NO FERROUS MATERIAL ALLOWED FOR GROUND BOXES.
  - 7) PROVIDE A MINIMUM OF 2" CLEARANCE BETWEEN TOP OF GROUT AND/OR CASING, AND BOTTOM OF PAVEMENT AND/OR CONCRETE STRUCTURE.
  - 8) SYSTEM INTEGRATOR OR MOBILITY AUTHORITY MUST APPROVE OF ALL DESIGN DRAWINGS.
  - 9) WIRES RUNNING IN COLUMNS SHALL EITHER BE IN THE COLUMN IN RECESSED CHASE OR IN CONDUIT FOR TRUSS COLUMNS.
  - 10) ALL GROUND/PULL BOX SIZES AND MODELS MUST BE APPROVED BY THE MOBILITY AUTHORITY OR SYSTEMS INTEGRATOR.
  - 11) FOR 2 MAIN LANES, REMOVE L3  
FOR 4 MAIN LANES, ADD L4



**DETAIL C-3  
AVI READER CONFIGURATION**  
SEE NOTE 7



**DETAIL C-4  
CONDUIT ENCASEMENT**  
SEE NOTE 7



**DETAIL C-5  
UTILITY POWER, BACKUP POWER, & TELECOMMUNICATIONS SCHEMATIC**

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FIXED PRICE  
TOLLING STANDARDS  
EXAMPLE ETC CONFIGURATION  
(MAIN LANES)

ETC-2

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CHECKED BY: KK	CONT.:	SECT.: JOB
		HIGHWAY NO.









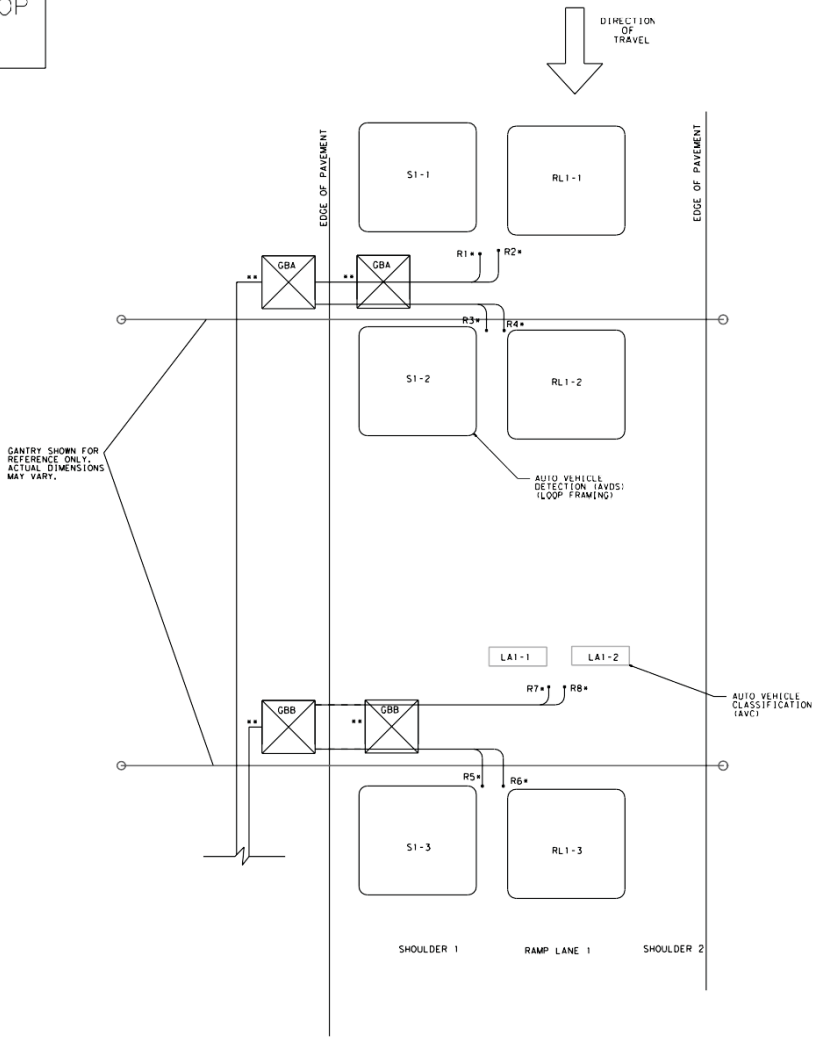




# Toll System Implementation Work Authorization No. 14

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SAMPLE LOOP  
LAYOUT



- GENERAL NOTES:
- 1) THE NUMBER AND LOCATION OF LOOPS AND RISERS TO BE SPECIFIED BY SYSTEM INTEGRATOR.
  - 2) NOT TO BE USED FOR LOOP PLACEMENT. MARK RISER LOCATION TO BE VERIFIED BY ENGINEER.
  - 3) PVC SEE DETAIL A2 "CONDUIT RISER DETAIL LOOP TAIL TO GROUND BOX CONDUIT TRENCH DETAIL".
  - 4) ADDITIONAL GBC'S MAY BE REQUIRED. COORDINATE NUMBER AND LOCATION WITH SYSTEMS INTEGRATOR.
  - 5) ALL GROUND/PILE BOX SIZES AND MODELS MUST BE APPROVED BY THE MOBILITY AUTHORITY OR SYSTEMS INTEGRATOR.
- SEE DETAIL A3 ON CONDUIT RISER DETAIL SHEET. RISER LOCATIONS TO BE SPECIFIED BY SYSTEMS INTEGRATOR.
  - SEE DETAIL A1, A4, ON CONDUIT RISER DETAIL SHEET. PREFERRED LOCATION FOR GROUND BOXES IS OUTSIDE OF PAVEMENT. IF INSUFFICIENT ROOM IS AVAILABLE OUTSIDE OF PAVEMENT, GROUND BOX SHALL BE HS-20 TRAFFIC RATED. IF GROUND BOX IS IN PAVEMENT, IT MUST BE NON-FERROUS.

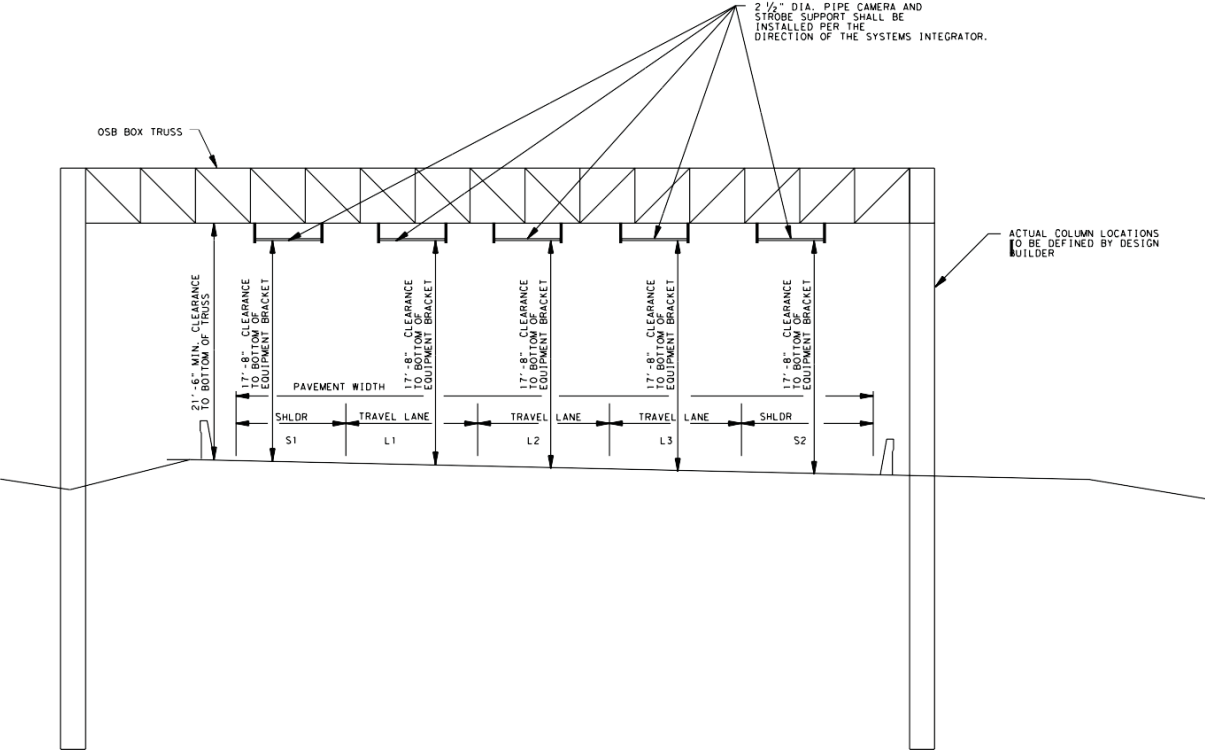
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 Document incomplete; not intended for permit, bidding or construction.  
 Engineer: KRIS Z. KELTNER  
 P.E. Serial No.: 93753  
 Date: 15-NOV-2013

NOT TO SCALE

		HNTB Corporation The HNTB Companies Engineers, Architects, Planners TYPE FIRM REGISTRATION NO. 1 420	
<b>FIXED PRICE TOLLING STANDARDS</b> <b>GROUND BOX PLACEMENT AND CONDUIT RISER LOCATION (RAMPS)</b> P2 - RMP			
DESIGNED BY:	6122-ND	FEDERAL AID PROJECT NO.	SHEET NO.
	6		14
DRAWN BY:	STATE	DIST.	COUNTY
	TX	AUS	
CHECKED BY:	CONT.	SECT.	JOB
			HIGHWAY NO.

# Toll System Implementation Work Authorization No. 14

Pen: Top level: \\ouad00\pwork\Jobs\4837-CTRM\Loop1-HL\Project Development\Design\CD\FTiles\p\on\MGR\0-11\17.dwg  
 Design: F:\homer\ouad00\pwork\Jobs\4837-CTRM\B3\Operations and Maintenance\10117.dwg New Fixed Price Tolling Standard\Main\Gantry\Tangent\Level\tagged and SDATE\ssssssssssssssss



- NOTES**
- TWO (2) BRACKETS ARE REQUIRED FOR EACH LOCATION SHOWN. BRACKETS SHALL BE ADJUSTABLE TO ALLOW FOR POSITIONING IN ACCORDANCE WITH THE SYSTEMS INTEGRATOR'S SPECIFICATIONS. DESIGN BUILDER MUST COORDINATE INITIAL PLACEMENT LOCATION WITH THE SYSTEMS INTEGRATOR.
  - WALKWAYS ARE REQUIRED TO BE INSTALLED ON ALL GANTRY TRUSSES. LADDERS ARE REQUIRED TO BE INSTALLED ON ALL GANTRY COLUMNS.
  - FOR 2 MAIN LANES, REMOVE L3. FOR 4 MAIN LANES, ADD L4.

QUANTITY OF BRACKETS:  
 2 LANES = 16 BRACKETS  
 3 LANES = 20 BRACKETS  
 4 LANES = 24 BRACKETS

INTENTIONAL VIEW ONLY  
 Document Incorporates: not intended for permit, bidding or construction.  
 Engineer: KRIS Z. KEITH  
 P.E., Serial No.: 23153  
 Date: 15-NOV-2013

NOT TO SCALE

**HNTB** HNTB Corporation  
 The HNTB Companies  
 Engineers Architects Planners  
 TYPE FIRM REGISTRATION NO. 420

CENTRAL TEXAS  
 Regional Mobility Authority

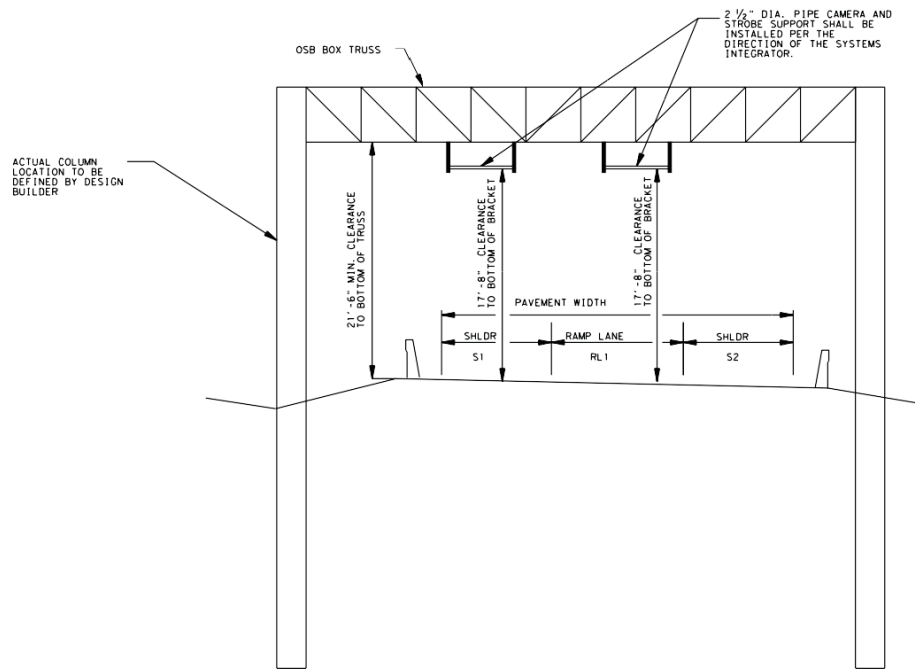
**FIXED PRICE  
 TOLLING STANDARDS  
 MAINLANE GANTRY CROSS-LANE  
 TANGENT ELEVATION VIEW**

G1-ML

DESIGNED BY:	DESIGN NO.	FEDERAL AID PROJECT NO.	SHEET NO.
6			15
DRAWN BY:	STATE	DIST.	COUNTY
DK	TEXAS	AUS	
CHECKED BY:	CONT.	SECT.	JOB HIGHWAY NO.
KK			

# Toll System Implementation Work Authorization No. 14

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 Scale: 1:10  
 \$DATE\$\$\$\$



- NOTES**
- TWO (2) BRACKETS ARE REQUIRED FOR EACH LOCATION SHOWN. BRACKETS SHALL BE ADJUSTABLE TO ALLOW FOR POSITIONING IN ACCORDANCE WITH THE SYSTEMS INTEGRATOR'S SPECIFICATIONS. DESIGN BUILDER MUST COORDINATE INITIAL PLACEMENT LOCATION WITH THE SYSTEMS INTEGRATOR.
  - WALKWAYS ARE REQUIRED TO BE INSTALLED ON ALL GANTRY TRUSSES. LADDERS ARE REQUIRED TO BE INSTALLED ON ALL GANTRY COLUMNS.

QUANTITY OF BRACKETS:  
1 RAMP LANE = 8 BRACKETS

INITIAL REVIEW ONLY  
 Document Incorporates: not intended for permit, bidding or construction.  
 Engineer: KRIS Z. KEITH  
 P.E. Serial No.: 33153  
 Date: 15-NOV-2013

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**HNTB** Corporation  
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Engineers Architects Planners  
TYPE FIRM REGISTRATION NO. 420

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Regional Mobility Authority

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**FIXED PRICE  
TOLLING STANDARDS  
RAMP CROSS-LANE  
TANGENT ELEVATION VIEW**

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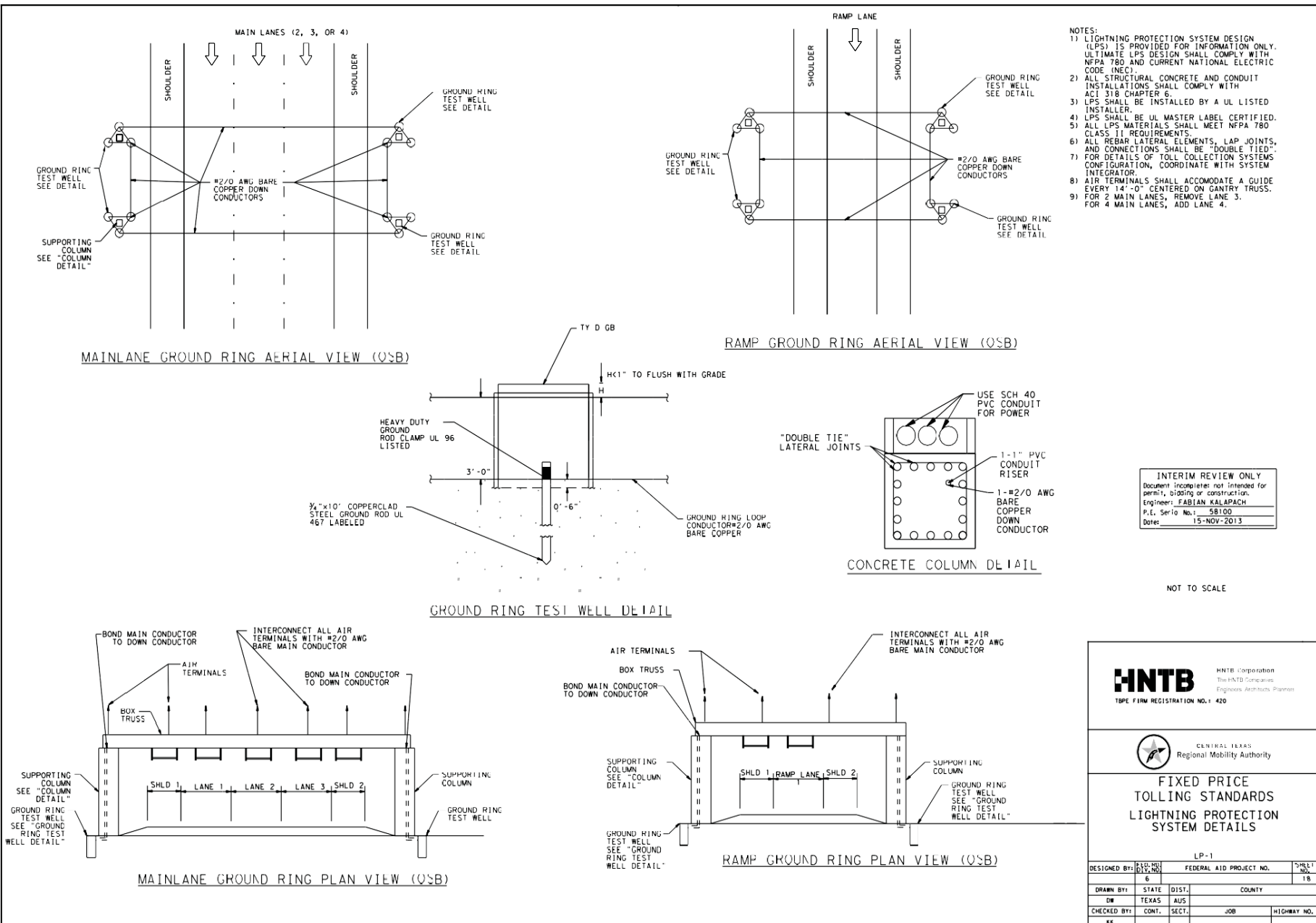
G2-RMP

<small>DESIGNED BY:</small>	<small>DESIGN NO.:</small>	<small>FEDERAL AID PROJECT NO.:</small>	<small>SHEET NO.:</small>
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<small>DRAWN BY:</small>	<small>STATE:</small>	<small>DIST.:</small>	<small>COUNTY:</small>
DK	TEXAS	AUS	
<small>CHECKED BY:</small>	<small>CONT.:</small>	<small>SECT.:</small>	<small>JOB:</small> <small>HIGHWAY NO.:</small>
KK			



# Toll System Implementation Work Authorization No. 14

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 Scale: 1:20



**INTERIM REVIEW ONLY**  
 Document incomplete: not intended for permit, bidding or construction.  
 Engineer: FABIAN KALBACH  
 P.E. Serial No: 58100  
 Date: 15-NOV-2013

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Engineers Architects Planners

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CENTRAL TEXAS  
Regional Mobility Authority

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**FIXED PRICE  
TOLLING STANDARDS  
LIGHTNING PROTECTION  
SYSTEM DETAILS**

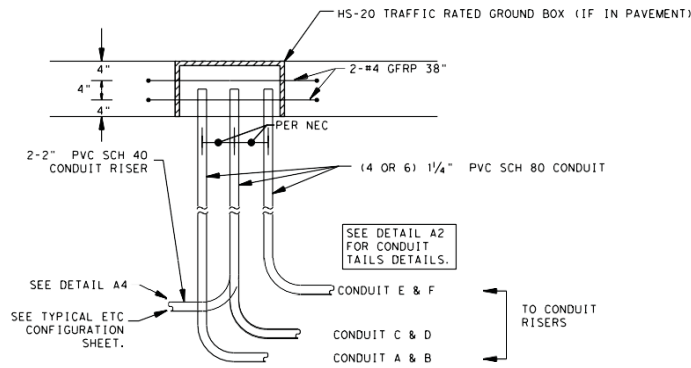
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LP-1

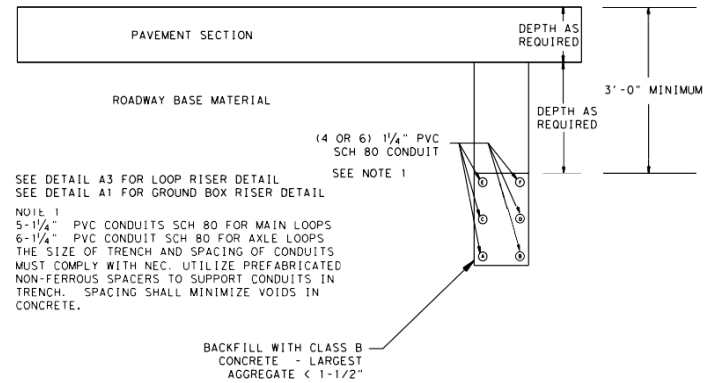
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6		18
DRAWN BY: STATE	DIST.	COUNTY
DR TEXAS	AUS	
CHECKED BY: CONT.	SECT.	JOB
KK		HIGHWAY NO.

# Toll System Implementation Work Authorization No. 14

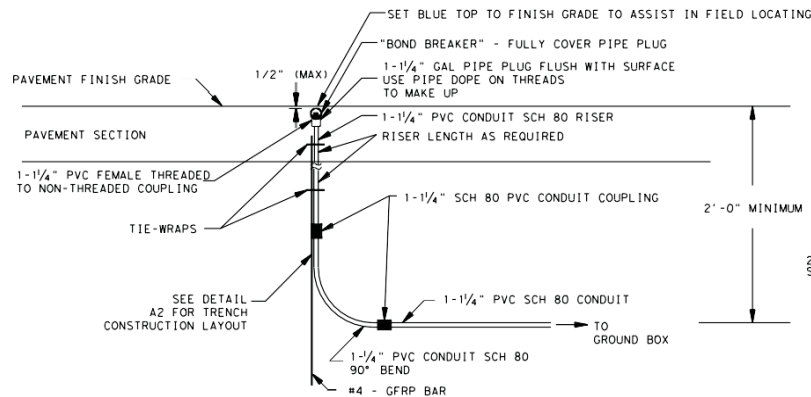
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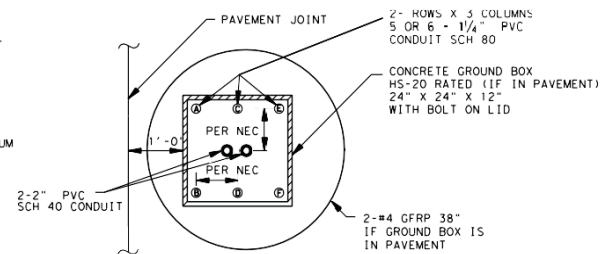
**CONDUIT RISER DETAIL A1**  
LOOP TAIL TO GROUND BOX  
CONDUIT TRENCH DETAIL



**CONDUIT RISER DETAIL A2**  
LOOP TAIL TO GROUND BOX  
CONDUIT TRENCH DETAIL



**CONDUIT RISER DETAIL A3**  
LOOP TAIL TO GROUND BOX  
CONDUIT LOOP RISER DETAIL



DETAIL A4

INTERIM REVIEW ONLY  
 Document incomplete - not intended for  
 permit, bidding or construction.  
 Engineer: KRIS Z. KEITH  
 P.E. Serial No. 93753  
 Date: 15-NOV-2013

NOT TO SCALE

**HNTB** HNTB Corporation  
The HNTB Companies  
Engineers, Architects, Planners  
TYPE FIRM REGISTRATION NO. 420

CENTRAL TEXAS  
Regional Mobility Authority

**FIXED PRICE  
TOLLING STANDARDS  
CONDUIT RISER  
DETAILS**

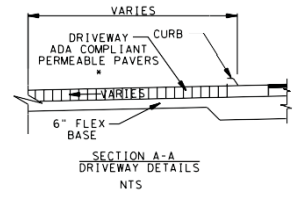
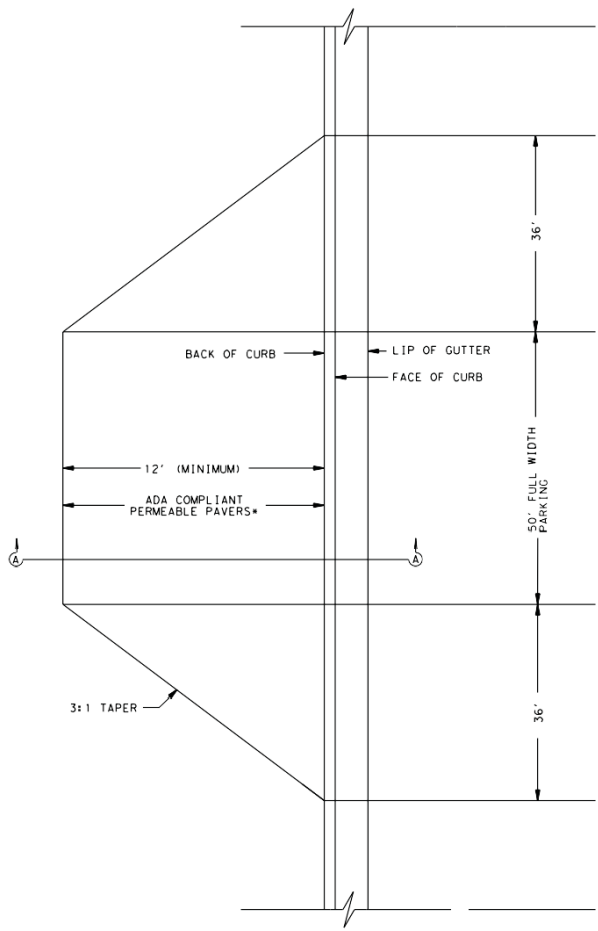
A1-A4

DESIGNED BY: KZ	DATE: 11/17/17	FEDERAL AID PROJECT NO.	SHEET NO. 19
DRAWN BY: 6	STATE: TEXAS	DIST.:	COUNTY:
CHECKED BY: KK	CONT.:	SECT.:	JOB:
			HIGHWAY NO.:



# Toll System Implementation Work Authorization No. 14

Plan Top: I:\out\00\work\Jobs\16837-CTBMA\Coord\1 ML UP-ProJect Development\Design\CD Files\SP of MPO\AC-11117.dgn  
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 Scale: 1:20  
 Printed on: SDAI1E\*\*\*\*\*



ENSURE GRADE BREAK DOES NOT EXCEED 8% UNLESS OTHERWISE DIRECTED.

DRIVEWAY CROSS SLOPE TO BE DESIGNED TO FACILITATE DRAINAGE AND SHALL NOT EXCEED +/- 5%. DRIVEWAY SECTIONS THAT CROSS EXISTING OR PROPOSED PEDESTRIAN FACILITIES SHALL NOT EXCEED +/- 2.0%.

PORTIONS OF DRIVEWAYS THAT OVERLAP PEDESTRIAN FACILITIES SHALL MEET ALL REQUIREMENTS OF PEDESTRIAN FACILITIES, INCLUDING TEXAS ACCESSIBILITY STANDARDS.

\*THE PERMEABLE PAVER SURFACE MAY BE CONCRETE IF SPECIFIED BY MOBILITY AUTHORITY. DESIGN-BUILDER TO CONFIRM SURFACE TYPE WITH MOBILITY AUTHORITY.

INTERIM REVIEW ONLY  
 Document incomplete: not intended for permit, bidding or construction.  
 Engineer: KRIS Z. KELLER  
 P.E. Serial No.: 93753  
 Date: 15-NOV-2013

NOT TO SCALE

**HNTB**  
HNTB Corporation  
 The HNTB Companies  
 Engineers, Architects, Planners  
 TYPE FIRM REGISTRATION NO. 1 420

CENTRAL TEXAS  
 Regional Mobility Authority

**FIXED PRICE  
 TOLLING STANDARDS  
 DRIVEWAY DETAIL**

DW-1

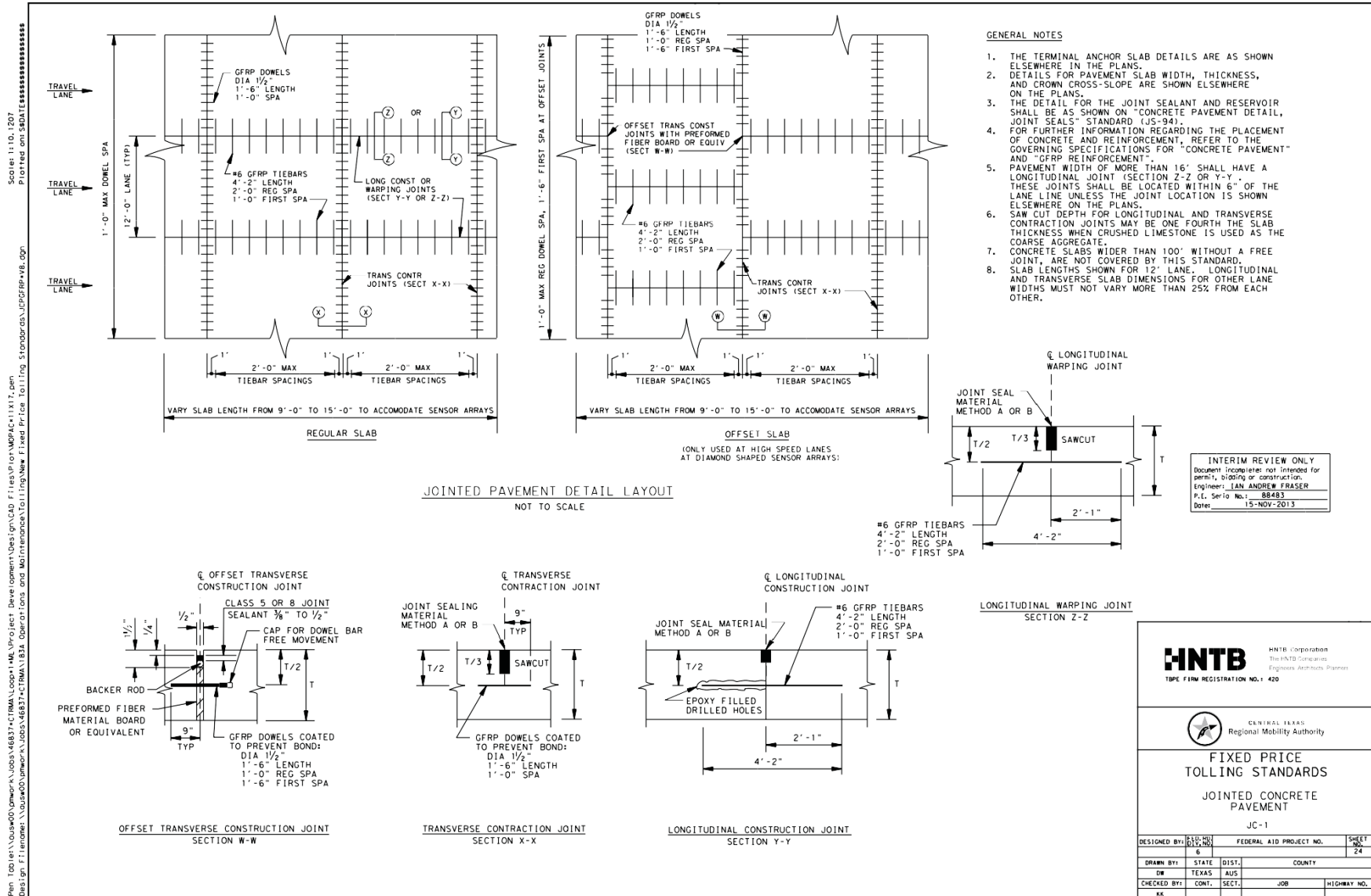
DESIGNED BY:	6130	FEDERAL AID PROJECT NO.:		SHEET NO.:	21
DATE:	6				
DRAWN BY:	STATE	DIST.:	COUNTY		
OR:	TEXAS	AUS			
CHECKED BY:	CONT.	SECT.:	JOB	HIGHWAY NO.	
XX					







# Toll System Implementation Work Authorization No. 14



## **ATTACHMENT E**

### **Price Sheet**

State Highway 45 SW Project

**Price Sheet**  
**Toll System Installation/Integration**  
State Highway 45 SW Project

Task No.	Description	Qty	Unit	Unit Price (US \$'s)	Extended Price (US \$'s)	Equipment / Subcontractors	Labor	Markup on Sub's & Equipment %	Total	Total Hours	
	System Integration										
1	Toll Zone - Materials / Equipment	1	Lot	617,840.96	617,840.96	514,867		102,973	20.0%	617,841	
2	Cooridor Devices - Equipment	1	Lot	408,445.76	408,445.76	340,371		68,074	20.0%	408,446	
3	Program Management	1	Lot	235,329.97	235,329.97		235,330			235,330	1,311
4	System Design & Documentation	1	Lot	183,990.19	183,990.19		183,990			183,990	1,242
5	SW Development	1	Lot	77,985.96	77,985.96		77,986			77,986	552
6	System Integration/Testing	1	Lot	191,187.54	191,187.54		191,188			191,188	1,224
7	Installation	1	Lot	376,701.30	376,701.30	134,054	215,837	26,811	20.0%	376,701	1,769
8	Fiber	1	Lot	255,683.01	255,683.01	198,361	17,650	39,672	20.0%	255,683	55
B	Bonding	1	LS	17,087.36	17,087.36	17,087				17,087	
	<b>TOTAL</b>				<b>2,364,252.06</b>	<b>1,204,741</b>	<b>921,981</b>	<b>237,531</b>		<b>2,364,252</b>	<b>6,153</b>

The Pricing shown above Excludes:

- All Recurring Data Communication Costs
- Lane Closures & MOT (if needed)
- Recurring 3rd-Party SW/HW Support Agreements & SW Licenses
- Spares Replenishment Costs
- System HW/SW Warranty/Maintenance Services & Support

Milestone-Based Payments for SH-45 Southwest System Implementation					
Payment Number	Payment Milestone	% Paid	Cum. % Paid	\$ Amount	Cum. \$'s
<b>A. Non-Equipment Cost</b>					
A-1	Notice to Proceed	7.5%	7.5%	111,805	111,805
A-2	Project Management Documents Approved (Baseline Project Management Plan, Project Schedule and Update Quality Assurance Plan)	7.5%	15.0%	111,805	223,609
A-3	System Design Documents Approved (System Requirements Document (SRD), Updated Business Rules Document (BRD) and System Detailed Design Document (SDDD)	10.0%	25.0%	149,073	372,682
A-4	Approval of Remaining Documents (Installation and Master Test Plans)	10.0%	35.0%	149,073	521,755
A-5	Approved Installation Drawing Packages	15.0%	50.0%	223,609	745,364
A-6	Approved Interface Test, Formal Full On-site First Installation Testing (OFIT) Completed	7.5%	57.5%	111,805	857,169
A-7	Approved and Approval of All Maintenance Manuals, Training Materials and User Manuals	7.5%	65.0%	111,805	968,973
A-8	All Sites Commissioned	7.5%	72.5%	111,805	1,080,778
A-9	Training Completed and Go-Live	7.5%	80.0%	111,805	1,192,582
A-10	Formal System Operational Testing Approved	10.0%	90.0%	149,073	1,341,655
A-11	SH-45 SW System Acceptance	10.0%	100.0%	149,073	1,490,728
<b>B. Hardware, Equipment and Off-the-Shelf Software</b>					
B-1	Ordering Verified	10.0%	10.0%	61,784	61,784
B-2	Purchased, Received and Verified	90.0%	100.0%	556,057	617,841
<b>C. Fiber</b>					
C-1	Start of Fiber Installation Activities	40.0%	40.0%	102,273	102,273
C-2	Fiber Installation Substantially Completed	52.5%	92.5%	134,234	236,507
C-3	Formal System Operational Testing Approved	7.5%	100.0%	19,176	255,683
<b>TOTAL</b>				<b>\$</b>	<b>2,364,252</b>

## ATTACHMENT F

### Preliminary Project Schedule and Milestones

#### State Highway 45 SW Project

*(Dates and durations subject to change.)*

<b>Task</b>	<b>Duration and/or Milestone Date</b>
Contractor Contract Executed	November 2016
Construction Duration (Approximate)	2.25 Years
Open to Traffic	February 2019