CENTRAL TEXAS
Regional Mobility Authority

March 29, 2017
AGENDA ITEM #11

Approve Work Authorization No. 14 with Kapsch Inc. for system integration services related to the SH 45SW Project

Strategic Plan Relevance:	Regional Mobility
Department:	Toll Operations
Contact:	Tim Reilly, Director of Toll Operations
Associated Costs:	$2,364,252.06 (not to exceed)
Funding Source:	Reimbursed with Project Funds
Action Requested:	Consider and act on draft resolution

Summary:

Under this proposed work authorization, Kapsch TrafficCom USA (formerly Schneider Electric) will provide toll system integration services related to project activities required to assist the Mobility Authority in the development of the SH 45SW project.

These efforts will include, but not be limited to the design, acquisition, installation, testing, and integration of a complete and fully operational toll collection system and intelligent transportation system.

Backup provided: Draft Work Authorization No. 14
Draft Resolution

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

RESOLUTION NO. 17-0XX

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 29th 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 N0. 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.

_____

Signature Date

_____

Typed/Printed Name and Title

CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY

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

_____

Signature Date

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 exiting 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

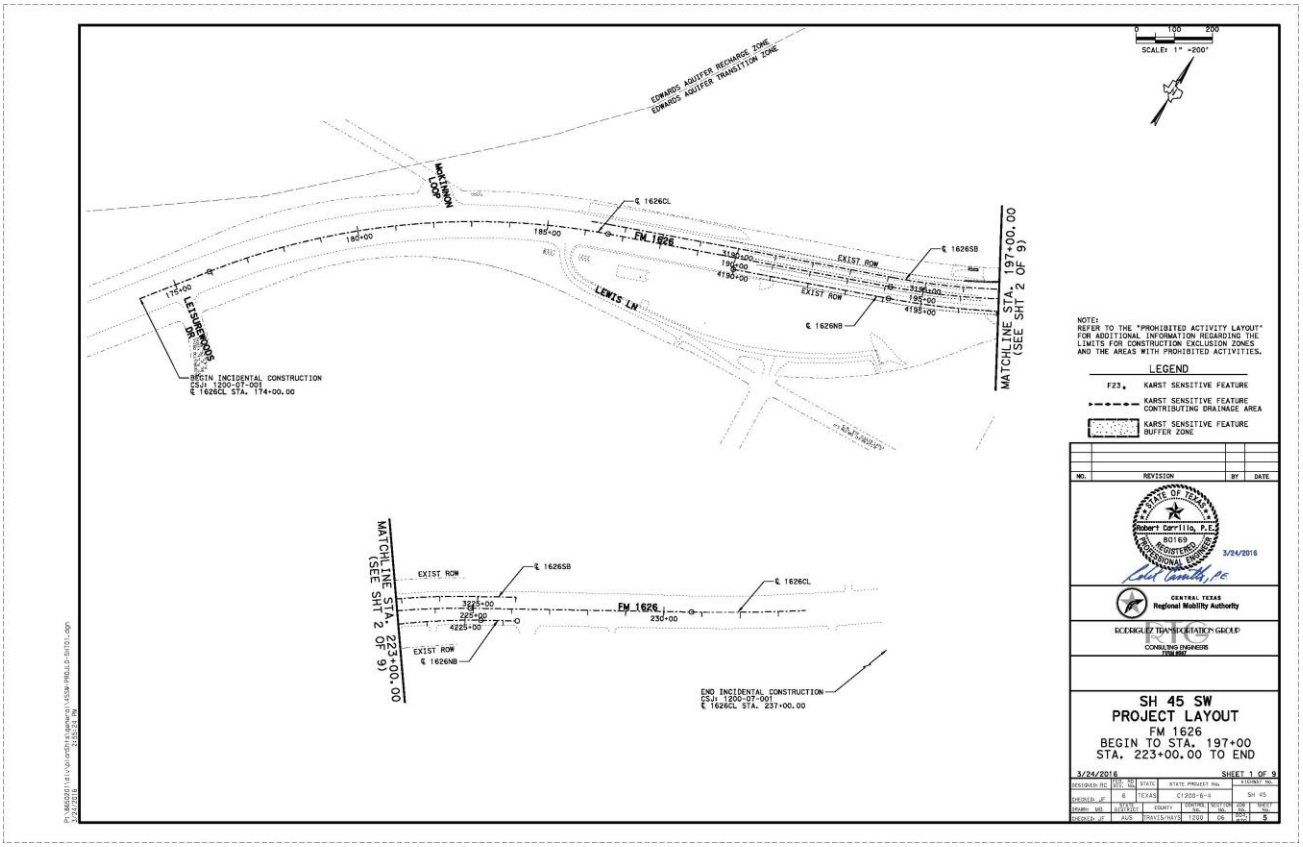
The Project Schedule shall be developed to incorporate the milestone dates established for this Work Authorization No. 14 as presented in ***ATTACHMENT F***.

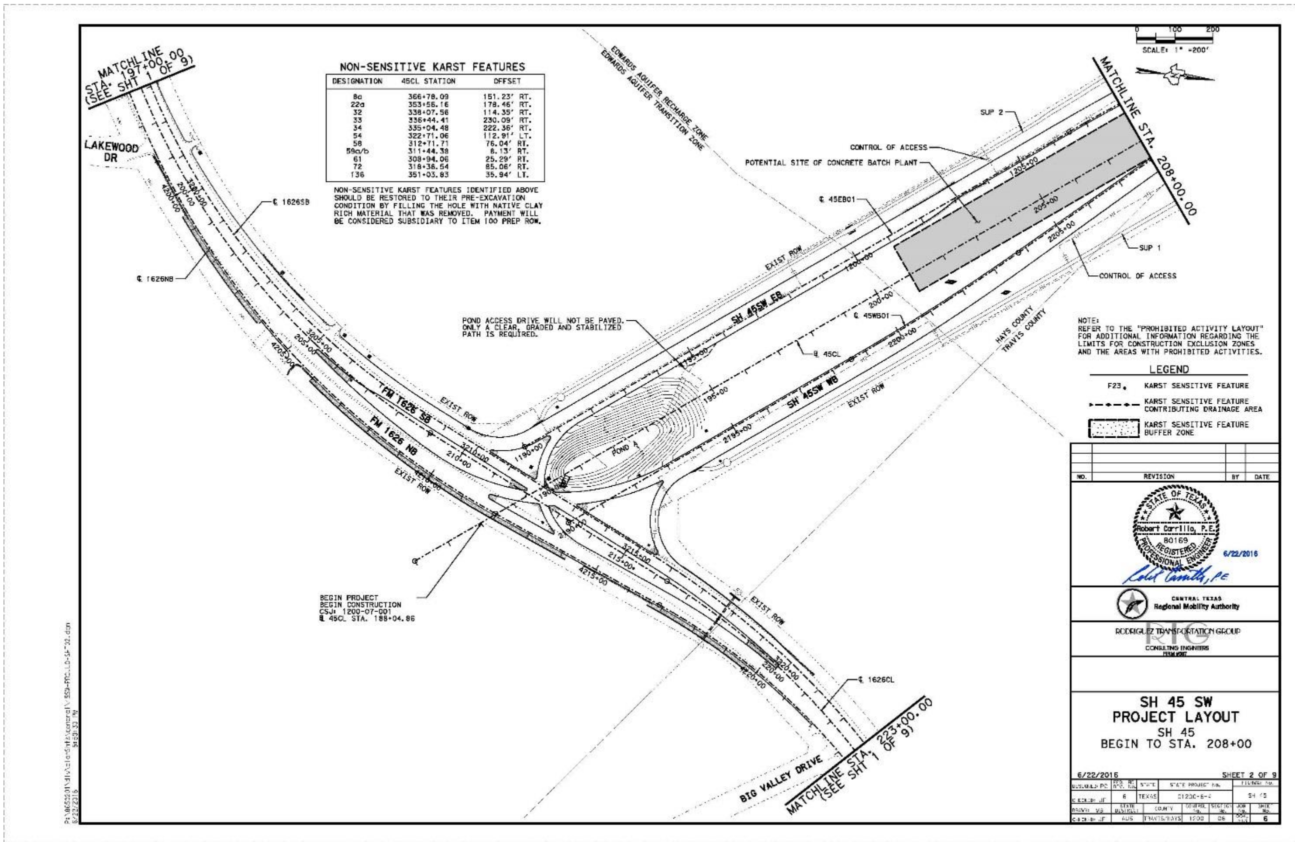
[END OF SECTION]

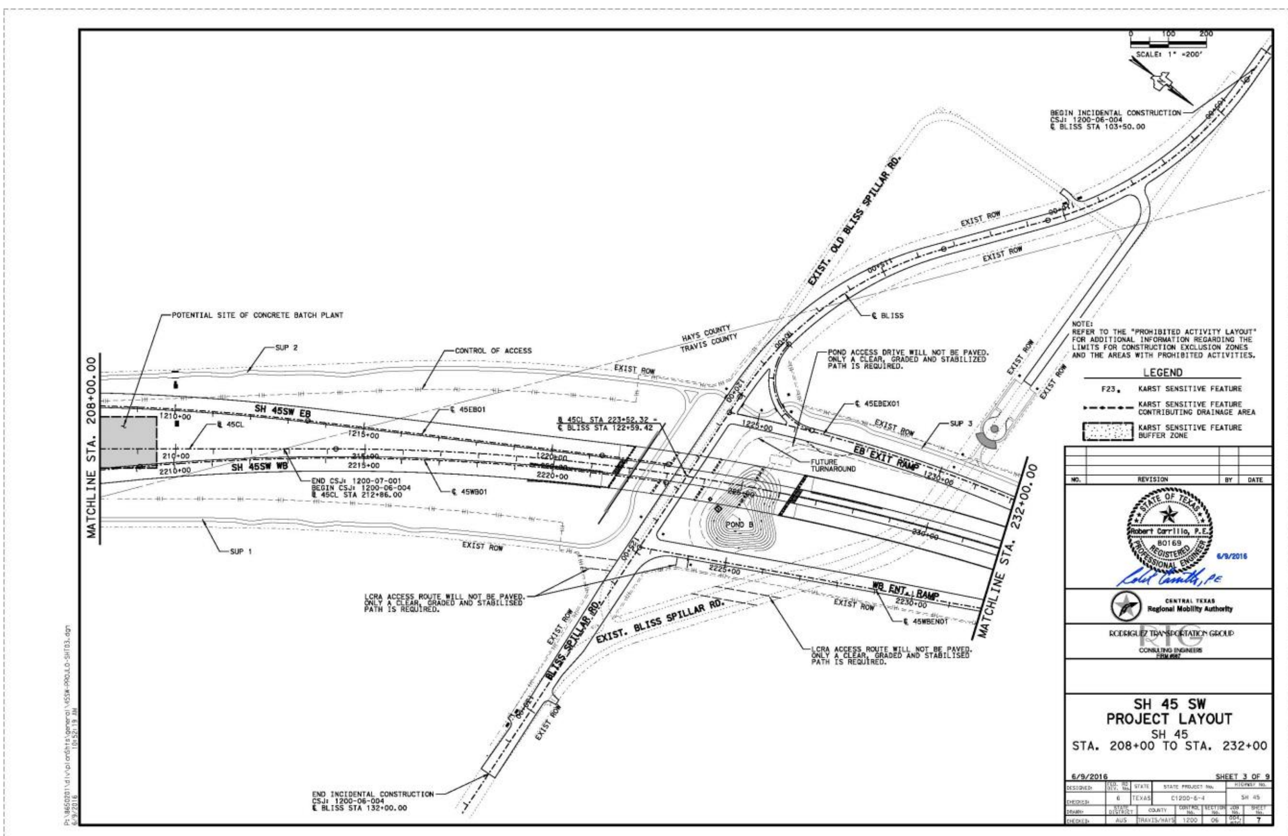
ATTACHMENT B

Toll System Layout

State Highway 45 SW Project




NON-SENSITIVE KARST FEATURES
DESIGNATION 45CL STATION OFFSET
8a 366+78.09 151.23' RT.
22a 353+56.16 178.46' RT.
32 338+07.56 114.35' RT.
33 336+44.41 230.09' RT.
34 335+04.48 222.36' RT.
54 322+71.06 112.91' LT.
58 312+71.71 76.04' RT.
59a/b 311+44.38 8.13' RT.
61 308+94.06 25.29' RT.
72 318+36.54 85.06' RT.
136 351+03.83 35.94' LT.
NON-SENSITIVE KARST FEATURES IDENTIFIED ABOVE SHOULD BE RESTORED TO THEIR PRE-EXCAVATION CONDITION BY FILLING THE HOLE WITH NATIVE CLAY RICH MATERIAL THAT WAS REMOVED. PAYMENT WILL BE CONSIDERED SUBSIDIARY TO ITEM 100 PREP ROW.
MATCHLINE STA. 197+00.00 (SEE SHT 1 OF 9)
LAKEWOOD DR
POND ACCESS DRIVE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILIZED PATH IS REQUIRED.
POTENTIAL SITE OF CONCRETE BATCH PLANT
CONTROL OF ACCESS
SUP 2
SUP 1
SH 45SW EB
SH 45SW WB
FM 1626 SB
FM 1626 NB
POND A
EXIST ROW
HAYS COUNTY
TRAVIS COUNTY
BEGIN PROJECT
BEGIN CONSTRUCTION
CSJ: 1200-07-001
45CL STA. 189+04.86
BIG VALLEY DRIVE
MATCHLINE STA. 223+00.00 (SEE SHT 1 OF 9)
MATCHLINE STA. 208+00.00
SCALE: 1" =200'
NOTE:
REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
CENTRAL TEXAS Regional Mobility Authority
RODRIGUEZ TRANSPORTATION GROUP
SH 45 SW
PROJECT LAYOUT
SH 45
BEGIN TO STA. 208+00
6/22/2016
SHEET 2 OF 9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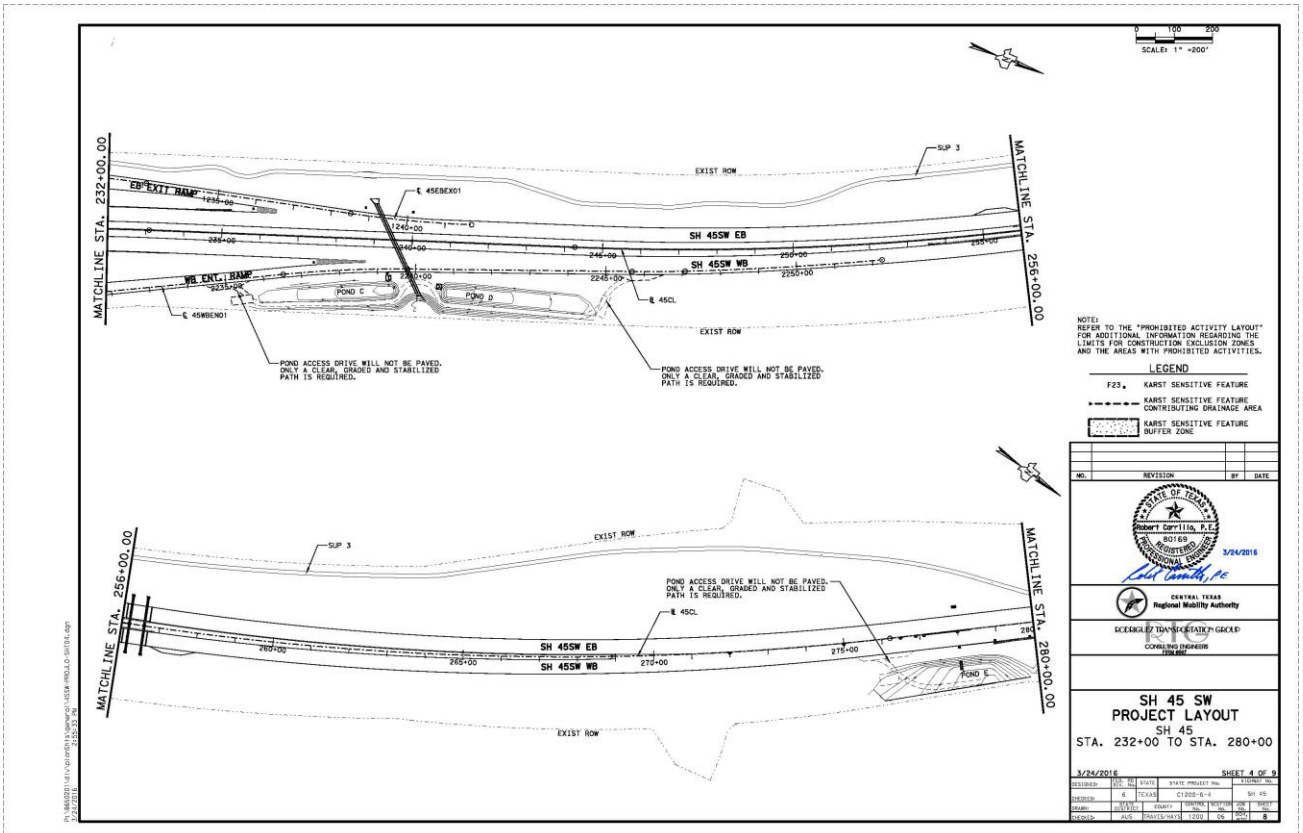
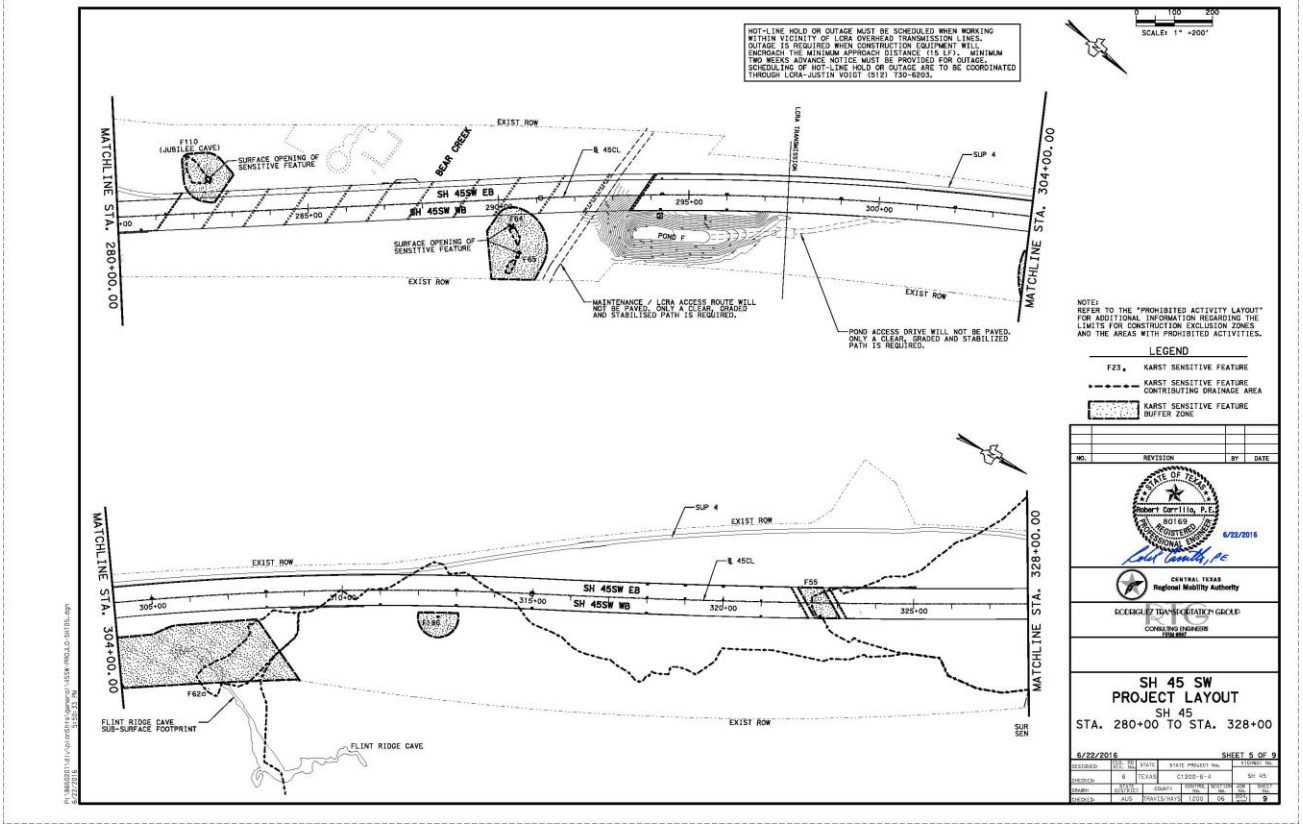
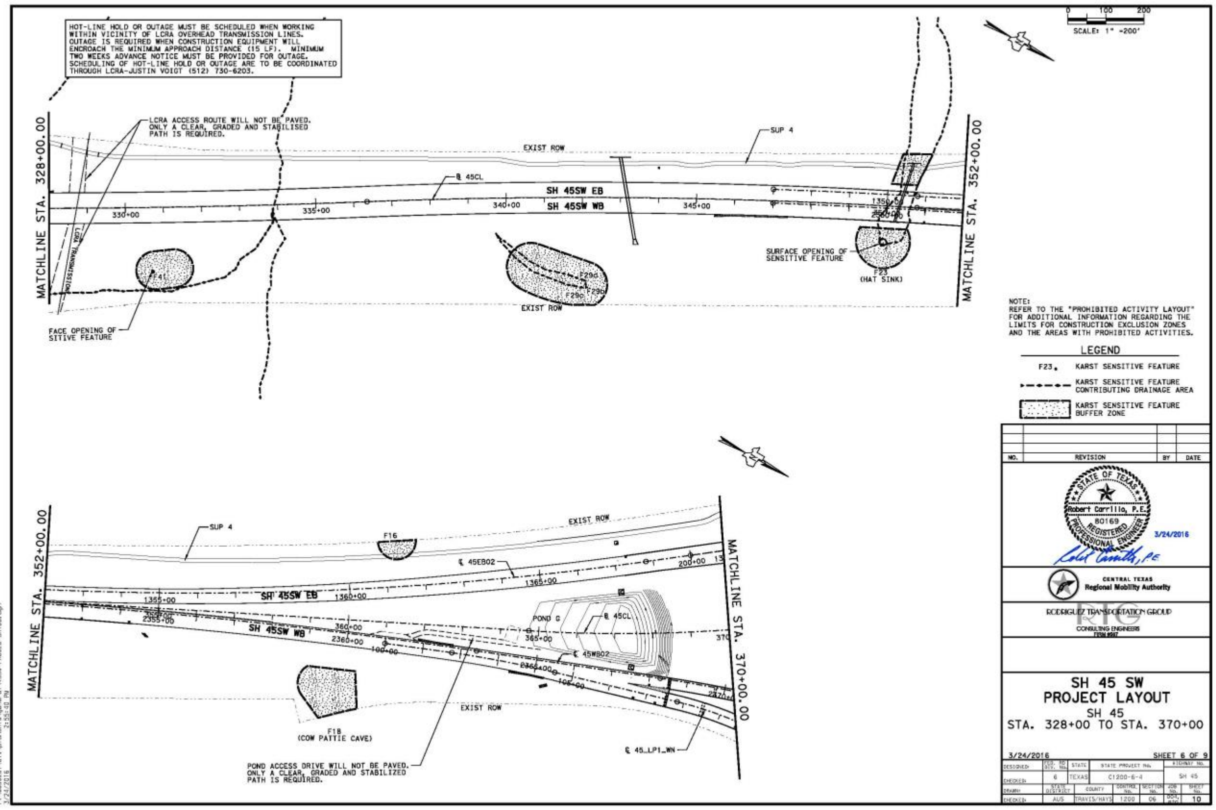
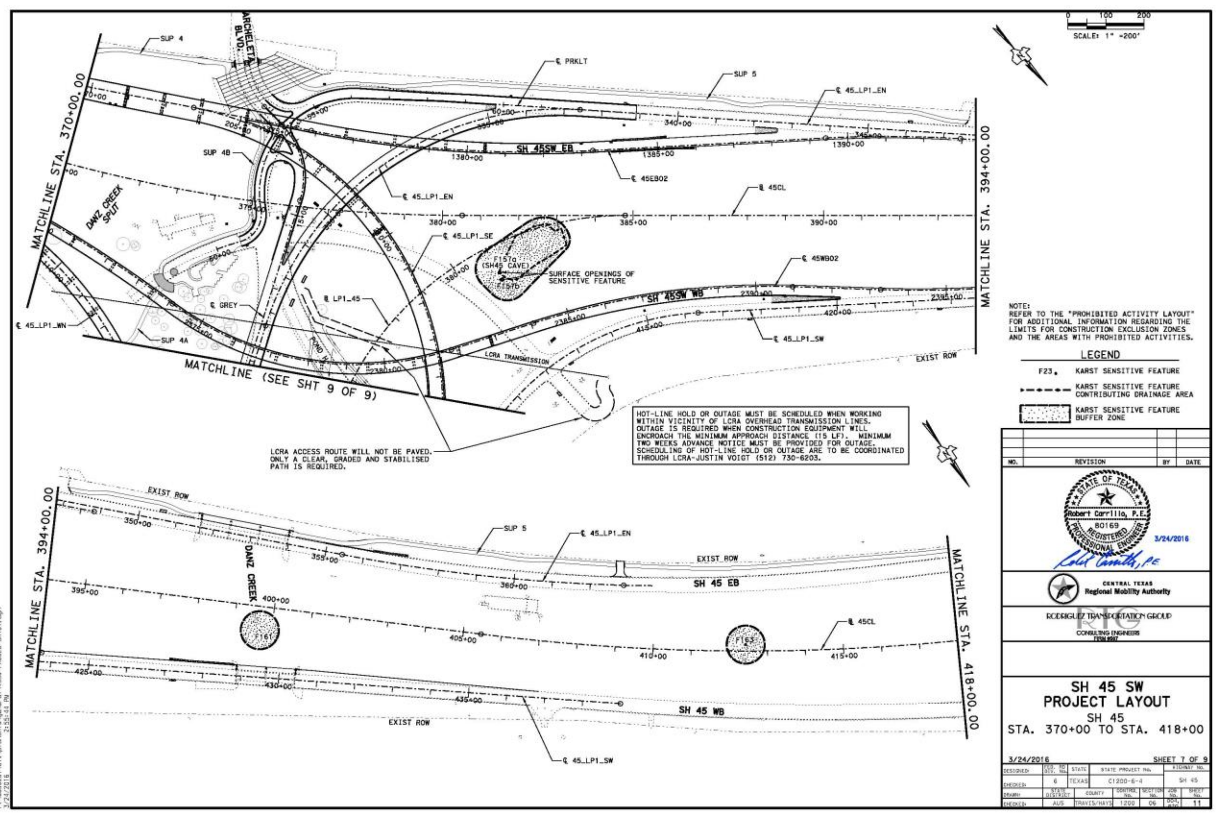
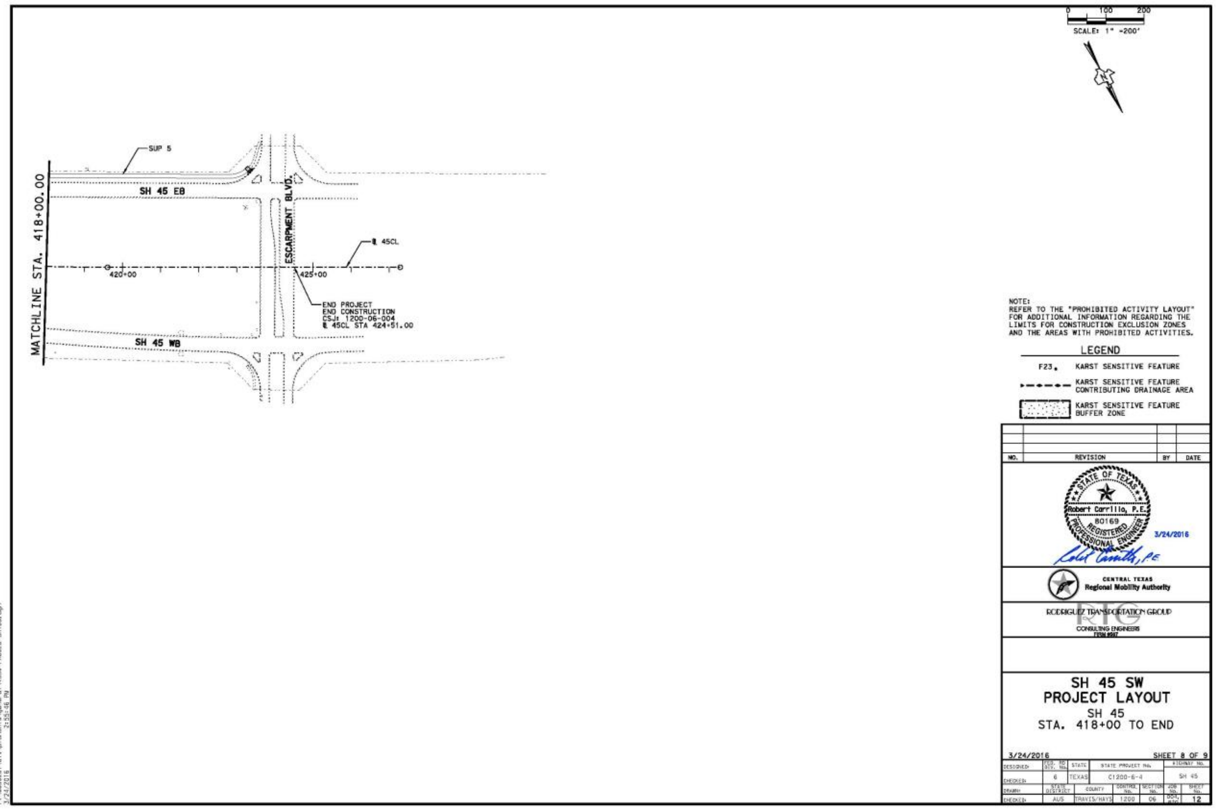
CSJ: 1200-06-004
BLISS STA 103+50.00
EXIST. OLD BLISS SPILLAR RD.
POTENTIAL SITE OF CONCRETE BATCH PLANT
SUP 2
CONTROL OF ACCESS
HAYS COUNTY
TRAVIS COUNTY
POND ACCESS DRIVE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILIZED PATH IS REQUIRED.
MATCHLINE STA. 208+00.00
SH 45SW EB
SH 45SW WB
45CL STA 223+52.32 = BLISS STA 122+59.42
END CSJ: 1200-07-001
BEGIN CSJ: 1200-06-004
45CL STA 212+86.00
EB EXIT RAMP
FUTURE TURNAROUND
POND B
SUP 1
SUP 3
WB ENT. RAMP
LCRA ACCESS ROUTE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILISED PATH IS REQUIRED.
EXIST. BLISS SPILLAR RD.
MATCHLINE STA. 232+00.00
END INCIDENTAL CONSTRUCTION
CSJ: 1200-06-004
BLISS STA 132+00.00
NOTE:
REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
CENTRAL TEXAS Regional Mobility Authority
RODRIGUEZ TRANSPORTATION GROUP
SH 45 SW
PROJECT LAYOUT
SH 45
STA. 208+00 TO STA. 232+00
6/9/2016
SHEET 3 OF 9

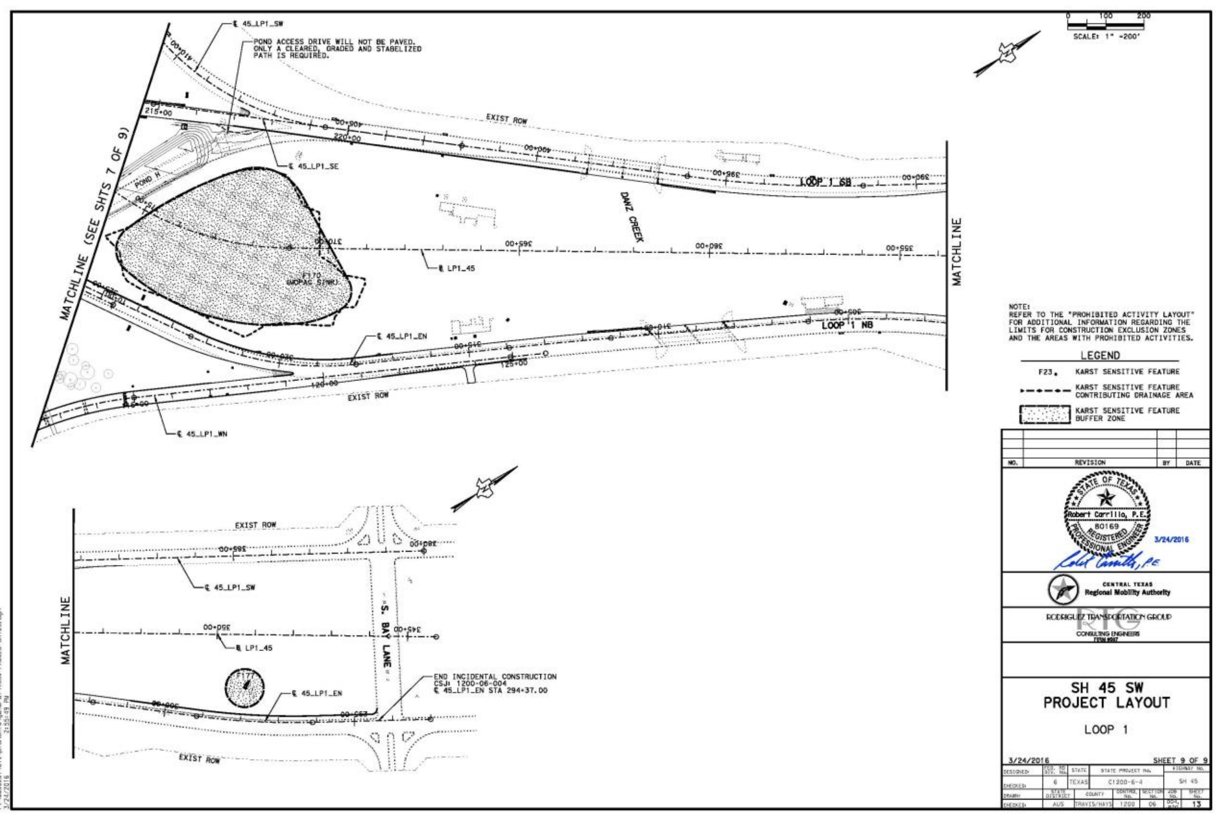

MATCHLINE STA. 232+00.00
MATCHLINE STA. 256+00.00
MATCHLINE STA. 280+00.00
EB EXIT RAMP
WB ENT. RAMP
SH 45SW EB
SH 45SW WB
EXIST ROW
SUP 3
POND C
POND D
POND E
POND ACCESS DRIVE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILIZED PATH IS REQUIRED.
NOTE: REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
SCALE: 1" =200'
SH 45 SW
PROJECT LAYOUT
SH 45
STA. 232+00 TO STA. 280+00
3/24/2016
SHEET 4 OF 9


MATCHLINE STA. 280+00.00
MATCHLINE STA. 304+00.00
MATCHLINE STA. 328+00.00
HOT-LINE HOLD OR OUTAGE MUST BE SCHEDULED WHEN WORKING WITHIN VICINITY OF LCRA OVERHEAD TRANSMISSION LINES. OUTAGE IS REQUIRED WHEN CONSTRUCTION EQUIPMENT WILL ENCROACH THE MINIMUM APPROACH DISTANCE (15 LF). MINIMUM TWO WEEKS ADVANCE NOTICE MUST BE PROVIDED FOR OUTAGE. SCHEDULING OF HOT-LINE HOLD OR OUTAGE ARE TO BE COORDINATED THROUGH LCRA-JUSTIN VOIGT (512) 730-6203.
F110 (JUBILEE CAVE)
SURFACE OPENING OF SENSITIVE FEATURE
BEAR CREEK
SH 45SW EB
SH 45SW WB
POND F
MAINTENANCE / LCRA ACCESS ROUTE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILISED PATH IS REQUIRED.
POND ACCESS DRIVE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILIZED PATH IS REQUIRED.
F620
FLINT RIDGE CAVE SUB-SURFACE FOOTPRINT
FLINT RIDGE CAVE
NOTE: REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
SCALE: 1" =200'
SH 45 SW
PROJECT LAYOUT
SH 45
STA. 280+00 TO STA. 328+00
6/22/2016
SHEET 5 OF 9


HOT-LINE HOLD OR OUTAGE MUST BE SCHEDULED WHEN WORKING WITHIN VICINITY OF LCRA OVERHEAD TRANSMISSION LINES. OUTAGE IS REQUIRED WHEN CONSTRUCTION EQUIPMENT WILL ENCROACH THE MINIMUM APPROACH DISTANCE (15 LF). MINIMUM TWO WEEKS ADVANCE NOTICE MUST BE PROVIDED FOR OUTAGE. SCHEDULING OF HOT-LINE HOLD OR OUTAGE ARE TO BE COORDINATED THROUGH LCRA-JUSTIN VOIGT (512) 730-6203.
LCRA ACCESS ROUTE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILISED PATH IS REQUIRED.
MATCHLINE STA. 328+00.00
MATCHLINE STA. 352+00.00
EXIST ROW
SH 45SW EB
SH 45SW WB
SUP 4
SURFACE OPENING OF SENSITIVE FEATURE
F23 (HAT SINK)
NOTE: REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
F23 KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
F16
F18 (COW PATTIE CAVE)
POND ACCESS DRIVE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILIZED PATH IS REQUIRED.
MATCHLINE STA. 370+00.00
Robert Carrillo, P.E. 80169 3/24/2016
CENTRAL TEXAS Regional Mobility Authority
RODRIGUEZ TRANSPORTATION GROUP
SH 45 SW
PROJECT LAYOUT
SH 45
STA. 328+00 TO STA. 370+00
SHEET 6 OF 9


SUP 4
SUP 5
SUP 4B
SUP 4A
MATCHLINE STA. 370+00.00
MATCHLINE STA. 394+00.00
SH 45SW EB
SH 45SW WB
DANZ CREEK SPLIT
F157a (SH45 CAVE)
SURFACE OPENINGS OF SENSITIVE FEATURE
MATCHLINE (SEE SHT 9 OF 9)
LCRA TRANSMISSION
EXIST ROW
HOT-LINE HOLD OR OUTAGE MUST BE SCHEDULED WHEN WORKING WITHIN VICINITY OF LCRA OVERHEAD TRANSMISSION LINES. OUTAGE IS REQUIRED WHEN CONSTRUCTION EQUIPMENT WILL ENCROACH THE MINIMUM APPROACH DISTANCE (15 LF). MINIMUM TWO WEEKS ADVANCE NOTICE MUST BE PROVIDED FOR OUTAGE. SCHEDULING OF HOT-LINE HOLD OR OUTAGE ARE TO BE COORDINATED THROUGH LCRA-JUSTIN VOIGT (512) 730-6203.
LCRA ACCESS ROUTE WILL NOT BE PAVED. ONLY A CLEAR, GRADED AND STABILISED PATH IS REQUIRED.
NOTE: REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
F23 KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
DANZ CREEK
SH 45 EB
SH 45 WB
MATCHLINE STA. 418+00.00
Robert Carrillo, P.E. 80169 3/24/2016
CENTRAL TEXAS Regional Mobility Authority
RODRIGUEZ TRANSPORTATION GROUP
SH 45 SW
PROJECT LAYOUT
SH 45
STA. 370+00 TO STA. 418+00
SHEET 7 OF 9


SCALE: 1" =200'
SUP 5
SH 45 EB
ESCARPMENT BLVD.
45CL
420+00
425+00
MATCHLINE STA. 418+00.00
END PROJECT
END CONSTRUCTION
CSJ: 1200-06-004
45CL STA 424+51.00
SH 45 WB
NOTE:
REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
REVISION
Robert Carrillo, P.E.
80169
3/24/2016
CENTRAL TEXAS Regional Mobility Authority
RODRIGUEZ TRANSPORTATION GROUP
SH 45 SW
PROJECT LAYOUT
SH 45
STA. 418+00 TO END
3/24/2016
SHEET 8 OF 9


45_LP1_SW
POND ACCESS DRIVE WILL NOT BE PAVED. ONLY A CLEARED, GRADED AND STABELIZED PATH IS REQUIRED.
SCALE: 1" =200'
EXIST ROW
45_LP1_SE
MATCHLINE (SEE SHTS 7 OF 9)
LOOP 1 SB
DANZ CREEK
MATCHLINE
LP1_45
45_LP1_EN
LOOP 1 NB
45_LP1_WN
EXIST ROW
S. BAY LANE
END INCIDENTAL CONSTRUCTION
CSJ: 1200-06-004
45_LP1_EN STA 294+37.00
NOTE:
REFER TO THE "PROHIBITED ACTIVITY LAYOUT" FOR ADDITIONAL INFORMATION REGARDING THE LIMITS FOR CONSTRUCTION EXCLUSION ZONES AND THE AREAS WITH PROHIBITED ACTIVITIES.
LEGEND
KARST SENSITIVE FEATURE
KARST SENSITIVE FEATURE CONTRIBUTING DRAINAGE AREA
KARST SENSITIVE FEATURE BUFFER ZONE
REVISION
Robert Carrillo, P.E.
80169
3/24/2016
CENTRAL TEXAS Regional Mobility Authority
RODRIGUEZ TRANSPORTATION GROUP
SH 45 SW
PROJECT LAYOUT
LOOP 1
3/24/2016
SHEET 9 OF 9

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.
TOLL SYSTEM: LOCATIONS, LAYOUTS, STRUCTURES, MOUNTS/BRACKETS							
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	The contractor is to provide and install all brackets and frames needed to attach all SI procured equipment. SI to provide locations for installation to the contractor. SI to provided requirements for hanger and orientation of hanger mount to Gantries
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.
EQUIPMENT CABINETS							
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
TOLL SUB-SYSTEMS							
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**	
POWER DISTRIBUTION SUB-SYSTEM							
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.
COMMUNICATIONS SUB-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**	
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
SYSTEMS SERVERS AND SPACE							
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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STANDARD PLANS & GUIDELINES

INDEX OF SHEETS

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

HNTB Corporation
The HNTB Companies
Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420

CENTRAL TEXAS
Regional Mobility Authority

FIXED PRICE
TOLLING STANDARDS

INDEX OF
SHEETS

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6			2
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				

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 NECCESSARY)
AVDS & AVC ENTRY, MIDDLE, EXIT, AND AXLE LOOPS (IF NECCESSARY)

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.

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

HNTB
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The HNTB Companies
Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420

CENTRAL TEXAS
Regional Mobility Authority

FIXED PRICE
TOLLING STANDARDS

GENERAL NOTES

GN-1

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6			3
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
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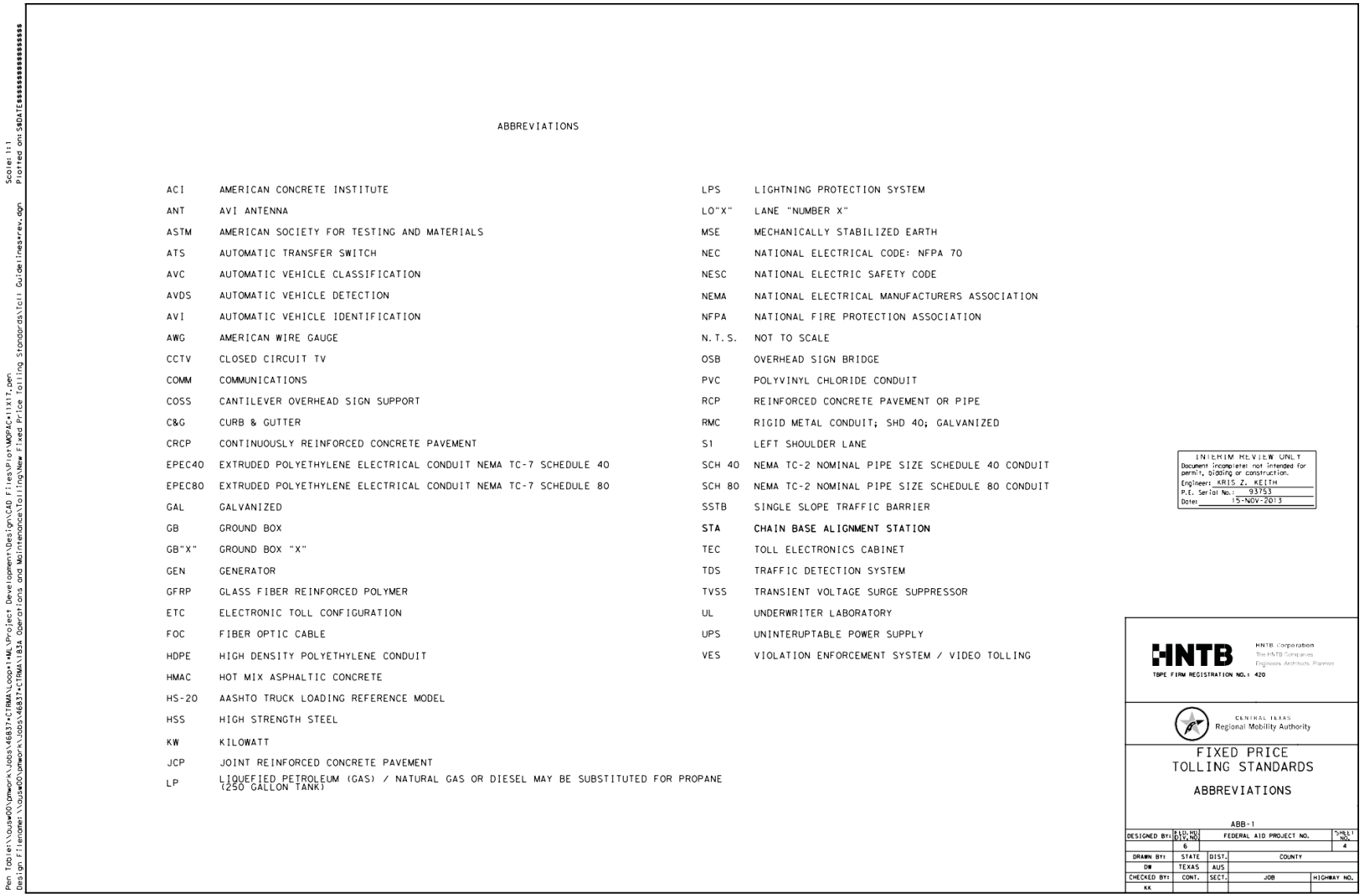

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ABBREVIATIONS

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

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Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
Date: 15-NOV-2015

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CENTRAL TEXAS
Regional Mobility Authority

FIXED PRICE
TOLLING STANDARDS

ABBREVIATIONS

ABB-1

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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GROUND/PULL BOX	⊠	CONDUIT	- - - -
GENERATOR	GEN	PROPANE TANK (250 GALLON TANK)	LP
COMMUNICATIONS	Ⓒ	ENCASED CONDUIT	
ELECTRICAL SERVICE	Ⓟ	BLACK VINYL FENCE (6' TALL)	——x——
SUPPORTING COLUMN	◯	TOLL ELECTRONICS CABINET	TEC
JUNCTION BOX	J		
DISCONNECT SWITCH	DS		
AUTOMATIC TRANSFER SWITCH	ATS		
AUTO VEHICLE CLASSIFICATION LOOP			
AUTO VEHICLE DETECTION LOOP			

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TOLLING STANDARDS

SYMBOLS USED

S-1

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
	6				5
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CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.	
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TERMS & CONDITIONS

THE CENTRAL TEXAS REGIONAL MOBILITY AUTHORITY (HEREINAFTER REFERRED TO AS MOBILITY AUTHORITY) IS COMMITTED TO PROVIDING ELECTRONIC ACCESS TO FILES OF STANDARDS. MOBILITY AUTHORITY MAKES EVERY REASONABLE EFFORT TO DO SO IN A CROSS-PLATFORM AND COMPLEX MULTI-PROTOCOL ENVIRONMENT. MOBILITY AUTHORITY DOES NOT POSSESS A STAFF THAT IS AVAILABLE TO PROVIDE TECHNICAL SUPPORT TO OUTSIDE PARTIES WHO AVAIL THEMSELVES OF CAD FILES THAT ARE PROVIDED. IT IS IMPORTANT, THEREFORE, THAT ALL POTENTIAL USERS OF THESE FILES READ THE FOLLOWING DISCLAIMER AND ACCEPT ITS TERMS AS A PREREQUISITE TO THE USE OF THE FILES.

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1. MOBILITY AUTHORITY MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH RESPECT TO THE FILE(S) WHICH ARE THE SUBJECT OF THIS AGREEMENT, AND SPECIFICALLY MAKES NO WARRANTY THAT SAID FILE(S) SHALL BE MARKETABLE OR FIT FOR ANY PARTICULAR PURPOSE. FURTHERMORE, ANY DESCRIPTION OF SAID FILE(S) SHALL NOT BE DEEMED TO CREATE AN EXPRESS WARRANTY THAT SUCH FILES SHALL CONFORM TO SAID DESCRIPTION.

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3. RECEIVER AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS MOBILITY AUTHORITY, ITS OFFICERS, AGENTS, AND EMPLOYEES FROM AND AGAINST ANY AND ALL CLAIMS, SUITS, LOSSES, DAMAGES OR COSTS, INCLUDING REASONABLE ATTORNEY'S FEES, ARISING FROM OR BY REASON OF RECEIVERS; USE OR POSSESSION WITH RESPECT TO ANY OF THE FILE(S) FURNISHED BY MOBILITY AUTHORITY PURSUANT TO THIS AGREEMENT, AND SUCH INDEMNIFICATION SHALL SURVIVE ACCEPTANCE OF SAID FILE(S) BY RECEIVER.

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5. MICROSTATION (*.DGN) FILENAMES THAT HAVE A COMPANION PDF ICON CAN BE VIEWED IN ADOBE ACROBAT READER BY CLICKING ON THE PDF ICON. THIS READER CAN BE USED TO PRINT THESE PDF FILES. RECEIVER AGREES THAT MOBILITY AUTHORITY ASSUMES NO RESPONSIBILITIES FOR PRINTING WITH ADOBE. ALSO, RECEIVER AGREES THAT MOBILITY AUTHORITY CANNOT BE HELD RESPONSIBLE FOR ANY PROBLEMS ARISING WITH THE PRINTING OF A PDF FILE.

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8. THE DESIGN FILES STANDARDS ARE COPYRIGHTED BY MOBILITY AUTHORITY AND MAY NOT BE RESOLD.

9. THESE TERMS AND CONDITIONS CONSTITUTE THE COMPLETE AND FINAL AGREEMENT OF THE PARTIES HERETO. RECEIVER ACCEPTS THE AFOREMENTIONED TERMS AND CONDITIONS.

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P.E. Serial No.: 93753
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FIXED PRICE
TOLLING STANDARDS

TERMS AND
CONDITIONS

TC-1

DESIGNED BY:	S.U. MU. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
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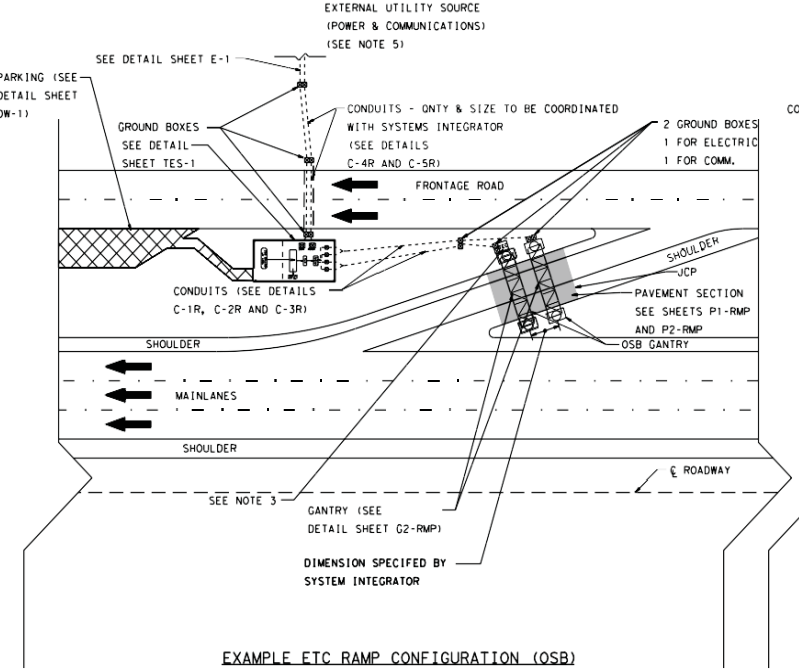
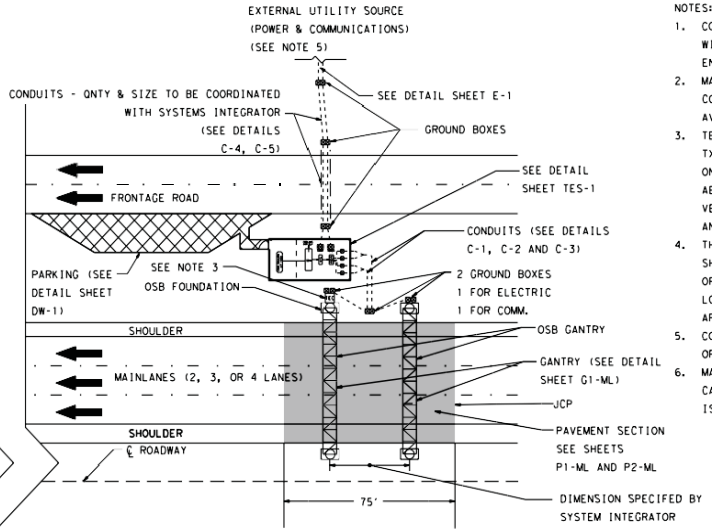
DRAWN BY:	STATE	DIST.	COUNTY
DW	TEXAS	AUS	
CHECKED BY:	CONT.	SECT.	JOB / HIGHWAY NO.
KK			



EXAMPLE ETC RAMP CONFIGURATION (OSB)



EXAMPLE ETC MAIN LANE CONFIGURATION (OSB)

NOTES:

1. CONDUIT BENDS SHALL NOT EXCEED 180° WITHOUT A PULL BOX UNLESS APPROVED BY ENGINEER.
2. MAXIMUM LENGTH OF RUN FROM COMMUNICATION CABINET TO FURTHEST AVI/AVDS IS 125'.
3. TEC TO BE MOUNTED ON COLUMN FOR STANDARD TXDOT 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.
4. THE DESIGN BUILDER MUST PROVIDE DRAWINGS SHOWING THE LOCATION OF GANTRY, PROFILES OF ROADWAY, AND SUGGESTED GENERATOR LOCATIONS TO MOBILITY AUTHORITY FOR APPROVAL.
5. COMMUNICATIONS SHALL TIE INTO EXISTING OR PROPOSED DUCT BANK.
6. MAXIMUM LENGTH OF RUN FROM COMMUNICATION CABINET TO FURTHEST VES/TDS EQUIPMENT IS 300'.

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EXAMPLE ETC CONFIGURATIONS

ETC-1

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	6			7
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				

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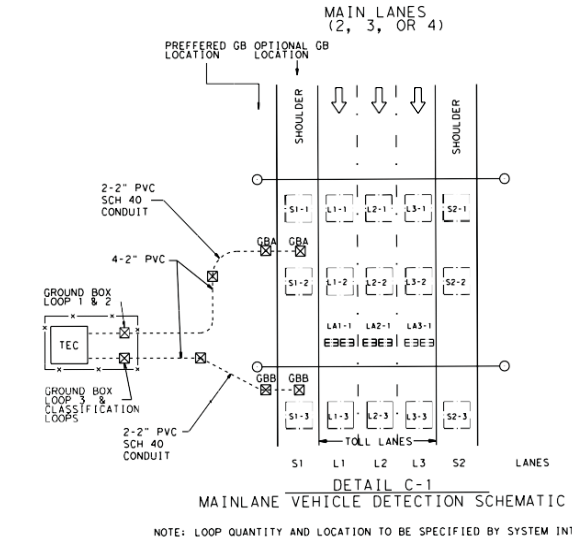
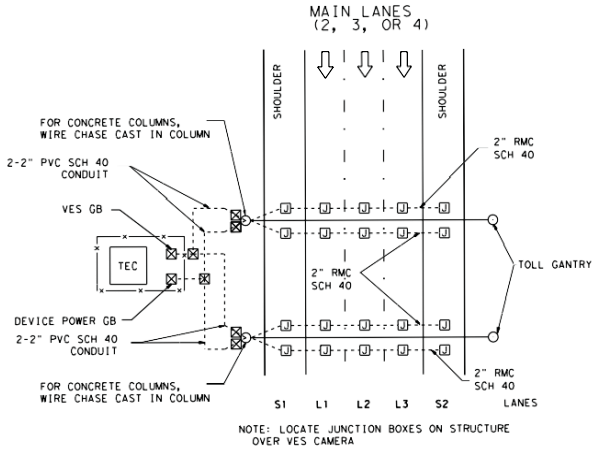


DETAIL C-1
MAINLANE VEHICLE DETECTION SCHEMATIC

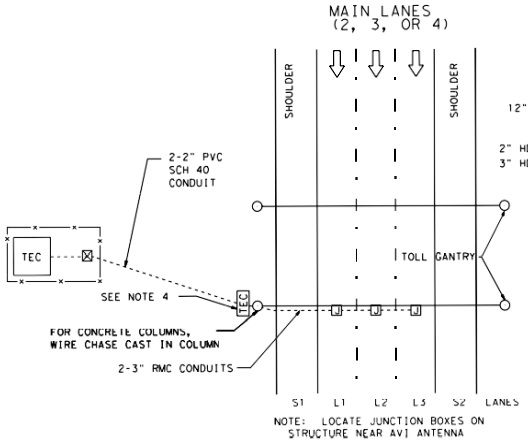
NOTE: LOOP QUANTITY AND LOCATION TO BE SPECIFIED BY SYSTEM INTEGRATOR



NOTE: LOCATE JUNCTION BOXES ON STRUCTURE OVER VES CAMERA

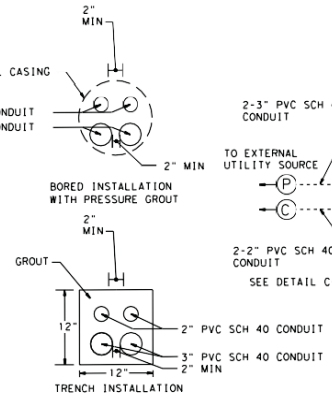
DETAIL C-2
VES CONFIGURATION

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 C1: MAXIMUM CABLE LENGTH FROM S1-1 AND S1-3 TO TEC SHALL NOT EXCEED 300'
4) TEC TO BE MOUNTED ON COLUMN FOR STANDARD TXDOT 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 RECESED 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

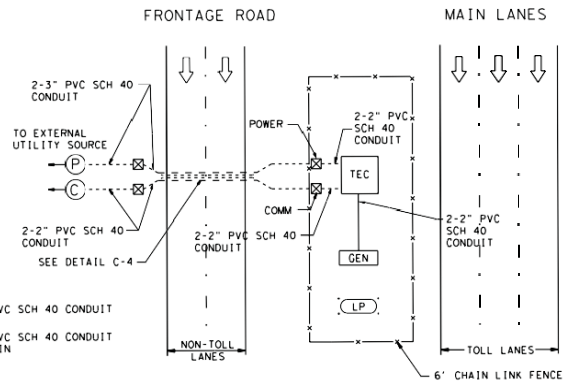


NOTE: LOCATE JUNCTION BOXES ON STRUCTURE NEAR AVI ANTENNA

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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Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
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FIXED PRICE
TOLLING STANDARDS
EXAMPLE ETC CONFIGURATION
(MAIN LANES)

ETC-2

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.
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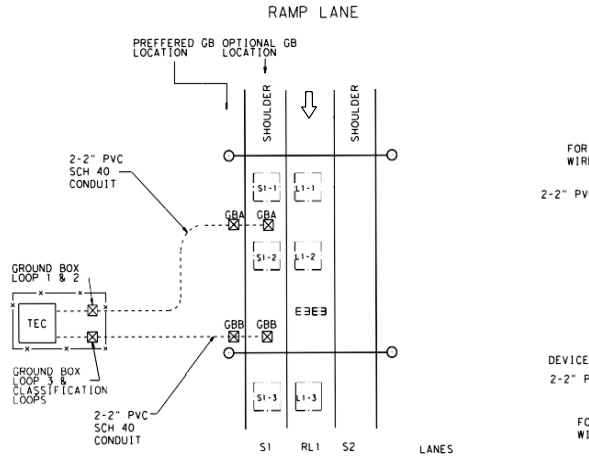
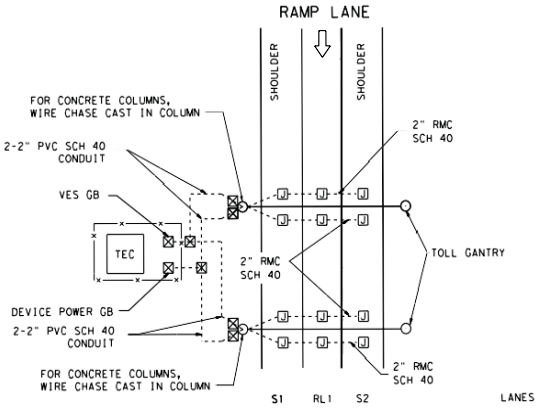


DETAIL C-1R
RAMP VEHICLE DETECTION SCHEMATIC

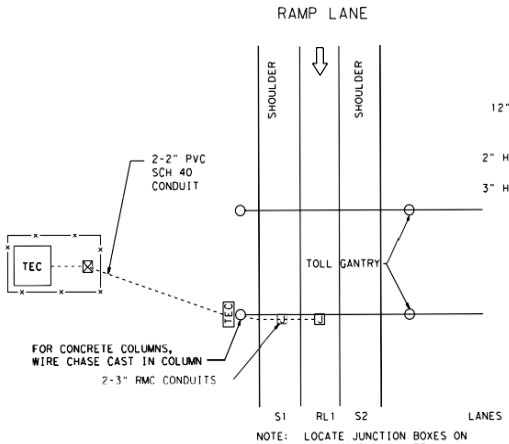
NOTE: LOOP QUANTITY AND LOCATION TO BE SPECIFIED BY SYSTEM INTEGRATOR



NOTE: LOCATE JUNCTION BOXES ON STRUCTURE OVER VES CAMERA

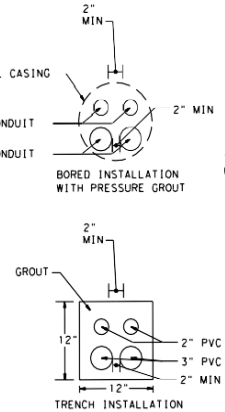
DETAIL C-2R
VES CONFIGURATION

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 C1: MAXIMUM CABLE LENGTH FROM S1-1 AND S1-3 TO TEC SHALL NOT EXCEED 300'
4) TEC TO BE MOUNTED ON COLUMN FOR STANDARD TXDOT 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 RECESED 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.

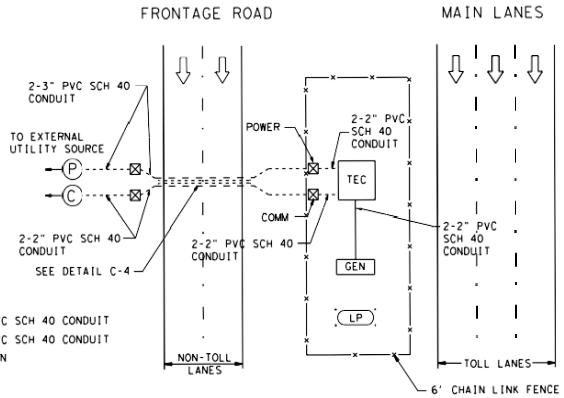


NOTE: LOCATE JUNCTION BOXES ON STRUCTURE NEAR AVI ANTENNA

DETAIL C-3R
AVI READER CONFIGURATION
SEE NOTE 7



DETAIL C-4R
CONDUIT ENCASEMENT
(SEE NOTE 7)



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

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FIXED PRICE
TOLLING STANDARDS
EXAMPLE ETC CONFIGURATION (RAMPS)

ETC-3

DESIGNED BY:	DIST. NO./DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
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DRAWN BY:	STATE	DIST.	COUNTY	
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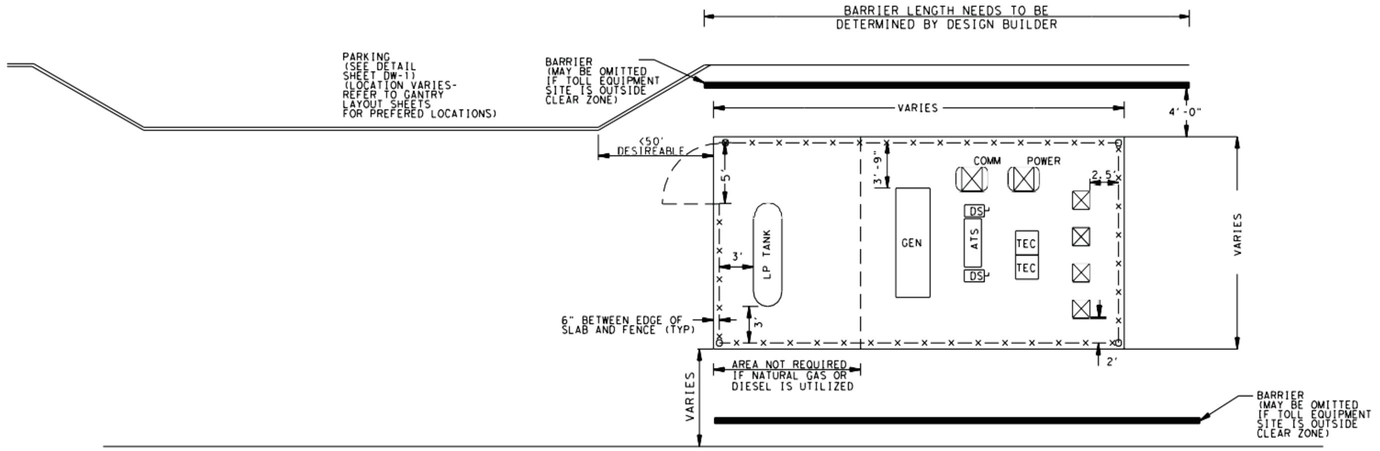
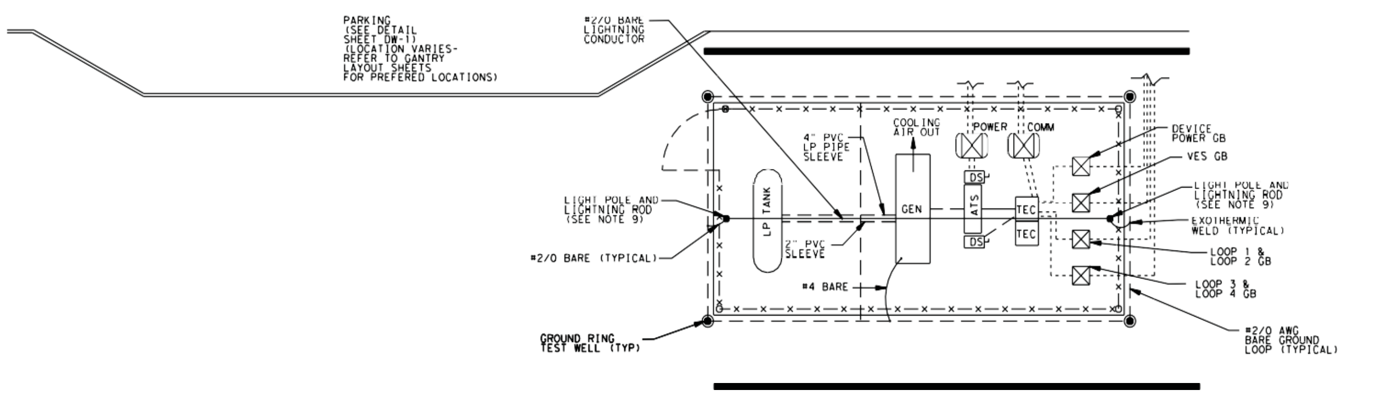


DETAIL 1
EQUIPMENT PLACEMENT
AND DIMENSIONS



DETAIL 2
EQUIPMENT PLACEMENT
AND ELECTRICAL RUNS

NOTES:

1) PARKING MAY BE LOCATED ON EITHER SIDE OF SLAB FOUNDATION. LAYOUTS MUST BE MIRRORED IF PARKING IS RELOCATED.

2) DESIGN BUILDER SHALL DESIGN SLAB FOUNDATION AND SUBMIT TO MOBILITY AUTHORITY FOR APPROVAL.

3) DESIGN BUILDER SHALL PROVIDE ANCHOR DETAILS FOR ALL EQUIPMENT.

4) TEC, FUEL TANK, GENERATOR, AND ATS TO BE PROVIDED BY SYSTEM INTEGRATOR.

5) TEC SHALL HAVE FRONT AND REAR ACCESS LOCKABLE DOORS.

6) TEC SHALL BE INSULATED WITH R4 FOAM INSULATION.

7) TEC SHALL HAVE REDUNDANT ENVIRONMENTAL CONTROLS.

8) TEC SHALL HAVE INTRUSION DETECTION SYSTEM.

9) 18' ALUMINUM LIGHT POLE AND LIG TNING ROD WITH MINIMUM 150 WAT METAL HALIDE 120V/240V OR EQU VALENT LED OUT OOR LIGHT FIXTURE WITH PHO O CELL.

10) DESIGN BUILDER SHALL BE RESPONSIBLE FOR PROVIDING PROTECTION FOR ALL EQUIPMENT PLACEMENT LOCATIONS.

11) DESIGN BUILDER SHALL DETERMINE NUMBER OF WIRES, SIZE OF WIRES AND CONDUIT SIZE NEEDED TO MEET NEC AND ROAD REQUIREMENTS.

12) TEC CABINET TO BE DUAL 334 OR EQUIVALENT.

12) ALL GROUND/PULL BOX SIZES AND MODELS MUST BE APPROVED BY THE MOBILITY AUTHORITY OR SYSTEMS INTEGRATOR.

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

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The HNTB Companies
Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420

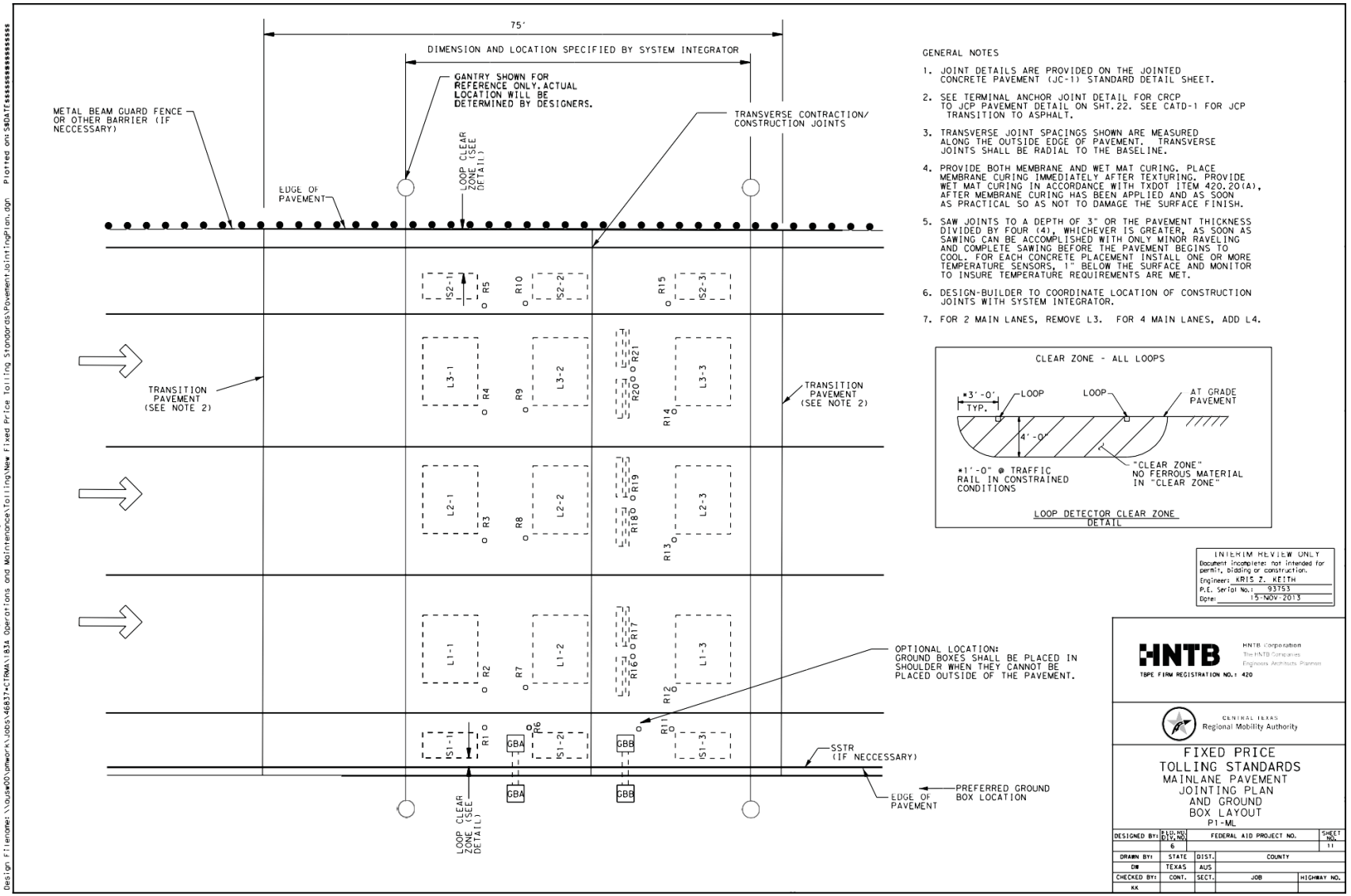
CENTRAL TEXAS
Regional Mobility Authority

FIXED PRICE
TOLLING STANDARDS

TOLL EQUIPMENT SITE
PLACEMENT DETAILS

TES-1

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.			SHEET NO.
	6				10
DRAWN BY:	STATE	DIST.	COUNTY		
DW	TEXAS	AUS			
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.	
KK					



GENERAL NOTES

1. JOINT DETAILS ARE PROVIDED ON THE JOINTED CONCRETE PAVEMENT (JC-1) STANDARD DETAIL SHEET.
2. SEE TERMINAL ANCHOR JOINT DETAIL FOR CRCP TO JCP PAVEMENT DETAIL ON SHT. 22. SEE CATD-1 FOR JCP TRANSITION TO ASPHALT.
3. TRANSVERSE JOINT SPACINGS SHOWN ARE MEASURED ALONG THE OUTSIDE EDGE OF PAVEMENT. TRANSVERSE JOINTS SHALL BE RADIAL TO THE BASELINE.
4. PROVIDE BOTH MEMBRANE AND WET MAT CURING. PLACE MEMBRANE CURING IMMEDIATELY AFTER TEXTURING. PROVIDE WET MAT CURING IN ACCORDANCE WITH TXDOT ITEM 420.20(A), AFTER MEMBRANE CURING HAS BEEN APPLIED AND AS SOON AS PRACTICAL SO AS NOT TO DAMAGE THE SURFACE FINISH.
5. SAW JOINTS TO A DEPTH OF 3" OR THE PAVEMENT THICKNESS DIVIDED BY FOUR (4), WHICHEVER IS GREATER, AS SOON AS SAWING CAN BE ACCOMPLISHED WITH ONLY MINOR RAVELING AND COMPLETE SAWING BEFORE THE PAVEMENT BEGINS TO COOL. FOR EACH CONCRETE PLACEMENT INSTALL ONE OR MORE TEMPERATURE SENSORS, 1" BELOW THE SURFACE AND MONITOR TO INSURE TEMPERATURE REQUIREMENTS ARE MET.
6. DESIGN-BUILDER TO COORDINATE LOCATION OF CONSTRUCTION JOINTS WITH SYSTEM INTEGRATOR.
7. FOR 2 MAIN LANES, REMOVE L3. FOR 4 MAIN LANES, ADD L4.

LOOP DETECTOR CLEAR ZONE DETAIL

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

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FIXED PRICE
TOLLING STANDARDS
MAINLANE PAVEMENT
JOINTING PLAN
AND GROUND
BOX LAYOUT
P1-ML

DESIGNED BY:	F.A.D. NO. / DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6			11
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				

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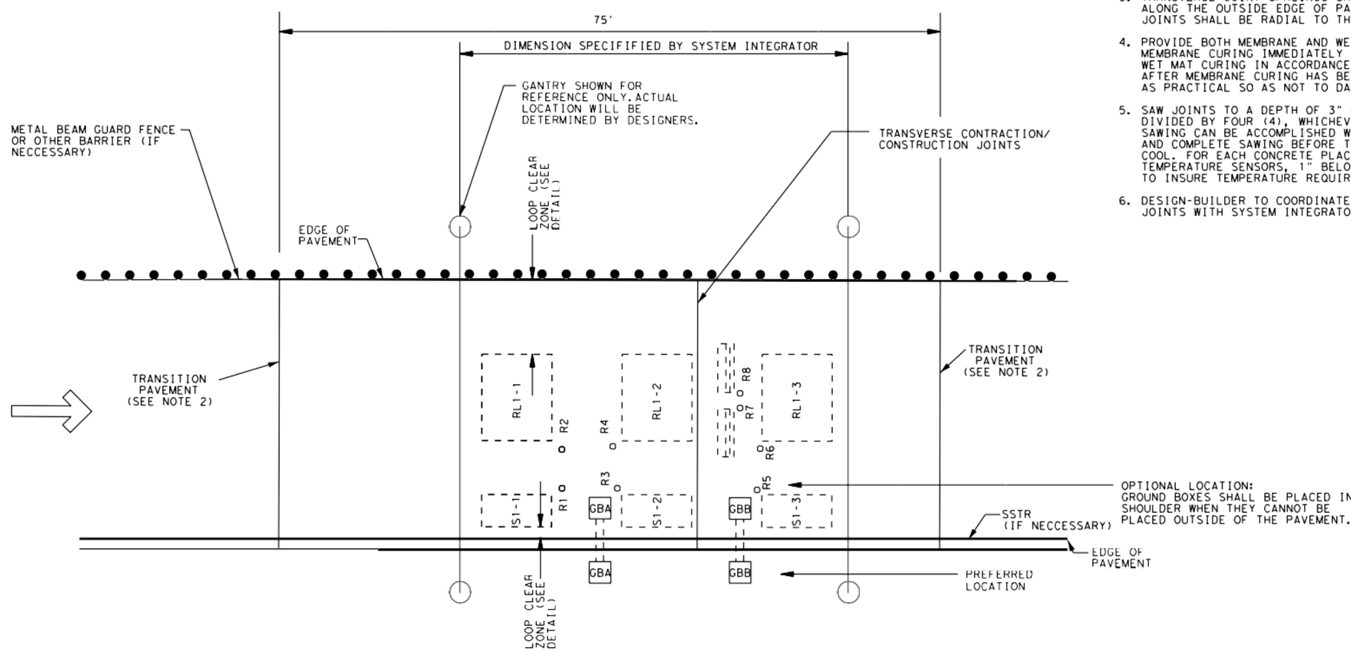

GENERAL NOTES

1. JOINT DETAILS ARE PROVIDED ON THE JOINTED CONCRETE PAVEMENT (JC-1) STANDARD DETAIL SHEET.
2. SEE TERMINAL ANCHOR JOINT DETAIL FOR CRCP TO JCP PAVEMENT DETAIL ON SHT.22. SEE CATD-1 FOR JCP TRANSITION TO ASPHALT.
3. TRANSVERSE JOINT SPACINGS SHOWN ARE MEASURED ALONG THE OUTSIDE EDGE OF PAVEMENT. TRANSVERSE JOINTS SHALL BE RADIAL TO THE BASELINE.
4. PROVIDE BOTH MEMBRANE AND WET MAT CURING. PLACE MEMBRANE CURING IMMEDIATELY AFTER TEXTURING. PROVIDE WET MAT CURING IN ACCORDANCE WITH TXDOT ITEM 420.20(A), AFTER MEMBRANE CURING HAS BEEN APPLIED AND AS SOON AS PRACTICAL SO AS NOT TO DAMAGE THE SURFACE FINISH.
5. SAW JOINTS TO A DEPTH OF 3" OR THE PAVEMENT THICKNESS DIVIDED BY FOUR (4), WHICHEVER IS GREATER, AS SOON AS SAWING CAN BE ACCOMPLISHED WITH ONLY MINOR RAVELING AND COMPLETE SAWING BEFORE THE PAVEMENT BEGINS TO COOL. FOR EACH CONCRETE PLACEMENT INSTALL ONE OR MORE TEMPERATURE SENSORS, 1" BELOW THE SURFACE AND MONITOR TO INSURE TEMPERATURE REQUIREMENTS ARE MET.
6. DESIGN-BUILDER TO COORDINATE LOCATION OF CONSTRUCTION JOINTS WITH SYSTEM INTEGRATOR.

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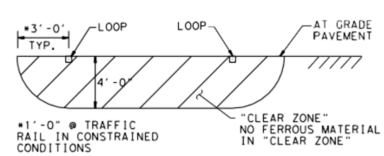
Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
Date: 15-NOV-2013

CLEAR ZONE - ALL LOOPS



LOOP DETECTOR CLEAR ZONE DETAIL

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FIXED PRICE
TOLLING STANDARDS
RAMP PAVEMENT
JOINTING PLAN
AND GROUND
BOX LAYOUT
P1-RMP

DESIGNED BY:	FED. RD. DIV. NO.		FEDERAL AID PROJECT NO.	SHEET NO.
	6			12
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				

Scale: 1:10 Plotted on: $$DATE$$$$$$$$$$$$$$$$$$
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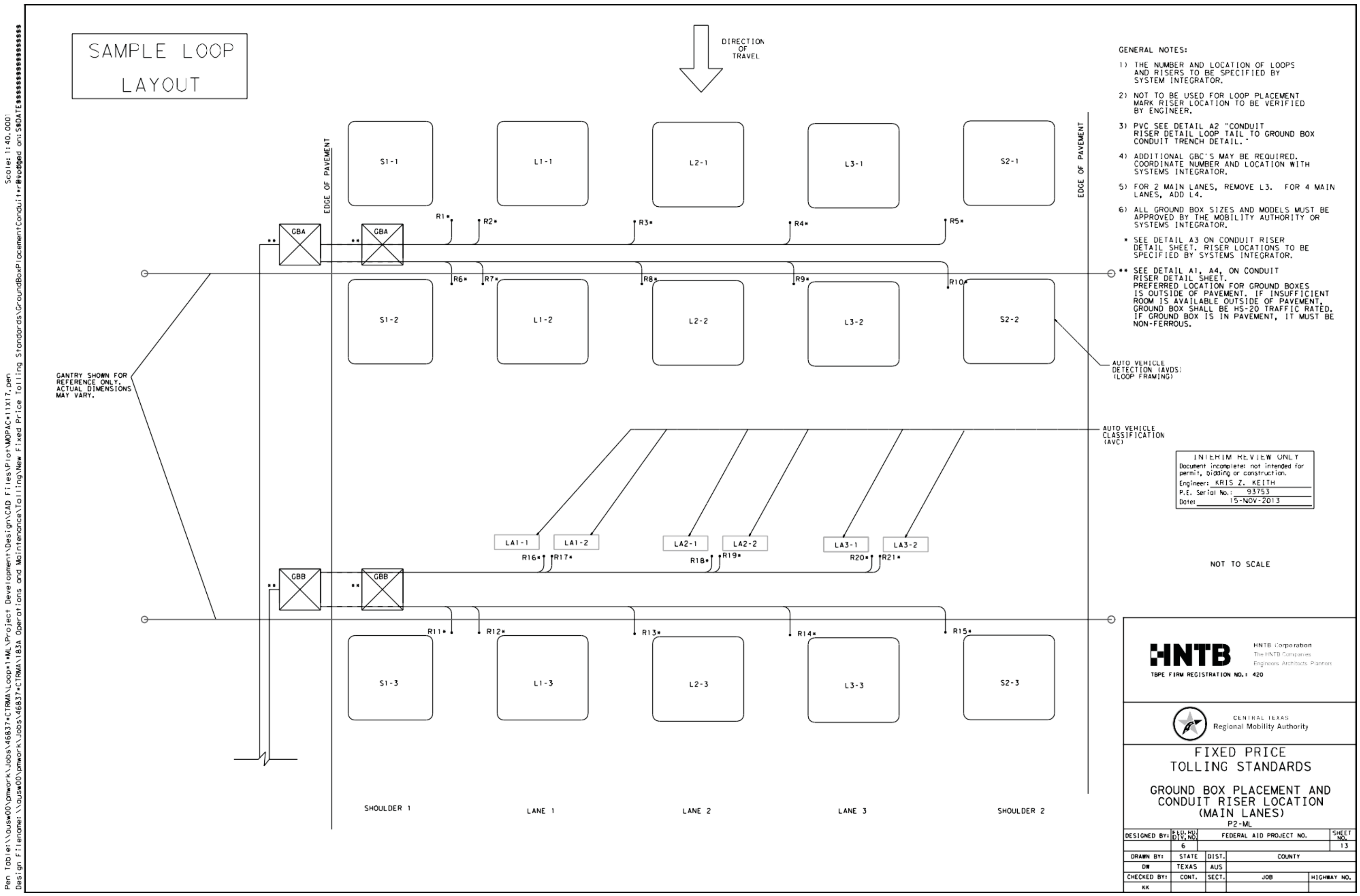
SAMPLE LOOP LAYOUT
DIRECTION OF TRAVEL
EDGE OF PAVEMENT
S1-1
L1-1
L2-1
L3-1
S2-1
S1-2
L1-2
L2-2
L3-2
S2-2
S1-3
L1-3
L2-3
L3-3
S2-3
GBA
GBB
R1*
R2*
R3*
R4*
R5*
R6*
R7*
R8*
R9*
R10*
R11*
R12*
R13*
R14*
R15*
R16*
R17*
R18*
R19*
R20*
R21*
LA1-1
LA1-2
LA2-1
LA2-2
LA3-1
LA3-2
GANTRY SHOWN FOR REFERENCE ONLY. ACTUAL DIMENSIONS MAY VARY.
AUTO VEHICLE DETECTION (AVDS) (LOOP FRAMING)
AUTO VEHICLE CLASSIFICATION (AVC)
SHOULDER 1
LANE 1
LANE 2
LANE 3
SHOULDER 2
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) FOR 2 MAIN LANES, REMOVE L3. FOR 4 MAIN LANES, ADD L4.
6) ALL GROUND 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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Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
Date: 15-NOV-2013
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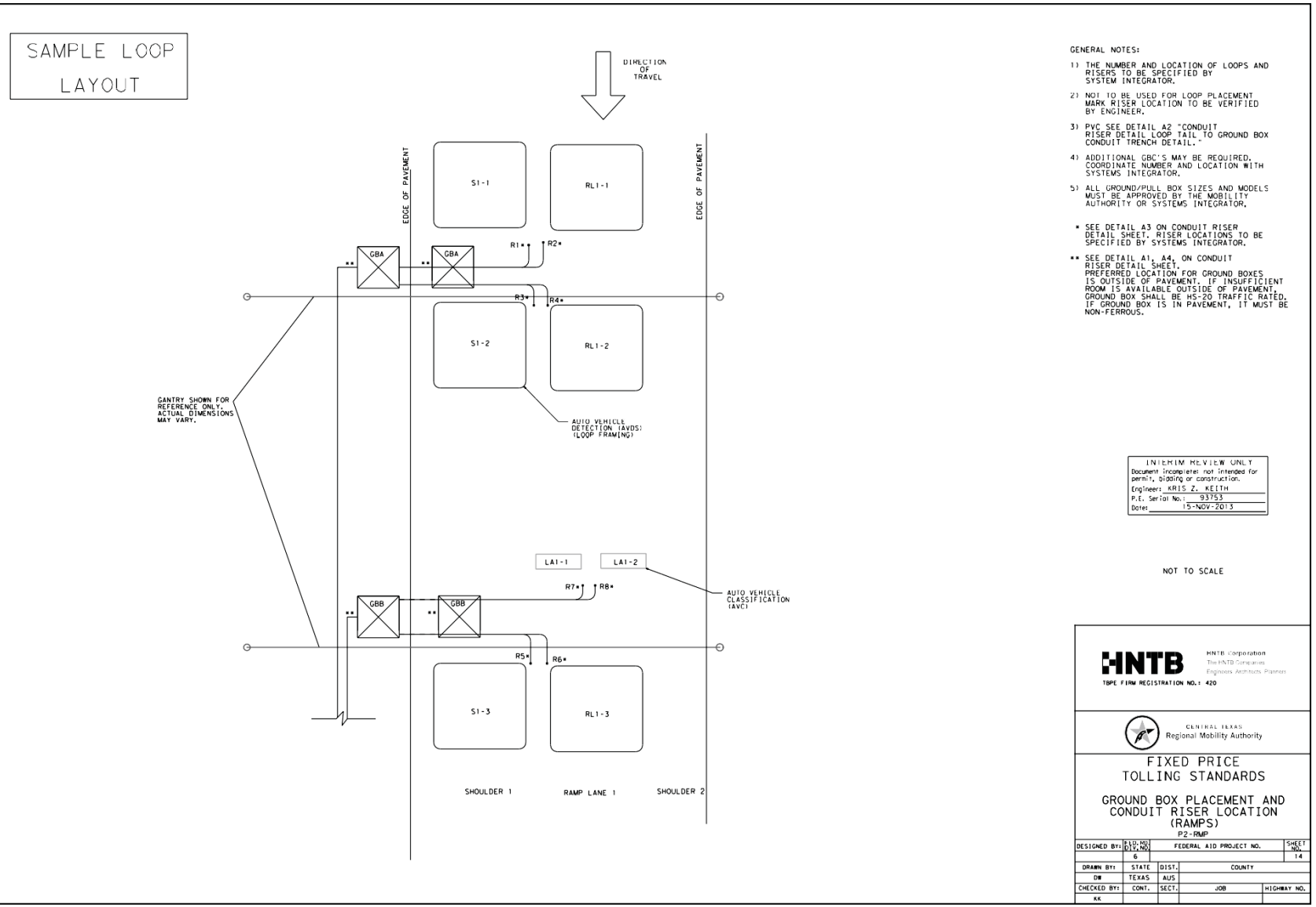
CENTRAL TEXAS
Regional Mobility Authority
FIXED PRICE TOLLING STANDARDS
GROUND BOX PLACEMENT AND CONDUIT RISER LOCATION (MAIN LANES)
P2-ML
DESIGNED BY:
FED. RD. DIV. NO. 6
FEDERAL AID PROJECT NO.
SHEET NO. 13
DRAWN BY: DW
STATE TEXAS
DIST. AUS
COUNTY
CHECKED BY: KK
CONT.
SECT.
JOB
HIGHWAY NO.


SAMPLE LOOP LAYOUT
DIRECTION OF TRAVEL
EDGE OF PAVEMENT
EDGE OF PAVEMENT
S1-1
RL1-1
S1-2
RL1-2
S1-3
RL1-3
GBA
GBA
GBB
GBB
R1*
R2*
R3*
R4*
R5*
R6*
R7*
R8*
LA1-1
LA1-2
AUTO VEHICLE DETECTION (AVDS) (LOOP FRAMING)
AUTO VEHICLE CLASSIFICATION (AVC)
GANTRY SHOWN FOR REFERENCE ONLY. ACTUAL DIMENSIONS MAY VARY.
SHOULDER 1
RAMP LANE 1
SHOULDER 2
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/PULL 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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Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
Dates: 15-NOV-2013
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CENTRAL TEXAS Regional Mobility Authority
FIXED PRICE TOLLING STANDARDS
GROUND BOX PLACEMENT AND CONDUIT RISER LOCATION (RAMPS)
P2-RMP
DESIGNED BY: KK
DRAWN BY: DW
CHECKED BY: KK
FED. RD. DIV. NO.: 6
STATE: TEXAS
CONT.
FEDERAL AID PROJECT NO.
DIST.: AUS
COUNTY
SECT.
JOB
HIGHWAY NO.
SHEET NO.: 14

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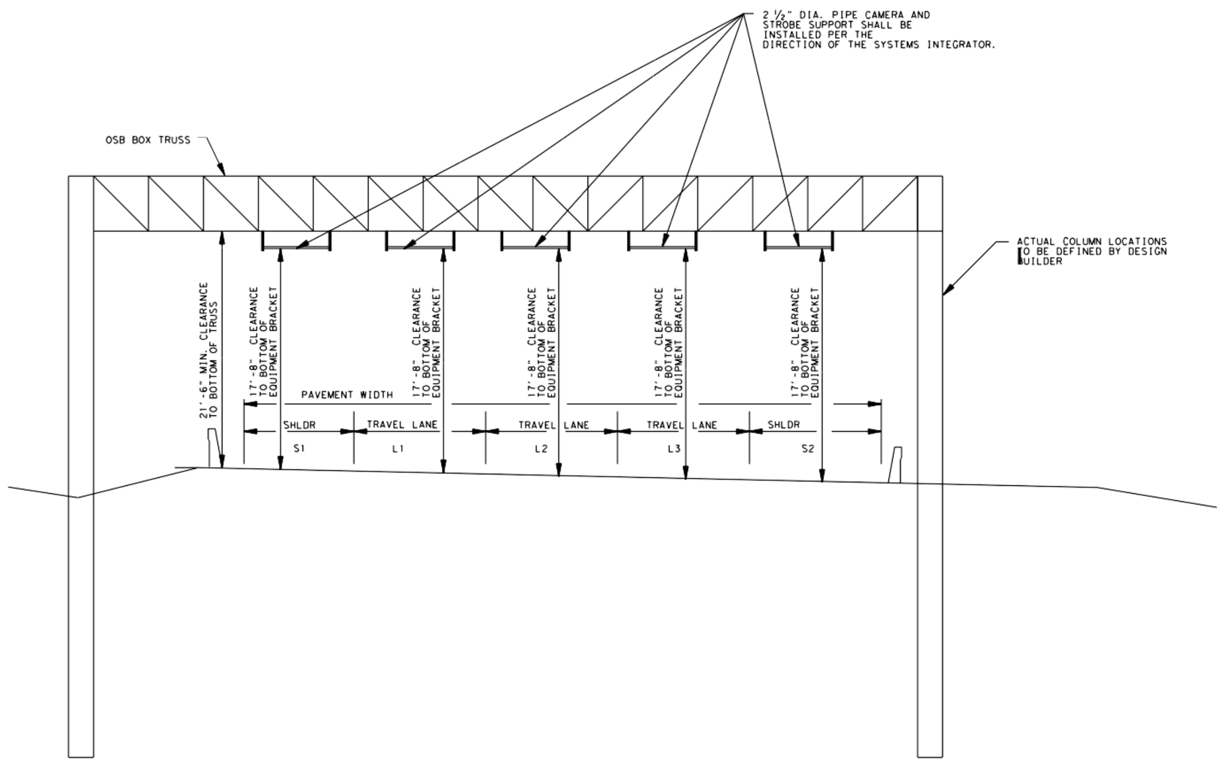

NOTES

1. TWO (2) BRACKETS ARE REQUIRED FOR EACH LOCATON SHOWN. BRACKETS SHALL BE ADJUSTABLE TO ALLOW FOR POSITIONING IN ACCORDANCE WITH THE SYSTEMS INTEGRATOR'S SPECICATIONS. DESIGN BUILDER MUST COORDINATE INITIAL PLACEMENT LOCATION WITH THE SYSTEMS INTEGRATOR.
2. WALKWAYS ARE REQUIRED TO BE INSTALLED ON ALL GANTRY TRUSSES. LADDERS ARE REQUIRED TO BE INSTALLED ON ALL GANTRY COLUMNS.
3. 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

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Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
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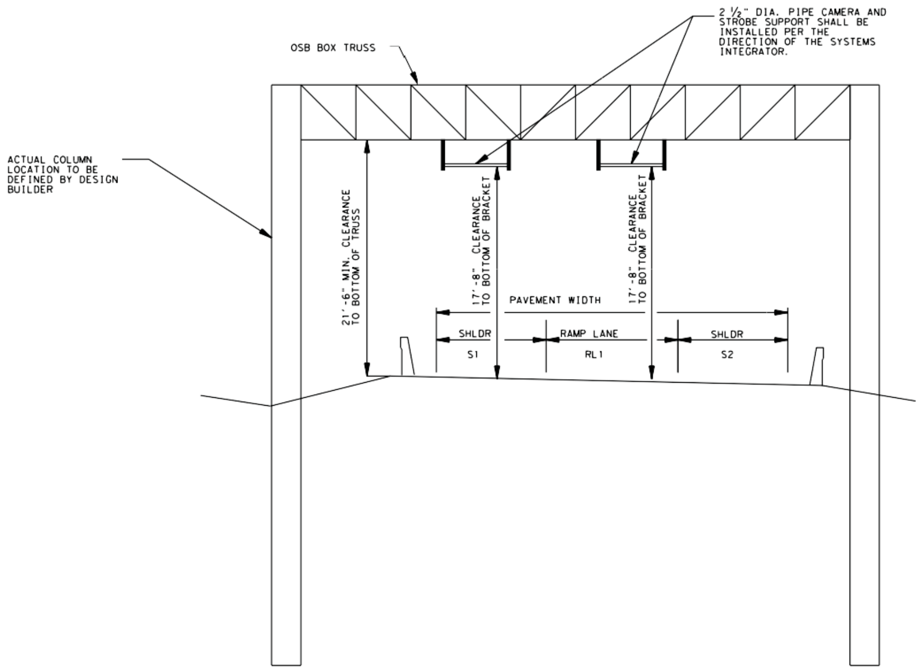
Regional Mobility Authority

FIXED PRICE
TOLLING STANDARDS

MAINLANE GANTRY CROSS-LANE
TANGENT ELEVATION VIEW

G1-ML

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6			15
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				



NOTES

1. TWO (2) BRACKETS ARE REQUIRED FOR EACH LOCATION SHOWN. BRACKETS SHALL BE ADJUSTABLE TO ALLOW FOR POSITIONING IN ACCORDANCE WITH THE SYSTEMS INTEGRATOR'S SPECICATIONS. DESIGN BUILDER MUST COORDINATE INITIAL PLACEMENT LOCATION WITH THE SYSTEMS INTEGRATOR.
2. 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

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Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
Date: 15-NOV-2013

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FIXED PRICE
TOLLING STANDARDS

RAMP CROSS-LANE
TANGENT ELEVATION VIEW

G2-RMP

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6			16
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				

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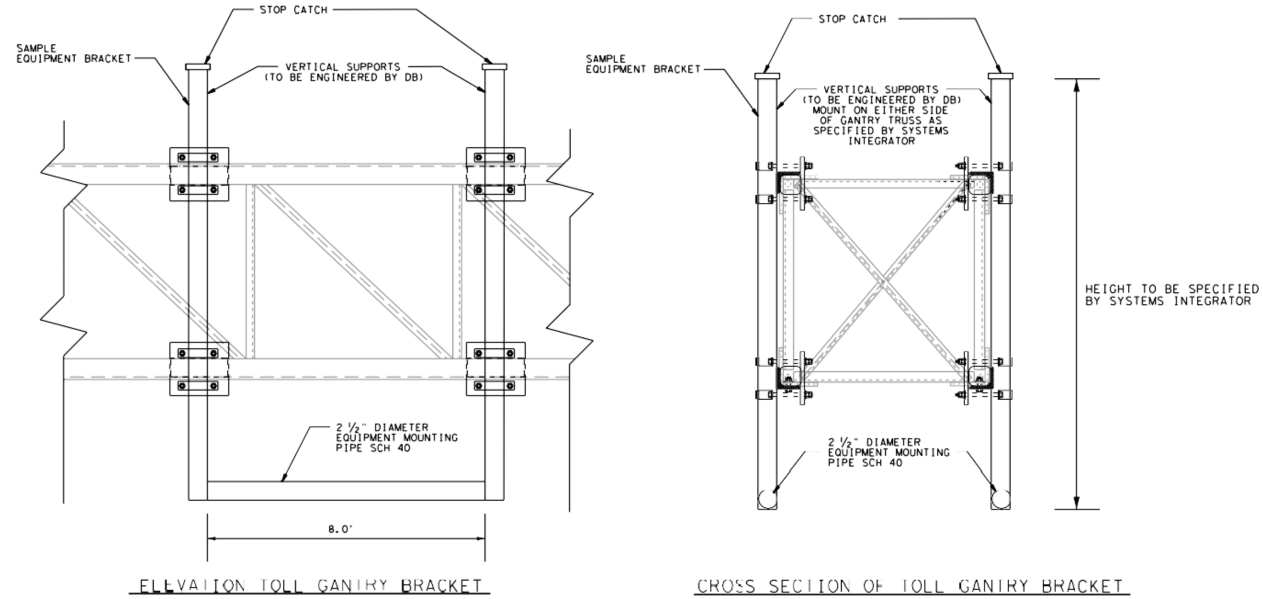
Design Filename: \\ausw00\pmwork\Jobs\46837*CTRMA\183A Operations and Maintenance\Tolling\New Fixed Price Tolling Standards\MLGantryXlaneTangentElevView.dgn



GENERAL NOTES:

1) THESE DETAILS ARE FOR USE WITH TXDOT STANDARD OVERHEAD SIGN BRIDGE (OSB) OR CANTILEVER OVERHEAD SIGN SUPPORT (COSS).

2) FOR CONNECTION DETAILS NOT SHOWN SEE OVERHEAD SIGN BRIDGE TRUSS DETAILS (OSBC) OR CANTILEVER OVERHEAD SIGN SUPPORT DETAILS (COSSD).

3) AI-R AL SHALL BE COMPATIBLE WITH THE REQUIREM NTS OF THE ASSOCIATED REFERENCE SIGN BRIDG S ANDARDS.

4) QUANTITY OF EQUIPMENT BRACKETS AND LOCATION TO BE SPECIFIED BY SYSTEM INTEGRATOR.

5) DESIGN OF EQUIPMENT BRACKET AND CONNECTION TO OVERHEAD TRUSS TO BE PROVIDED BY DESIGN BUILDER. AVI ANTENNA AND CAMERA MOUNTING HARDWARE AND CONNECTION DETAILS TO BE PROVIDED BY SYSTEM INTEGRATOR.

6) SHOP DRAWINGS FOR AVI ANTENNA AND VES CAMERA SUPPORT SHALL BE PROVIDED FOR ENGINEER'S REVIEW.

7) DESIGNER BUILDER TO SPECIFY APPROPRIATE, SPAN, ICE LOADING, AND WIND ZONE. TRUSS DYNAMIC RESPONSE AND DEFLECTION SHALL BE COMPATIBLE WITH TOLL SYSTEM REQUIREMENTS.

8) DESIGN OF OSB AND COSS COLUMNS, DRILLED SHAFTS, AND TRUSS TO COLUMN CONNECTION TO BE PROVIDED BY DESIGN BUILDER.

9) EQUIPMENT BRACKET AND ALL MOUNTING HARDWARE SHALL BE HOT DIP GALVANIZED.

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

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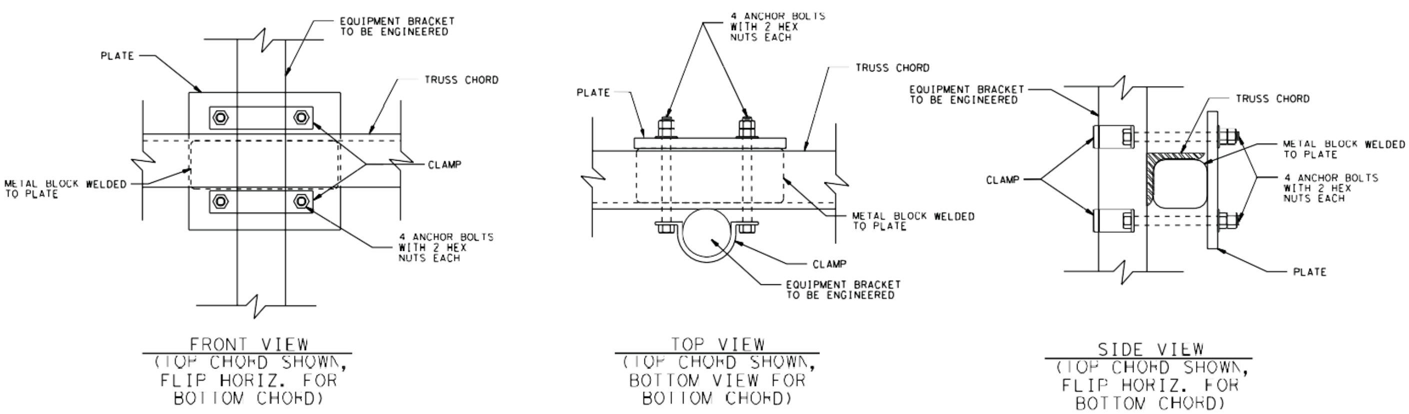

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Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420

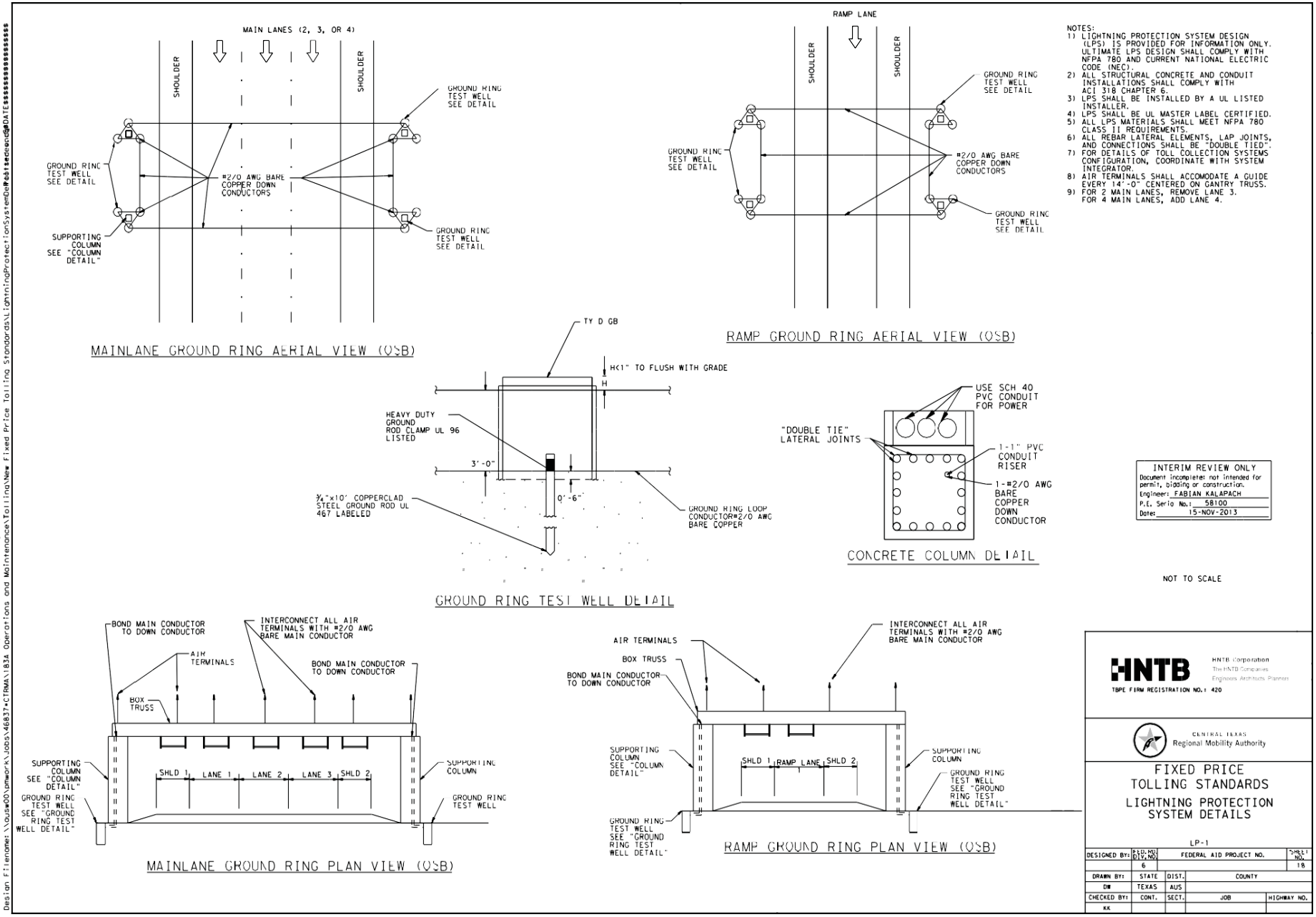
CENTRAL TEXAS
Regional Mobility Authority

FIXED PRICE
TOLLING STANDARDS
TOLL GANTRY
MISCELLANEOUS
DETAILS

MG-1

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6			17
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				

Scale: 1:2


MAIN LANES (2, 3, OR 4)
SHOULDER
SHOULDER
GROUND RING TEST WELL SEE DETAIL
GROUND RING TEST WELL SEE DETAIL
#2/0 AWG BARE COPPER DOWN CONDUCTORS
SUPPORTING COLUMN SEE "COLUMN DETAIL"
GROUND RING TEST WELL SEE DETAIL
MAINLANE GROUND RING AERIAL VIEW (OSB)
RAMP LANE
SHOULDER
SHOULDER
GROUND RING TEST WELL SEE DETAIL
GROUND RING TEST WELL SEE DETAIL
#2/0 AWG BARE COPPER DOWN CONDUCTORS
GROUND RING TEST WELL SEE DETAIL
RAMP GROUND RING AERIAL VIEW (OSB)
NOTES:
1) LIGHTNING PROTECTION SYSTEM DESIGN (LPS) IS PROVIDED FOR INFORMATION ONLY. ULTIMATE LPS DESIGN SHALL COMPLY WITH NFPA 780 AND CURRENT NATIONAL ELECTRIC CODE (NEC).
2) ALL STRUCTURAL CONCRETE AND CONDUIT INSTALLATIONS SHALL COMPLY WITH ACI 318 CHAPTER 6.
3) LPS SHALL BE INSTALLED BY A UL LISTED INSTALLER.
4) LPS SHALL BE UL MASTER LABEL CERTIFIED.
5) ALL LPS MATERIALS SHALL MEET NFPA 780 CLASS II REQUIREMENTS.
6) ALL REBAR LATERAL ELEMENTS, LAP JOINTS, AND CONNECTIONS SHALL BE "DOUBLE TIED".
7) FOR DETAILS OF TOLL COLLECTION SYSTEMS CONFIGURATION, COORDINATE WITH SYSTEM INTEGRATOR.
8) AIR TERMINALS SHALL ACCOMODATE A GUIDE EVERY 14'-0" CENTERED ON GANTRY TRUSS.
9) FOR 2 MAIN LANES, REMOVE LANE 3. FOR 4 MAIN LANES, ADD LANE 4.
TY D GB
HC1" TO FLUSH WITH GRADE
H
HEAVY DUTY GROUND ROD CLAMP UL 96 LISTED
3'-0"
0'-6"
¾"x10' COPPERCLAD STEEL GROUND ROD UL 467 LABELED
GROUND RING LOOP CONDUCTOR=2/0 AWG BARE COPPER
GROUND RING TEST WELL DETAIL
USE SCH 40 PVC CONDUIT FOR POWER
"DOUBLE TIE" LATERAL JOINTS
1-1" PVC CONDUIT RISER
1-#2/0 AWG BARE COPPER DOWN CONDUCTOR
CONCRETE COLUMN DETAIL
INTERIM REVIEW ONLY
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Engineer: FABIAN KALAPACH
P.E. Serial No.: 58100
Date: 15-NOV-2013
NOT TO SCALE
BOND MAIN CONDUCTOR TO DOWN CONDUCTOR
INTERCONNECT ALL AIR TERMINALS WITH #2/0 AWG BARE MAIN CONDUCTOR
AIR TERMINALS
BOND MAIN CONDUCTOR TO DOWN CONDUCTOR
BOX TRUSS
SUPPORTING COLUMN SEE "COLUMN DETAIL"
SHLD 1
LANE 1
LANE 2
LANE 3
SHLD 2
SUPPORTING COLUMN
GROUND RING TEST WELL SEE "GROUND RING TEST WELL DETAIL"
GROUND RING TEST WELL
MAINLANE GROUND RING PLAN VIEW (OSB)
AIR TERMINALS
INTERCONNECT ALL AIR TERMINALS WITH #2/0 AWG BARE MAIN CONDUCTOR
BOX TRUSS
BOND MAIN CONDUCTOR TO DOWN CONDUCTOR
SUPPORTING COLUMN SEE "COLUMN DETAIL"
SHLD 1
RAMP LANE
SHLD 2
SUPPORTING COLUMN
GROUND RING TEST WELL SEE "GROUND RING TEST WELL DETAIL"
GROUND RING TEST WELL SEE "GROUND RING TEST WELL DETAIL"
RAMP GROUND RING PLAN VIEW (OSB)
HNTB
HNTB Corporation
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Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420
CENTRAL TEXAS
Regional Mobility Authority
FIXED PRICE
TOLLING STANDARDS
LIGHTNING PROTECTION
SYSTEM DETAILS
LP-1
DESIGNED BY:
F.D. NO. DIV. NO.
6
FEDERAL AID PROJECT NO.
SHEET NO.
18
DRAWN BY: DW
STATE TEXAS
DIST. AUS
COUNTY
CHECKED BY: KK
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SECT.
JOB
HIGHWAY NO.
Scale: 1:20
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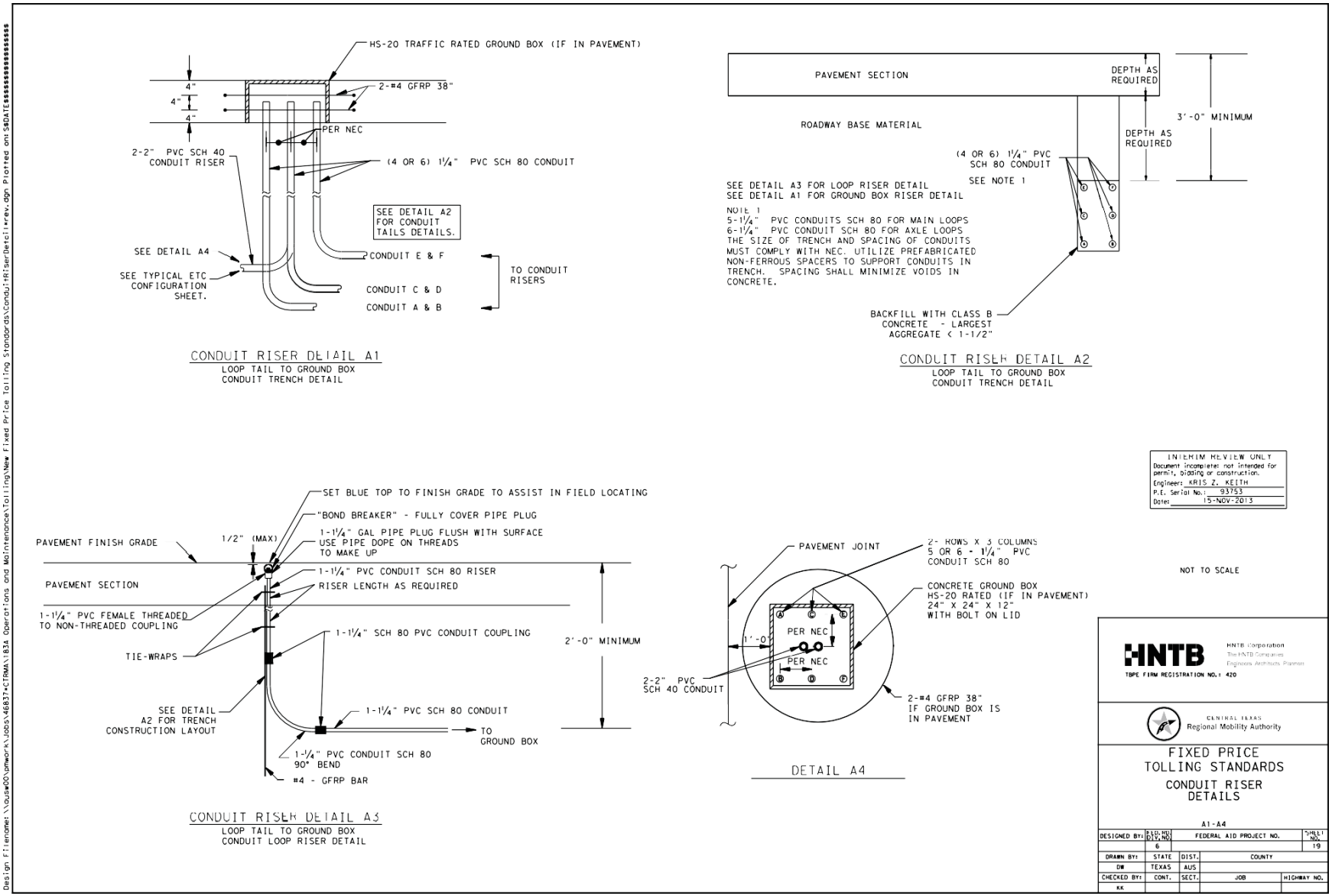
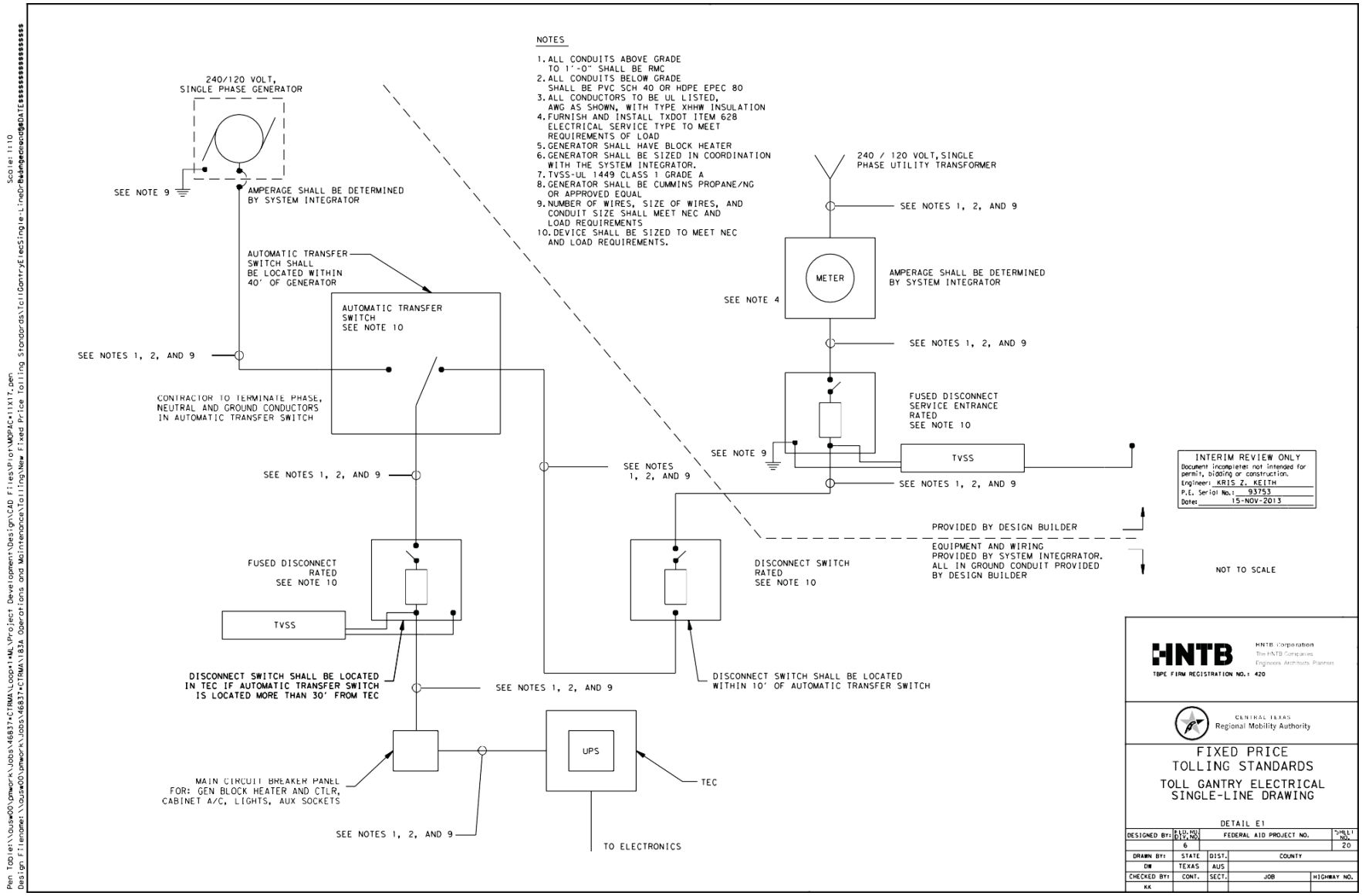
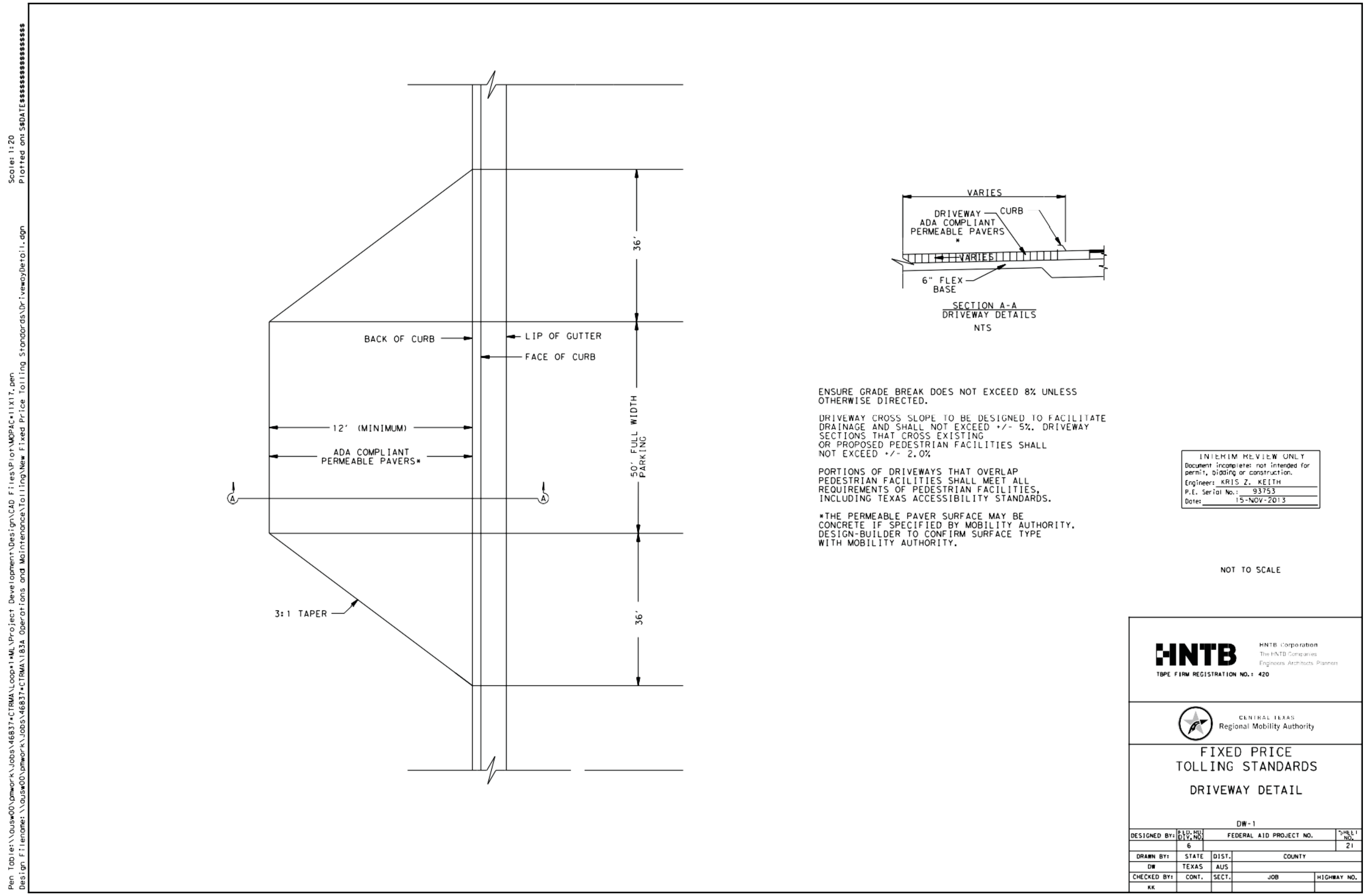
DATE


HS-20 TRAFFIC RATED GROUND BOX (IF IN PAVEMENT)
4"
4"
4"
2-#4 GFRP 38"
PER NEC
2-2" PVC SCH 40 CONDUIT RISER
(4 OR 6) 1¼" PVC SCH 80 CONDUIT
SEE DETAIL A2 FOR CONDUIT TAILS DETAILS.
SEE DETAIL A4
SEE TYPICAL ETC CONFIGURATION SHEET.
CONDUIT E & F
CONDUIT C & D
CONDUIT A & B
TO CONDUIT RISERS
CONDUIT RISER DETAIL A1
LOOP TAIL TO GROUND BOX
CONDUIT TRENCH DETAIL
PAVEMENT SECTION
DEPTH AS REQUIRED
ROADWAY BASE MATERIAL
3'-0" MINIMUM
DEPTH AS REQUIRED
(4 OR 6) 1¼" PVC SCH 80 CONDUIT
SEE NOTE 1
SEE DETAIL A3 FOR LOOP RISER DETAIL
SEE DETAIL A1 FOR GROUND BOX RISER DETAIL
NOTE 1
5-1¼" PVC CONDUITS SCH 80 FOR MAIN LOOPS
6-1¼" PVC CONDUIT SCH 80 FOR AXLE LOOPS
THE SIZE OF TRENCH AND SPACING OF CONDUITS MUST COMPLY WITH NEC. UTILIZE PREFABRICATED NON-FERROUS SPACERS TO SUPPORT CONDUITS IN TRENCH. SPACING SHALL MINIMIZE VOIDS IN CONCRETE.
BACKFILL WITH CLASS B CONCRETE - LARGEST AGGREGATE < 1-1/2"
CONDUIT RISER DETAIL A2
LOOP TAIL TO GROUND BOX
CONDUIT TRENCH DETAIL
SET BLUE TOP TO FINISH GRADE TO ASSIST IN FIELD LOCATING
"BOND BREAKER" - FULLY COVER PIPE PLUG
1-1¼" GAL PIPE PLUG FLUSH WITH SURFACE USE PIPE DOPE ON THREADS TO MAKE UP
PAVEMENT FINISH GRADE
1/2" (MAX)
1-1¼" PVC CONDUIT SCH 80 RISER
RISER LENGTH AS REQUIRED
PAVEMENT SECTION
1-1¼" PVC FEMALE THREADED TO NON-THREADED COUPLING
1-1¼" SCH 80 PVC CONDUIT COUPLING
2'-0" MINIMUM
TIE-WRAPS
SEE DETAIL A2 FOR TRENCH CONSTRUCTION LAYOUT
1-1¼" PVC SCH 80 CONDUIT
TO GROUND BOX
1-¼" PVC CONDUIT SCH 80 90° BEND
#4 - GFRP BAR
CONDUIT RISER DETAIL A3
LOOP TAIL TO GROUND BOX
CONDUIT LOOP RISER DETAIL
PAVEMENT JOINT
2- ROWS X 3 COLUMNS 5 OR 6 - 1¼" PVC CONDUIT SCH 80
CONCRETE GROUND BOX HS-20 RATED (IF IN PAVEMENT) 24" X 24" X 12" WITH BOLT ON LID
1'-0"
PER NEC
PER NEC
2-2" PVC SCH 40 CONDUIT
2-#4 GFRP 38" IF GROUND BOX IS IN PAVEMENT
DETAIL A4
NOT TO SCALE
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
HNTB
HNTB Corporation
The HNTB Companies
Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420
CENTRAL TEXAS Regional Mobility Authority
FIXED PRICE
TOLLING STANDARDS
CONDUIT RISER DETAILS
A1-A4
DESIGNED BY:
FED. RD. DIV. NO. 6
FEDERAL AID PROJECT NO.
SHEET NO. 19
DRAWN BY:
STATE TEXAS
DIST. AUS
COUNTY
CHECKED BY:
CONT.
SECT.
JOB
HIGHWAY NO.
KK
Pen Tables:\\Dusw001\pmwork\Jobs\46837+CTRMA\Loop+1.MAL\Project Development\Design\CAD Files\Plot\MOPAC+11X17.pen
Design Filename: \\Dusw001\pmwork\Jobs\46837+CTRMA\183A Operations and Maintenance\Tolling\New Fixed Price Tolling Standards\Conduit+RiserDetail+rev.dgn Plotted on: %%DATE
Scale: 1:2


NOTES
1. ALL CONDUITS ABOVE GRADE TO 1'-0" SHALL BE RMC
2. ALL CONDUITS BELOW GRADE SHALL BE PVC SCH 40 OR HDPE EPEC 80
3. ALL CONDUCTORS TO BE UL LISTED, AWG AS SHOWN, WITH TYPE XHHW INSULATION
4. FURNISH AND INSTALL TXDOT ITEM 628 ELECTRICAL SERVICE TYPE TO MEET REQUIREMENTS OF LOAD
5. GENERATOR SHALL HAVE BLOCK HEATER
6. GENERATOR SHALL BE SIZED IN COORDINATION WITH THE SYSTEM INTEGRATOR.
7. TVSS-UL 1449 CLASS 1 GRADE A
8. GENERATOR SHALL BE CUMMINS PROPANE/NG OR APPROVED EQUAL
9. NUMBER OF WIRES, SIZE OF WIRES, AND CONDUIT SIZE SHALL MEET NEC AND LOAD REQUIREMENTS
10. DEVICE SHALL BE SIZED TO MEET NEC AND LOAD REQUIREMENTS.
240/120 VOLT, SINGLE PHASE GENERATOR
SEE NOTE 9
AMPERAGE SHALL BE DETERMINED BY SYSTEM INTEGRATOR
AUTOMATIC TRANSFER SWITCH SHALL BE LOCATED WITHIN 40' OF GENERATOR
AUTOMATIC TRANSFER SWITCH SEE NOTE 10
SEE NOTES 1, 2, AND 9
CONTRACTOR TO TERMINATE PHASE, NEUTRAL AND GROUND CONDUCTORS IN AUTOMATIC TRANSFER SWITCH
240 / 120 VOLT, SINGLE PHASE UTILITY TRANSFORMER
SEE NOTES 1, 2, AND 9
METER
AMPERAGE SHALL BE DETERMINED BY SYSTEM INTEGRATOR
SEE NOTE 4
SEE NOTES 1, 2, AND 9
FUSED DISCONNECT SERVICE ENTRANCE RATED SEE NOTE 10
SEE NOTE 9
TVSS
SEE NOTES 1, 2, AND 9
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
SEE NOTES 1, 2, AND 9
SEE NOTES 1, 2, AND 9
PROVIDED BY DESIGN BUILDER
EQUIPMENT AND WIRING PROVIDED BY SYSTEM INTEGRRATOR. ALL IN GROUND CONDUIT PROVIDED BY DESIGN BUILDER
NOT TO SCALE
FUSED DISCONNECT RATED SEE NOTE 10
TVSS
DISCONNECT SWITCH RATED SEE NOTE 10
DISCONNECT SWITCH SHALL BE LOCATED IN TEC IF AUTOMATIC TRANSFER SWITCH IS LOCATED MORE THAN 30' FROM TEC
DISCONNECT SWITCH SHALL BE LOCATED WITHIN 10' OF AUTOMATIC TRANSFER SWITCH
SEE NOTES 1, 2, AND 9
UPS
TEC
MAIN CIRCUIT BREAKER PANEL FOR: GEN BLOCK HEATER AND CTLR, CABINET A/C, LIGHTS, AUX SOCKETS
SEE NOTES 1, 2, AND 9
TO ELECTRONICS
HNTB
HNTB Corporation
The HNTB Companies
Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420
CENTRAL TEXAS
Regional Mobility Authority
FIXED PRICE
TOLLING STANDARDS
TOLL GANTRY ELECTRICAL
SINGLE-LINE DRAWING
DETAIL E1
DESIGNED BY:
F.ED. RD. DIV. NO.
FEDERAL AID PROJECT NO.
SHEET NO.
6
20
DRAWN BY:
STATE
DIST.
COUNTY
DW
TEXAS
AUS
CHECKED BY:
CONT.
SECT.
JOB
HIGHWAY NO.
KK


36'
BACK OF CURB
LIP OF GUTTER
FACE OF CURB
12' (MINIMUM)
ADA COMPLIANT
PERMEABLE PAVERS*
50' FULL WIDTH
PARKING
A
A
3:1 TAPER
36'
VARIES
DRIVEWAY
CURB
ADA COMPLIANT
PERMEABLE PAVERS
*
VARIES
6" FLEX
BASE
SECTION A-A
DRIVEWAY DETAILS
NTS
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. KEITH
P.E. Serial No.: 93753
Date: 15-NOV-2013
NOT TO SCALE
HNTB Corporation
The HNTB Companies
Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420
CENTRAL TEXAS
Regional Mobility Authority
FIXED PRICE
TOLLING STANDARDS
DRIVEWAY DETAIL
DW-1
DESIGNED BY:
FED. RD. DIV. NO.
FEDERAL AID PROJECT NO.
SHEET NO.
6
21
DRAWN BY:
STATE
DIST.
COUNTY
DW
TEXAS
AUS
CHECKED BY:
CONT.
SECT.
JOB
HIGHWAY NO.
KK
Scale: 1:20
Plotted on: $$DATE$$$$$$$$$$$$$$$$$$$$
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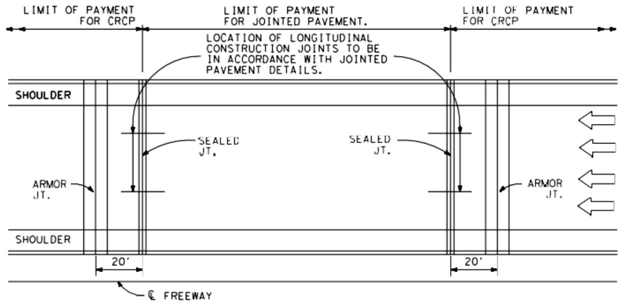
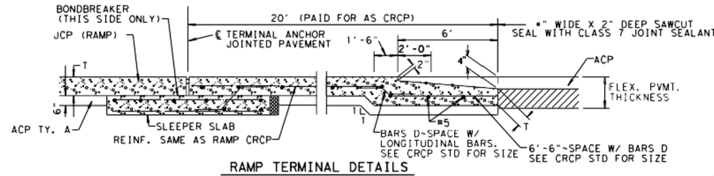
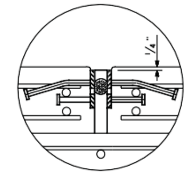


TYPICAL FREEWAY LAYOUT
CONCRETE MEDIAN AND SHOULDERS
(SHOWING 2 TERMINAL ANCHORS)

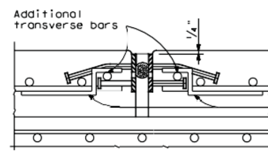


RAMP TERMINAL DETAILS



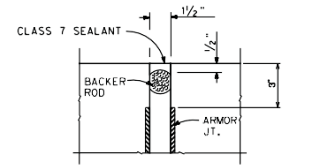
OPTIONAL ARMOR JT DESIGN

Note: Armor Joint may be depressed by 1/4" across roadway for construction concerns. 1/4" to 3/8" radius tool to be used at concrete edge. Optional Armor Joint design shall not be used at abutment.



SINGLE LAYER REINFORCEMENT

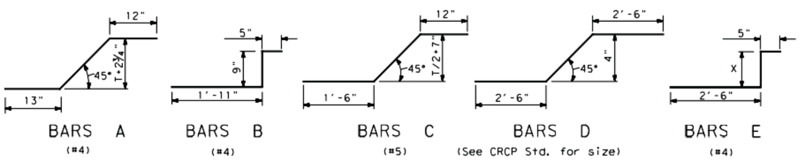
Two additional transverse bars shall be placed to engage Nelson Studs when single layer of continuous steel is present. Bars E shall be placed along longitudinal bars to engage additional transverse bars



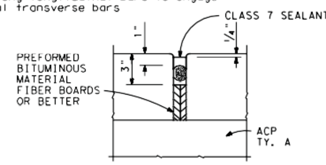
PLAN VIEW

TREATMENT OF VERTICAL EDGE

Vertical edge shall be sealed with backer rod and class 7 sealant flush with pavement edge. Horizontal limits of backer rod along the length of the armor joint shall be extended to the outside of pavement. Joint shall be cleaned prior to sealing.



T	X
8"	2 1/4"
9"	2 3/4"
10"	3 1/4"
11"	3 3/4"
12"	4 1/4"
13"	4 3/4"

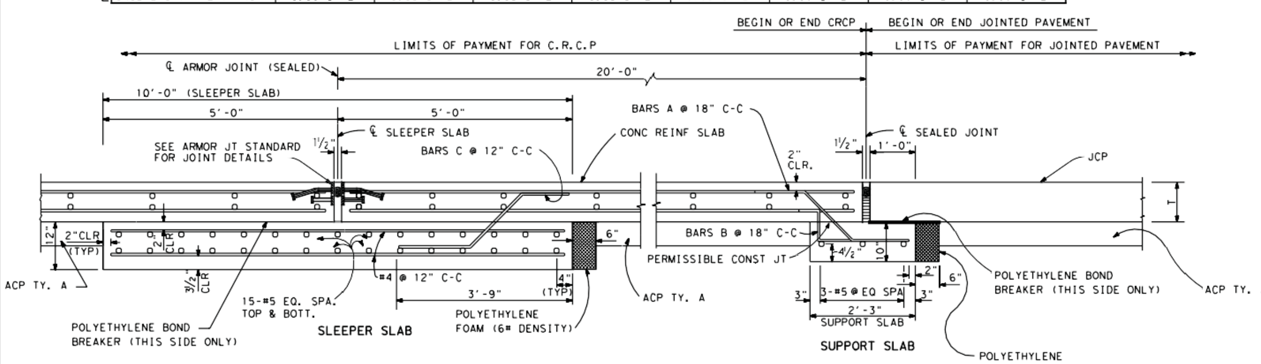


SEALED JOINT

1/4" to 3/8" radius tool to be used at concrete edge. Joint shall be cleaned prior to sealing

ESTIMATED QUANTITIES (FOR ONE TERMINAL ANCHOR)

	ITEM	PAVEMENT THICKNESS (INCHES)							
		8	9	10	11	12	13	14	15
SLEEPER SLAB	CONC (TERM ANCH)	0.37 CY/LF	0.37 CY/LF	0.37 CY/LF	0.37 CY/LF	0.37 CY/LF	0.37 CY/LF	0.37 CY/LF	0.37 CY/LF
	REINF STL (TERM ANCH)	49.0 LBS/LF	49.1 LBS/LF	49.2 LBS/LF	49.3 LBS/LF	49.5 LBS/LF	49.6 LBS/LF	49.7 LBS/LF	49.8 LBS/LF
	UNCL EXCAV (TERM ANCH)	0.19 CY/LF	0.19 CY/LF	0.19 CY/LF	0.19 CY/LF	0.19 CY/LF	0.19 CY/LF	0.19 CY/LF	0.19 CY/LF
SUPPORT SLAB	CONC (TERM ANCH)	0.07 CY/LF	0.07 CY/LF	0.07 CY/LF	0.07 CY/LF	0.07 CY/LF	0.07 CY/LF	0.07 CY/LF	0.07 CY/LF
	REINF STL (TERM ANCH)	7.3 LBS/LF	7.4 LBS/LF	7.5 LBS/LF	7.5 LBS/LF	7.6 LBS/LF	7.7 LBS/LF	7.8 LBS/LF	7.9 LBS/LF
	UNCL EXCAV (TERM ANCH)	0.03 CY/LF	0.03 CY/LF	0.03 CY/LF	0.03 CY/LF	0.03 CY/LF	0.03 CY/LF	0.03 CY/LF	0.03 CY/LF



SECTION THRU TERMINAL ANCHORAGE
(SHOWING ONE TERMINAL ANCHOR)

NOTES:

POLYETHYLENE FOAM (6# DENSITY), SAW CUTS, EXPANSION JOINTS, AND EXPANSION JOINT MATERIALS SUBSIDIARY TO PERTINENT ITEM.

SUPPORT SLAB AND SLEEPER SLAB SHALL BE PAID FOR IN ACCORDANCE WITH SPECIAL SPECIFICATION ITEM "TERMINAL ANCHORAGE SYSTEM".

EXCAVATION OF A.C.P. IN VICINITY OF SLEEPER AND SUPPORT SLABS SUBSIDIARY TO PERTINENT ITEM.

SEE C.R.C.P. STANDARD FOR LOCATION OF REINFORCEMENT AND DETAILS. C.R.C.P. IN VICINITY OF SLEEPER AND SUPPORT SLAB TO BE PAID UNDER PERTINENT ITEM

JOINTED CONCRETE PAVEMENT (JCP) DETAILS ARE SHOWN ELSEWHERE IN THE PLANS.

DETAILS FOR PAVEMENT WIDTH, AND CROWN CROSS-SLOPE SHALL BE AS SHOWN ELSEWHERE ON THE PLANS.

Texas Department of Transportation
Austin District Design

TERMINAL ANCHOR
JOINT - JOINTED

TAJ-1

Austin District Standard

© TxDOT 2006

REVISIONS	DIST	FED REG	FEDERAL AID PROJECT	SHEET
	AUS	6		22

COUNTY	CONTROL	SECT	JOB	HIGHWAY

FILE: TAJ-JCP.dgn

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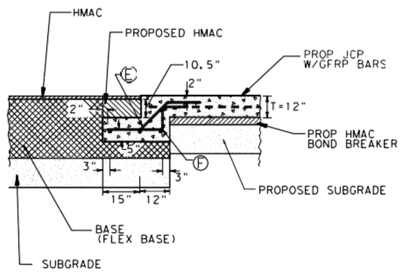
Scale: 1:5

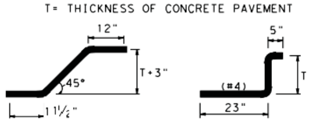
GENERAL NOTES

1. DESIGN-BUILDER TO COORDINATE WITH SYSTEM INTEGRATOR FOR ACTUAL JOINT LOCATIONS.
2. TRANSVERSE JOINT SPACINGS SHOWN ARE MEASURED ALONG THE OUTSIDE EDGE OF PAVEMENT. TRANSVERSE JOINTS SHALL BE RADIAL TO THE BASELINE.
3. PROVIDE BOTH MEMBRANE AND WET MAT CURING. PLACE MEMBRANE CURING IMMEDIATELY AFTER TEXTURING. PROVIDE WET MAT CURING IN ACCORDANCE WITH TXDOT ITEM 420, AFTER MEMBRANE CURING HAS BEEN APPLIED AND AS SOON AS PRACTICAL SO AS NOT TO DAMAGE THE SURFACE FINISH.
4. SAW JOINTS TO A DEPTH OF 3" OR THE PAVEMENT THICKNESS DIVIDED BY FOUR (4), WHICHEVER IS GREATER, AS SOON AS SAWING CAN BE ACCOMPLISHED WITH ONLY MINOR RAVELING AND COMPLETE SAWING BEFORE THE PAVEMENT BEGINS TO COOL. FOR EACH CONCRETE PLACEMENT INSTALL ONE OR MORE TEMPERATURE SENSORS, 1" BELOW THE SURFACE AND MONITOR TO INSURE TEMPERATURE REQUIREMENTS ARE MET.



TRANSITION DETAIL
JCP TO ASPHALT
NTS

T= THICKNESS OF CONCRETE PAVEMENT



BAR DETAIL (E) (#4)

BAR DETAIL (F) (#4)

NOTE: STEEL REINFORCING ALLOWED FOR BARS E AND F, AND SPACED AT 18" C-C

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Engineer: KRIS Z. KEITH
P.E. Serial No.: 93753
Date: 15-NOV-2013

NOT TO SCALE

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Engineers Architects Planners
TBPE FIRM REGISTRATION NO.: 420

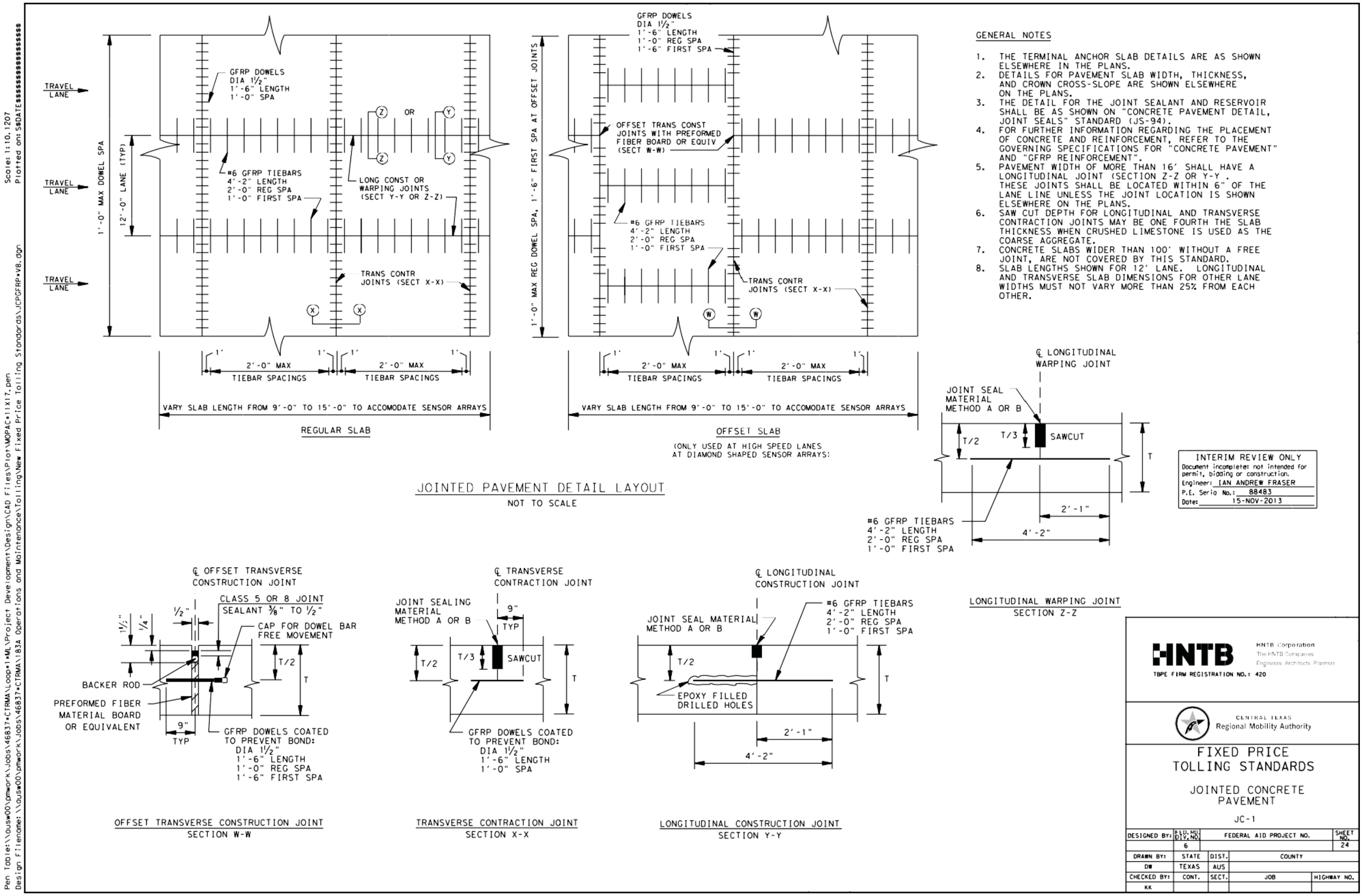
CENTRAL TEXAS
Regional Mobility Authority

FIXED PRICE
TOLLING STANDARDS

CONCRETE TO ASPHALT
TRANSITION DETAIL

CATD-1

DESIGNED BY:	FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		SHEET NO.
	6			23
DRAWN BY:	STATE	DIST.	COUNTY	
DW	TEXAS	AUS		
CHECKED BY:	CONT.	SECT.	JOB	HIGHWAY NO.
KK				


JOINTED PAVEMENT DETAIL LAYOUT
NOT TO SCALE
REGULAR SLAB
OFFSET SLAB
(ONLY USED AT HIGH SPEED LANES AT DIAMOND SHAPED SENSOR ARRAYS)
TRAVEL LANE
GFRP DOWELS DIA 1½" 1'-6" LENGTH 1'-0" SPA
#6 GFRP TIEBARS 4'-2" LENGTH 2'-0" REG SPA 1'-0" FIRST SPA
LONG CONST OR WARPING JOINTS (SECT Y-Y OR Z-Z)
TRANS CONTR JOINTS (SECT X-X)
OFFSET TRANS CONST JOINTS WITH PREFORMED FIBER BOARD OR EQUIV (SECT W-W)
1'-0" MAX DOWEL SPA
12'-0" LANE (TYP)
1'-0" MAX REG DOWEL SPA, 1'-6" FIRST SPA AT OFFSET JOINTS
2'-0" MAX TIEBAR SPACINGS
VARY SLAB LENGTH FROM 9'-0" TO 15'-0" TO ACCOMODATE SENSOR ARRAYS
GENERAL NOTES
1. THE TERMINAL ANCHOR SLAB DETAILS ARE AS SHOWN ELSEWHERE IN THE PLANS.
2. DETAILS FOR PAVEMENT SLAB WIDTH, THICKNESS, AND CROWN CROSS-SLOPE ARE SHOWN ELSEWHERE ON THE PLANS.
3. THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR SHALL BE AS SHOWN ON "CONCRETE PAVEMENT DETAIL, JOINT SEALS" STANDARD (JS-94).
4. FOR FURTHER INFORMATION REGARDING THE PLACEMENT OF CONCRETE AND REINFORCEMENT, REFER TO THE GOVERNING SPECIFICATIONS FOR "CONCRETE PAVEMENT" AND "GFRP REINFORCEMENT".
5. PAVEMENT WIDTH OF MORE THAN 16' SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6" OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
6. SAW CUT DEPTH FOR LONGITUDINAL AND TRANSVERSE CONTRACTION JOINTS MAY BE ONE FOURTH THE SLAB THICKNESS WHEN CRUSHED LIMESTONE IS USED AS THE COARSE AGGREGATE.
7. CONCRETE SLABS WIDER THAN 100' WITHOUT A FREE JOINT, ARE NOT COVERED BY THIS STANDARD.
8. SLAB LENGTHS SHOWN FOR 12' LANE. LONGITUDINAL AND TRANSVERSE SLAB DIMENSIONS FOR OTHER LANE WIDTHS MUST NOT VARY MORE THAN 25% FROM EACH OTHER.
℄ LONGITUDINAL WARPING JOINT
JOINT SEAL MATERIAL METHOD A OR B
SAWCUT
LONGITUDINAL WARPING JOINT
SECTION Z-Z
INTERIM REVIEW ONLY
Document incomplete: not intended for permit, bidding or construction.
Engineer: IAN ANDREW FRASER
P.E. Serial No.: 88483
Date: 15-NOV-2013
℄ OFFSET TRANSVERSE CONSTRUCTION JOINT
CLASS 5 OR 8 JOINT SEALANT ⅜" TO ½"
CAP FOR DOWEL BAR FREE MOVEMENT
BACKER ROD
PREFORMED FIBER MATERIAL BOARD OR EQUIVALENT
GFRP DOWELS COATED TO PREVENT BOND: DIA 1½" 1'-6" LENGTH 1'-0" REG SPA 1'-6" FIRST SPA
OFFSET TRANSVERSE CONSTRUCTION JOINT
SECTION W-W
℄ TRANSVERSE CONTRACTION JOINT
JOINT SEALING MATERIAL METHOD A OR B
GFRP DOWELS COATED TO PREVENT BOND: DIA 1½" 1'-6" LENGTH 1'-0" SPA
TRANSVERSE CONTRACTION JOINT
SECTION X-X
℄ LONGITUDINAL CONSTRUCTION JOINT
JOINT SEAL MATERIAL METHOD A OR B
EPOXY FILLED DRILLED HOLES
LONGITUDINAL CONSTRUCTION JOINT
SECTION Y-Y
HNTB
TBPE FIRM REGISTRATION NO.: 420
CENTRAL TEXAS Regional Mobility Authority
FIXED PRICE TOLLING STANDARDS
JOINTED CONCRETE PAVEMENT
JC-1
SHEET NO. 24
STATE TEXAS
DIST. AUS

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	Systen 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	
	TOTAL				**2,364,252.06**	**1,204,741**	**921,981**	**237,531**		**2,364,252**	**6,153**

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

ATTACHMENT F

Preliminary Project Schedule and Milestones

State Highway 45 SW Project

(Dates and durations subject to change.)

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