# KENTUCKY TRANSPORTATION CABINET
## AET REFERENCE DRAWINGS
### Typical All-Electronic Tolling (AET) Toll Zone Guidelines

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### Abbreviations

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<tr>
<td>AET</td>
<td>All-Electronic Tolling</td>
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<tr>
<td>AVC</td>
<td>Automatic Vehicle Classification</td>
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<tr>
<td>AVI</td>
<td>Automatic Vehicle Identification</td>
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<tr>
<td>C</td>
<td>Conduit</td>
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<td>C/L</td>
<td>Centerline</td>
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<tr>
<td>DMS</td>
<td>Dynamic Message Sign</td>
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<td>EOP</td>
<td>Edge of Pavement</td>
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<td>E.Q.</td>
<td>Equal Distance</td>
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<tr>
<td>FON</td>
<td>Fiber Optic Network</td>
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<td>ITS</td>
<td>Intelligent Transportation Systems</td>
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<tr>
<td>LPS</td>
<td>Lightning Protection System</td>
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<tr>
<td>NEC</td>
<td>National Electrical Code</td>
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<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
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<td>R/W</td>
<td>Right-of-Way</td>
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<tr>
<td>SOW</td>
<td>Scope of Work</td>
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<tr>
<td>SPD</td>
<td>Surge Protection Device</td>
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<tr>
<td>TYP</td>
<td>Typical</td>
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<tr>
<td>UL</td>
<td>Underwriters Laboratories</td>
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<tr>
<td>UPS</td>
<td>Uninterruptable Power Supply</td>
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All design and installation shall conform to the latest published edition/version of the State Standard Specifications, Roadway Drawings, and, as applicable, the NFPA 70 (NEC) and UL standards.

REVISION DATE - 4/10/2013
Notes:

1. Median column configuration may be adjusted depending on median width. One set of median columns may be acceptable for narrow medians.

2. Locate two Junction boxes where main FON truckline conduit intersects toll zone vault FON connection.

3. The FON trucklines as shown & approximate. The RODC steel conduit and fiber as part of this contract for all Interconnects to the Toll Zones. Use of secure point is point wherever will be considered and must be approved by the Joint Board.

4. Lane and shoulder configuration vary. See RFP for Lanes and Shoulders.

5. For all toll/traf entering Toll Zone Vault, place conduit boxes as needed to ensure test box before entering Toll Zone Vault & below level of sidewalk concrete slab.

6. Locations and length of steel beam guardrail, and location of end terminals shall be determined during design in accordance with AASHTO Institute safety, design guidelines and State standards.

7. For multiple segments with 4 or more truck lanes in each direction, install additional/online splice boxes in median.

8. Barrier section guard rail shall protect toll equipment and maintenance areas at each tolling area.

9. Provide concrete aprons for all Junction boxes as per the AET Scope of Work.
Notes:
1. The FDN tunnel is shown as approximate.
2. Lane and shoulder configuration may vary.
3. For all conduit runs entering Toll Zone Vault, place conduit boxes as needed to ensure test box before entering Toll Zone Vault is below level of skewwall concrete slab.
4. Location and length of steel beam guardrail and location of end terminals shall be determined during design in accordance with AASHTO area design guidelines and state standards.
5. Barrier wall or guard rail shall protect toll equipment and maintenance areas at each tolling zone.
6. Provide concrete aprons at all junction boxes as per the AET Scope of Work.
7. Toll Zone Vaults may be combined with the nearest Mainline Toll Vault if it is in close proximity. Additional roadside cabinets may be accommodated if Toll Vaults are combined.

Legend:
- Communications Junction Box
- Power Junction Box
- Loop Splitter Box
- Box with 8½ concrete apron; 1½ above grade
- Cast-in-Place Concrete Barrier Wall
- Structure Foundation

KENTUCKY TRANSPORTATION CABINET
AET REFERENCE DRAWINGS
Typical 2 Lane Ramp AET Tollzone Plan View

Ver 1.0 12/23/2013
Ver 1.2 4/32/2013

C-2
Sample Ramp Zone (1 Travel Lane)

Notes:
1. The PON trussline as shown is approximate.
2. Lane and shoulder configuration may vary.
3. For all conduit runs entering Toll Zone Vault, place conduit boxes as needed to ensure last box before entering Toll Zone Vault is below level of sidewalk concrete slab.
4. Location and length of steel beam guardrail and location of end terminals shall be determined during design in accordance with AASHTO roadside safety design guidelines and State standards.
5. Barrier wall or guard rail shall protect toll equipment and maintenance areas at each tolling zone.
6. Provide concrete aprons for all junction boxes as per the AET Scope of Work.
7. Toll Zone Vaults may be combined with the nearest Multiate Toll Vault if it is in close proximity. Additional models may be anticipated if Toll Vaults are combined.

Legend:
- Communications Junction Box
- Power Junction Box
- Loop Spike Box
- Cast-in-Place Concrete Barrier Wall
- Box with 18" concrete apron; 1' above grade

ATKINS
KENTUCKY TRANSPORTATION CABINET
AET REFERENCE DRAWINGS
Typical 1 Lane Ramp AET Toll Zone Plan View

SCALE | NOTA | DATE | DRAWN | SHEET NO.
--- | --- | --- | --- | ---
C-3
Sample Pull-off Design

Signing Notes:
1. TSI shall add required signing to AET Toll Zones with and without buildings.
   Coordinate signing with the Design Build Contractor and Developer. Sign locations are shown as sample for bidding.
2. Sign applies to both mainline and ramp AET Toll Zones.
3. Sign spacing shall be in accordance with State and MUTCD standards.
4. Sign sizes shall be in accordance with MUTCD Table 2B-1.
5. U-channel support design shall be in accordance with State standards.

Notes:
1. AET Toll Zone Vault and concrete pad may vary in size.
2. Locations and length of steel beam guardrail and location of end terminals shall be determined during design in accordance with AASHTO roadways safety design guidelines and State standards.
3. Acceleration and deceleration lengths shall be determined based on the design criteria included in the Roadway Scope of Work.
4. Center Toll Zone Vault between girders.
5. Provide driveway whether vault is present or not.
Section 'B-B'

C/L Downstream Gantry

Concrete Barrier Wall
Loop Wire
Section 'A-A'
Concrete Pavement Only
Metallic Dowel Bar (Typical 16"

Concrete Pavement Only
Loop Sawcut
Roadway Surface
Min. 1/4"

Notes:
1. All loops are by the Toll System Integrator.
2. Loop layout shown is typical for 2 travel lane mainline section. Toll System Integrator is responsible for actual loop dimensions for each AET site and coordination with the Design Build Contractor and the Developer.
3. Notes: This layout is for toll zones with concrete only.
GENERAL NOTES:
1. See Scope of Work for additional details and requirements.
2. Provide prefabricated pre-cut or built-in-place vault with R-21 insulation, per State building code.
3. Provide 3/4" chamfered edge on maintenance pad.
4. Hot-water heater safeguards as needed for local conditions, wire size, etc.

VAULT PLAN - ELECTRICAL:
1. Provide SPDs on all distribution panels.
2. Locate conduit stubups a minimum of 12" from interior wall finish.
3. Provide integral relay disconnect on HVAC unit.

LIGHTING SYSTEM:
1. Provide lighting system with battery backup for power loss capable of maintaining one interior light fixture for 30 minutes minimum.

SECURITY SYSTEM:
1. Provide conduit and electrical boxes to support the electronic door security system.

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KENTUCKY TRANSPORTATION CABINET
AET REFERENCE DRAWINGS
AET TollZone Vault Plan

MAK: [Signature]
Date: [Date]
Version: [Version]
24" x 24" x 12" Weatherlight Box

12" x 12" Divided Cable Tray

2" Flex Conduits

Violent/Tolling Camera
(By Others)

Tolling Antenna
(By Others)

Columns Location/Configuration may Vary Depending on Median Width

26" x 26" x 12" Weatherlight Box

26" x 26" x 12" Weatherlight Box

26" x 26" x 12" Weatherlight Box

Shoulder

Travel Lane

Travel Lane

Travel Lane

Travel Lane

Travel Lane

Travel Lane

Travel Lane

Shoulder

6 Mil. (Typ)

Upstream (First) Mainline Gantry Front (Approaching) Elevation Single Direction

Not to Scale

Notes:
1. Location of vertical supports to be coordinated by Toll System Integrator with Design Build Team or Developer.
2. Mounting plane are horizontal.
3. Corridor service walkways on Gantry to minimize closures for maintenance.

ATKINS

KENTUCKY TRANSPORTATION CABINET

AET REFERENCE DRAWINGS
Upstream Mainline AET Toll Zone Gantry Elevation Single Direction Front View (6 lane)

SCALE: N 380
Ver 1.1 3/22/2013
Ver 1.2 6/7/2013

A-3
Upstream (First) Mainline Gantry Rear Elevation View, Single Direction
(Cameras and Antennas Omitted for Clarity)

Not to Scale

Notes:
1. Location of vertical supports to be coordinated by Toll System Integrator with Design Build Team and Developer.
2. Mounting pipes are horizontal.
3. Corridor service walkways on gantry to minimize obstructions for maintenance.

Top View A-A
Downstream (Trailing) Mainline Gantry Front Elevation Single Direction

Notes:
1. Location of vertical supports to be coordinated by Toll System Integrator with Design Build Team and Developer.
2. Mounting pipes are horizontal.
3. Consider sensor walkways on gantry to minimize closures for maintenance.

Up to 12 x 2" Conduits In 2 Rows of 6; See Sheets E-1, E-2, and E-3 for Actual Number of Conduits

24" x 24" x 12" Weatherlight Box
12" x 12" Divided Cable Tray

Top View A-A
Upstream (First) Mainline Gantry Rear Elevation Single Direction
(Cameras and Antennas Omitted for Clarity)
Not to Scale

Notes:
1. Location of vertical supports to be coordinated
   by Toll System Integrator with Design Build Team and Developer.
2. Mounting pipes are horizontal.
3. Consider spinal walkways on gantry to minimize closures for maintenance.
Downstream (Trailing) Mainline Gantry Front Elevation Single Direction

Not to Scale

Notes:
1. Location of vertical supports to be coordinated by Toll System Integrator with Design Build Team and Developer.
2. Mounting plates are horizontal.
3. Consider service walkways on gantry to minimize closures for maintenance.
Notes:
1. Location of vertical supports to be coordinated by Toll System Integrator with Design Build Team and Developer.
2. Mounting pipes are horizontal. 
3. Consider semiautomatic walkways on gantry to minimize down time for maintenance.
Downstream (Trailing) Mainline Gantry Front Elevation Bi-Directional

Notes:
1. Location of vertical supports to be coordinated by Toll System Integrator with Design Build Team and Developer.
2. Mounting plates are horizontal.
3. Consider service walkways on gantry to minimize closures for maintenance.
Notes:
1. All mounting heights are to the centerline of the mounting pipe.
2. Heights are typical for both gantries.
3. Mounting pipes:
   Camera/Anenna, 2" Rigid Galvanized Pipe
   AVCiProfiler, 3" Rigid Galvanized Pipe (if mounting pipe is used)
4. Dimidated cable tray shall be watertight (NEMA 3R) and grounded on both ends per NEC.
5. All cabling from the dimidated cable tray to the top of the columns shall be concealed behind dedicating or steel walls.
6. Top of gantry mudshould treatment shall be higher than top of cavity tray and watertight box.
Gantry Side Elevation Single Direction

Notes:
1. All mounting heights are to the centerline of the mounting pipe.
2. Heights are typical for both gantries.
3. Mounting pipes
   - Camera/Antenna - 2’ Hot Dipped Painted Pipe.
   - AVC/Profiler - 3’ Hot Dipped Painted Pipe (if mounting pipe is used)
4. Diameter of cable tray shall be watertight (NEMA 3R) and grounded on both ends per NEC.
5. All conduit from the cable tray in the top of the columns shall be concealed behind cladding or index maps.
6. Top of gantry aesthetic treatment shall be higher than top of cable tray and watertight box.
Notes:

1. Sise junction boxes to fit conduit needs.
2. For all conduit runs entering Toll Zone Vault, please conduit boxes as needed to ensure fast loss before entering Toll Zone Vault is below level of sidewalk concrete slab.
3. Protect any electrical equipment installed adjacent to driveway with concrete bollards.
4. Provide concrete aprons for all junction boxes.
5. Provide a 2" conduit for Lightning Protection System grounding.

** For upstream location, number of conduits typically = 2 x number of traveled lanes
For downstream location, number of conduits typically = number of traveled lanes + shoulders greater than 4'-wide count as 'ticked lanes'
Notes:
1. Provide detailed conduit stub-up and interconnect diagrams, coordinate conduit layout with Design Build Contractor and Developer.
2. All toll zones use rigid metallic conduit for exposed installations.
3. Base Junction boxes as needed to fit conduit needs and cabinet sizes.
4. Coordinate pad conduit entry points with Design Build Contractor and Developer for proper location of stub-ups.
5. All cabinet sizes/dimensions are best information available and are subject to change by the TOL.
6. Refer to Sheet E-1 for extension of concrete pads.
7. Sweep conduit into side of Junction box. Coordinate conduit location with Design Build Contractor and Developer.
8. Provide box drain for all boxes below equipment cabinets.
9. Pad shall be 8" thick at bottom and below finished grade.
10. Provide 3/4" chamfered edge on equipment pads.

Typical Cabinet Sizes
AVI Cabinet - 35.5"W x 34.75"H
Zone Cabinet - 69.25"W x 72.5"H
UPS & Raw Power Panel - 32.25"W x 18.75"H

Pad Typical "A"
AVI Cabinet - As Needed

Pad Typical "B"
Zone Electronics and AVI Cabinets w/ Power Panel

Pad Typical "C"
AVI Cabinet w/ Power Panel
NOTES:

1. Provide UL-listed PVC or HDPE conduit for all underground conduit runs.

2. Provide rigid galvanized conduit for all above-ground exterior conduit runs.

3. Unless otherwise labeled, provide one (1) conduit, size to be determined by TSI, for all conduit runs.