GENERAL TOLLING REQUIREMENTS

PART 2 – DESIGN CRITERIA

~~JANUARY~~ AUGUST 2023~~3~~5

FDOT

FLORIDA'S TURNPIKE

200 Toll Site

200.1 Toll Site Categorization

Toll sites are categorized as follows:

(1) **TEB Site:** Toll site which includes a TEB that houses electronic equipment associated with toll collection from one or more toll gantries.

(2) **RTC Site:** Toll site without a TEB, including infrastructure for RTC(s) to support toll collection from one or more toll gantries.

See ***GTR 120.2*** for use of RTC toll sites.

~~200.1~~200.2 Toll Site ~~Subcomponents~~

A typical component set for toll sites with a TEB includes the site, toll equipment building, and toll gantry subcomponents. A typical component set for toll sites with a RTC includes the site and toll gantry subcomponents.

The RTC is furnished and installed by the Department's TEC and therefore does not require its own subcomponent plans. The infrastructure for the RTC is incorporated into the toll site subcomponent.

~~200.1.1~~200.2.1 Toll Site Subcomponents~~Site~~

A typical toll site includes toll pavement, roadside elements (barrier, guardrail etc.), sidewalk, equipment foundation slabs, access driveway, and electrical infrastructure for the site including connections between toll site, gantry and the TEB or RTC(s).

Toll site subcomponent set includes the following disciplines:

(1) Civil

(2) Structural

(3) Geotechnical

(4) Electrical

~~200.1.2~~200.2.2 Toll Equipment Building

TEB subcomponent set includes the following disciplines:

(1) Architectural

(2) Structural

(3) Mechanical with associated plumbing

(4) Electrical

~~200.1.3~~200.2.3 Toll Gantry

Toll gantry subcomponent set includes the following disciplines:

(1) Structural

(2) Geotechnical

(3) Electrical

201 Design Criteria

201.1 Toll Site Design Requirements

(1) Provide a complete toll site design that conforms to the ***GTR*** written criteria and criteria provided in the exhibits. Project-specific adaptation of each exhibit's criteria is required for a complete design.

(2) Each toll site must be designed for all interim and ultimate roadway configurations for the following:

(a) Lane widths, shoulders, buffers, profiles, and cross sections within the toll loop pavement area.

(b) Gantry mounted toll equipment layout(s).

(3) The ***GTR*** must not be referenced in plan notes or specification language. Plan notes must not conflict with or duplicate standard language in ***Standard Plans*** or ***Standard Specifications***.

(4) The ***GTR*** alone does not contain all requirements for a toll site. See ***GTR 102.1*** for additional information resources.

(5) Coordinate with Roadway Design to confirm toll site environmental impacts are included appropriately in the project environmental assessments at each Phase submittal.

201.2 UL Requirements

Infrastructure used at a toll site must be listed by UL or otherwise approved by the United States Department of Labor, under the requirements of ***29 CFR 1910.7***.

202 Toll Siting

202.1 Introduction

Many critical elements must be evaluated to identify a prospective toll site location that satisfies the design criteria as described herein. Given the numerous elements to consider, a detailed investigation is required for the selection of the proposed site. This study is documented in the Toll Siting Technical Memorandum (TSTM).

202.2 PD&E Toll Siting

During alternatives development, as part of the PD&E, a sketch level toll site must be included in each alternative. Sketch level toll sites must apply the appropriate toll site exhibit onto each concept alternative to confirm the basic geometry. The concept plans must have sufficient detail to show that the proposed location can support a viable toll site. They must also illustrate potential infrastructure conflicts that must be mitigated.

Perform the following for sketch level toll site development:

(1) Assume a separate toll site for each toll gantry during alternatives development.

(2) Use a GTR TEB site as a sketch for alternatives development.

(3) Coordinate with Turnpike Tolls Design where a GTR TEB site layout is not feasible.

(4) Identify and include justification for any required GTR Deviations.

(5) Coordinate with Turnpike Tolls Design and Turnpike Tolls Maintenance for mainline gantry type.

A preliminary TSTM must be prepared for the preferred alternative in accordance with ***GTR 202.3***.

202.3 Toll Siting Technical Memorandum

(1) Provide an evaluation of each specific toll site compared to each of the siting requirements for all interim and ultimate conditions based on the TSTM template identified in ***GTR 111***. Summarize the findings of the site analysis and provide recommendations regarding the acceptability of each site and why other sites were not selected. Include the station and milepost values of each recommended toll site location and Turnpike mile marker (MM) values for Turnpike projects.

(2) Identify the probable source for primary power (point of presence) and provide a figure showing the routing to the recommended toll site.

(3) Describe the urban/rural classification and commercial/residential land use around the proposed toll sites. Provide a figure showing the aerial view of the toll site location with the 200-foot radius and the 500-foot radius surrounding the proposed toll site envelope. These circled areas identify criteria as described in ***GTR 230.3*** and ***GTR 230.4*** respectively.

(4) Provide “to-scale” interim and ultimate Express Lane Diagrams for the corridor in projects that have existing and / or new express lanes.

(5) Include an analysis of the impacts of correcting any substandard conditions at each recommended site, and if correcting the impact is not feasible, then identify the deviations needed for each site. See ***GTR 110*** for details regarding the request for GTR Deviations.

(6) Include the analysis of criteria other than those set forth in the ***GTR*** for locating toll sites. Examples include criteria associated with ponds, environmental permitting, roadway, suitability of soils for foundations, maintenance of traffic constructability, right-of-way constraints, utility constraints (high pressure gas transmission lines, electric transmission systems), Federal Aviation Administration requirements, and availability of communications to the site.

(7) Analyze each toll site design to identify possible maneuvers that may be available to vehicles attempting to avoid toll payment. Provide methods to discourage evasive maneuvers, such as earth berms, landscape, fencing, bollards, barrier, and/or guardrail.

(8) The final TSTM must be signed and sealed.

(9) The toll site location(s) in the final TSTM must be incorporated into the construction documents. A toll site re-analysis is required for any revised site locations. Request approval from the Turnpike Design Engineer if toll site relocation is needed after the final TSTM.

Modification for Non-Conventional Projects:

Replace Item (9) above with the following:

(9) During the ATC process, ~~(8) Rr~~evise the RFP TSTM to include ~~all~~ any ~~approved and applicable~~ ATC modifications that directly or indirectly impact existing or proposed toll sites. ~~Sign and seal the revisions.~~ A revised TSTM is not required if toll sites are not impacted through the ATC process. ~~Request approval from the Turnpike Design Engineer if toll site relocation is needed after the notice to proceed.~~

(10) After notice to proceed:

(a) Sign and seal TSTM revisions previously approved during the ATC modifications process.

~~(a)~~(b) Request approval from the Turnpike Design Engineer if toll site relocation is needed.

~~(10)~~(11) The toll site location(s) in the RFP including all approved ATC modifications must be incorporated into the construction documents.

210 Technical Special Provisions

Turnpike Tolls Design has coordinated with FDOT Office of Program Management (Specifications and Estimates) regarding the approach related to the tolls facilities TSP(s). The ***Standard Specifications*** do not address all requirements, components, and systems associated with toll sites. Therefore, specific, individual TSPs / TSP sections are required for toll facilities.

210.1 General Requirements

The TSPs for toll site work discussed in this section address specific needs, components, and systems required for toll sites. The final, signed and sealed TSPs must meet the criteria set forth in the ***GTR***.

TSPs that are applicable to both TEB and RTC Tolls

~~TSP sections for TEB~~ Sites are included in ***GTR Part 2,*** ~~Appendix 1~~appendices as follows:~~.~~

(1) For projects that include both TEB and RTC toll sites, ***Appendix 1***, ***Appendix 2***, and ***Appendix 3*** specifications are required.

(2) For projects with only toll sites with TEB ***Appendix 1*** and ***Appendix 2*** specifications are required.

~~(1)~~(3) For projects with only RTC toll sites ***Appendix 1*** and ***Appendix 3*** specifications are required.

(4) The TSP and TSP sections for products used in toll site construction are classified into one of the following three levels:

(a) **Level 1:** The TSP section describes products based on performance and does not list manufacturers.

(b) **Level 2:** The TSPs or TSP sections identified as Level 2 include complex products or equipment (not easily defined, has many parts or components, or performance is not easily described, etc.). The TSPs or TSP sections is both prescriptive (includes manufacturer's names) and performance based which must include three or more manufacturers with an "or approved equal" statement. Two manufacturers are permitted for products or equipment that are not readily available.

(c) **Level 3**: The TSPs or TSP sections identified as Level 3 include sole sourced products that are required. The TSPs or TSP sections include specific products or equipment. The AOR/EOR must obtain approval for each Level 3 specification per ***FDM 110.4.1***.

~~(2) The TSP and TSP sections for products used in toll site construction are classified into one of the following three levels:~~

~~(a) **Level 1:** The TSP section describes products based on performance and does not list manufacturers.~~

~~(b) **Level 2:** The TSPs or TSP sections identified as Level 2 include complex products or equipment (not easily defined, has many parts or components, or performance is not easily described, etc.). The TSPs or TSP sections is both prescriptive (includes manufacturer's names) and performance based which must include three or more manufacturers with an "or approved equal" statement. Two manufacturers are permitted for products or equipment that are not readily available.~~

~~210.2 Level 3: The TSPs or TSP sections identified as Level 3 include sole sourced products that are required. The TSPs or TSP sections include specific products or equipment. The AOR/EOR must obtain approval for each Level 3 specification per *FDM* 110.4.1.~~

210.2 Development of AASHTO Formatted Technical Special Provisions for All Tolls Sites

The AASHTO formatted TSPs in ***Appendix 1*** for all toll sites (TEB and RTC) typically include:

(1) Fiber Reinforced Concrete for Toll Loop Pavement

(2) Toll Site Foundations and Equipment Slabs

(3) Bollards (Permanent / Removable)

(4) Accessible Gantry Gear Boxes

(5) Toll Gantries (Non-Accessible / Accessible)

(6) Cable Trays for Toll Gantries

(7) Surface Raceways and Wire Troughs at Toll Gantries

210.3 TSP Sections Development for TEB Sites

(1) The TSP for TEB includes multiple sections for toll site construction.

~~(1) The TSP for TEB includes multiple sections for toll site construction.~~

(2) The TSP sections in ***Appendix 2*** must meet the following criteria:

(a) The TSP sections must follow the CSI Masterformat®/AIA MASTERSPEC® format.

(b) A cover and table of contents must be provided for the toll facility's TSP package.

(3) Guidance for AIA Format Technical Special Provision Sections in ***GTR Part 2, Appendix 2*** ~~Guidance~~:

(a) Some TSP sections ~~in ***GTR Part 2, Appendix 1***~~ include guidance for usage in hidden text. ~~This includes guidance for sections that are applicable to toll sites with TEB or Toll Sites with RTC or both.~~

(b) Contains ~~TSP Sections in ***GTR Part 2, Appendix 1*** are~~ criteria for construction of toll sites. The EOR and the AOR must include all necessary project specific TSP sections in the contract documents. TSP sections must be modified to meet current code requirements prior to signing, sealing or releasing for construction.

(c) See ***GTR 307*** for additional requirements.

~~210.4 Development of AASHTO Formatted Technical Special Provisions for Tolls Sites~~

~~210.5 Coordinate with Turnpike Tolls Design for AASHTO formatted TSPs at toll sites. The AASHTO formatted TSPs typically include:~~

~~210.6 Bollards (Permanent / Removable)~~

~~210.7 Accessible Gantry Gear Boxes~~

~~210.8 Toll Gantries (Non-Accessible / Accessible)~~

~~210.9~~210.4 Technical Special Provisions for Roadside Tolling Cabinet Sites

~~Coordinate with Turnpike Tolls Design for development of TSPs for RTC sites' pilot projects.~~The AASHTO formatted TSPs in ***Appendix 3*** for RTC toll sites typically include:

(1) Acceptance Procedures for Toll Facilities at RTC Toll Sites

(2) Dry Well and Accessories at RTC Toll Sites

(3) Fire Extinguishers and Accessories at RTC Toll Sites

(4) General Requirements for Toll Facilities Electrical Infrastructure at RTC Toll Sites

(5) Low Voltage Electrical Cables and Power Conductors at RTC Toll Sites

(6) Grounding and Bonding for Electrical Systems at RTC Toll Sites

(7) Hangers and Supports for Electrical Systems at RTC Toll Sites

(8) Identification For Electrical Systems at RTC Toll Sites

(9) Lightning Protection System at RTC Toll Sites

(10) Emergency Generator at RTC Toll Sites

(11) Electricity Metering and Utility Service Entrance at RTC Toll Sites

(12) Panelboards at RTC Toll Sites

(13) Wiring Devices at RTC Toll Sites

(14) Automatic Transfer Switch at RTC Toll Sites

(15) Surge-Protective Devices, 1kv or Less at RTC Toll Sites

(16) Lighting Fixtures and Lamps at RTC Toll Sites

(17) Static Uninterruptible Power Supply Systems for Outdoor Communication Cabinets at RTC Toll Sites

(18) SCADA System at RTC Toll Sites

(19) Outdoor Communication Cabinet at RTC Toll Sites

211 Modified Special Provision

Modified Special Provisions (MSPs) ~~may be~~are required to address the specific needs of toll sites. The latest updated standard specification language must be requested from Specifications and Estimates Office for each section to be modified.

Sample MSPs have been developed for various standard specification sections. These samples are available upon request from Turnpike Tolls Design and must be modified to meet the latest standard specification language and project-specific requirements prior to signing, sealing or releasing for construction. ~~These sample MSPs typically include:~~

211.1 Modified Special Provisions for Toll Site Construction

MSPs required for projects with proposed toll sites or impacts to existing toll site infrastructure include the following as applicable:

(1) Toll Site Construction Scheduling

(2) Toll Site Construction Maintenance of Traffic

(3) Express Lanes Construction Scheduling

(4) Express Lanes Maintenance of Traffic

~~(4)~~(5) Express lanes “End-to-End Testing”

211.2 Modified Special Provisions for Projects with Toll Sites within Project Limits

~~Modified Special Provisions for Toll Site Infrastructure~~

MSPs are required for projects with toll sites within project limits where no work is anticipated at the existing toll sites. Include the following MSPs as applicable for MOT within toll site limits:

(1) Toll Site Construction Scheduling

~~(5)~~ Toll Site Construction Maintenance of Traffic~~Concrete Structures~~

~~(6) Conduit~~

~~(7) Pull, Splice, and Junction Boxes~~

~~(8) Intelligent Transportation System Device Materials~~

~~(9) Modified Special Provisions for Roadside Tolling Cabinet Sites~~

~~(10) Coordinate with Turnpike Tolls Design for development of additional MSPs for RTC sites’ pilot projects.~~

~~(11)~~(2)

220 Toll Site Roadway

220.1 General Requirements

(1) Each toll site must be designed to prevent toll avoidance maneuvers as described in ***GTR 202.3*** and the final TSTM.

(2) Roadway cross sections must be provided at the beginning and end of the toll loop pavement area and at the centerline of the gantry.

220.2 Roadway Requirements for Toll Sites

(1) The preferred location of the toll gantry is on a tangent segment of roadway. If a tangent roadway section is not feasible, then the toll gantry can be located on a curve with a radius greater than or equal to 3,000 feet as measured from edge of toll loop pavement area closest to center of curve.

(2) The centerline of the gantry must be perpendicular to the final striping of the toll loop pavement area for tangent alignments.

(3) The centerline of the gantry must be radial to the final striping of the toll loop pavement area for curved alignments.

(4) Toll loop pavement area may be located within sag and crest vertical curves only when the vertical grade is at least 0.3% at any point within the toll loop pavement area.

(5) The lane, shoulder, and buffer widths must be constant in the toll loop pavement area.

(6) At the toll loop pavement area, a minimum 10 foot separation is required between equipped lanes/shoulders and any adjacent non-tolled lanes as shown in Schemes 3 and 4 of ***Exhibit 220.2-1***, except where express lane buffers are used.

(7) The toll loop pavement is prohibited from being located within super-elevation transitions or any cross-slope transition areas, except for shoulder rocking.

(8) Toll sites must not be located within queuing areas as identified by the design year traffic analysis.

(9) Toll sites must not be located within areas where weaving, merging or diverging traffic is likely.

(10) In a merge area, the gantry centerline must be located a minimum of 200 feet upstream of the first lane drop sign or 50 feet beyond the end of the merge area.

(11) The gantry centerline must be located a minimum of 200 feet from nearby sign structures, bridges, or toll plaza canopies. Considerations that would increase this minimum distance include the following:

(a) The taper of the maintenance pull-off area must tie into the shoulder a minimum of 25’ before bridges or similar roadside features.

(b) MOT for bridge/sign structure inspection and maintenance that may extend into the toll site.

(c) MOT for bridge widening and/or replacements that may extend into the toll site.

(12) The difference between elevations used to calculate the APE must not exceed 26 inches.

(13) Express lane toll facilities require the following:

(a) Gantries must be located within one (1) mile downstream from the express lane ingress.

(b) Gantries must be located within one (1) mile to the last Toll Amount Sign within the EL segment before continuing to the next set of destinations.

~~(b)~~(c) Ingress to each EL segment must be designed without the need for “data” gantries.

~~(c)~~(d) The toll site must be coordinated with all ~~existing~~ existing, interim, and ultimate express lane ingress and egress locations.

(14) Toll gantries must not block an overhead sign. Minimum distance should be 800 feet for static panels and 1000 feet for dynamic message signs.

Exhibit 220.2-1 Toll Loop Pavement Area Separation Layouts

See "Redacted" GTR for updated Exhibit.

220.3 Existing Toll Site Requirements

(1) When milling and resurfacing at an existing toll site, for any cross-slope corrections, barrier replacement and/or changes to the roadway surface within the toll loop pavement area, the following is required:

(a) The toll loop pavement must be analyzed to determine that all roadway criteria and vertical clearance criteria over the roadway is not impacted.

(b) Changes to lane striping or non-conformance to vertical clearance criteria and roadway criteria within the toll loop pavement area will require a redesign of the toll site plans which meets all criteria.

(c) Evaluate if paving operations would damage existing toll loop conduits which would result in the need for installing toll header curb.

(2) Toll sites adjacent to a roadway improvement project must be analyzed to determine if the impacts to the existing sites can be mitigated or if new toll sites are required.

221 Toll Pavement Design

221.1 Toll Loop Pavement Area Dimensions

221.1.1 Pavement Length

(1) Toll loop pavement is 100 feet in length with the gantry located at the midpoint, splitting the 100-foot length into equal 50-foot segments.

(2) When the toll loop pavement area is located on a curve, the 100-foot minimum length is measured along the outside edge of shoulder pavement closest to the center of curvature.

221.1.2 Pavement Width

The pavement width encompasses TLs, ELs, with all adjacent shoulders and buffers. The toll loop pavement width includes the lane adjacent to the buffer in accordance with (1) below.

(1) Where the buffer is less than 10 feet at the toll loop pavement area, the GUL adjacent to the express lane buffer must be designed as a toll lane and be provided with toll equipment and toll loop pavement as shown in Schemes 1 and 2 of ***Exhibit 220.2-1***.

(2) Shoulder widths within the toll loop pavement area must comply with the following:

(a) The tolling shoulder must match the approach and departure roadway shoulder widths except for the following conditions:

(i) When the median barrier is widened to accommodate toll gantry supports and/or median toll loop pull boxes.

(ii) Single lane ramps must have at least one shoulder with a minimum width of 10 feet.

(iii) When the maintenance pull-off area is located adjacent to the shoulder, shoulder width must be 10 feet minimum. This shoulder requirement ends at the trailing edge of the maintenance pull-off area and must be of sufficient length to allow deceleration to a stop condition of maintenance vehicles.

(b) The paved shoulder width at the tolling loop pavement must match the total minimum roadway shoulder widths (paved and unpaved).

(c) Where guardrail is present, the paved shoulder width must extend to the face of the adjacent guardrail.

(3) The maximum lane width within the toll loop pavement area must not exceed 15 feet.

(4) The maximum shoulder width within the toll loop pavement area must not exceed 15 feet.

221.1.3 Pavement Depth

Pavement design for the toll shoulders must match the full depth pavement design of the toll loop lane.

221.2 Flexible Pavement Design

(1) The structural asphalt thickness for the toll loop pavement area must not be less than the approach and departure roadway structural asphalt thickness.

(2) The finished elevation of the pavement base must match between the tolling pavement section and the approach and departure roadway pavement sections.

(3) Pavement design calculations must be prepared to determine if a greater pavement design is required when the resilient modulus of the soil is less than 10,000 psi, or the accumulative 20-year equivalent single axle load (ESAL) values exceed 25 million for mainline traffic or 6 million for ramp traffic.

(4) A 12-inch wide toll header curb must extend the full length of the toll loop pavement, adjacent to the concrete barrier with loop conduit stub-ups. The toll header curb must be poured after installation of loop conduit stub-ups. See ***Exhibit 232.3-2*** and ***Exhibit 232.3-4***.

(5) Each lane and shoulder within the toll loop pavement area must not have any transverse construction joints in frictional courses and structural pavement courses. Longitudinal construction joints are only permitted at the edges between lanes and between lanes and shoulders.

221.2.1 Mainline Travel Lanes

The minimum flexible pavement design for new construction of mainline travel lanes and shoulders must comply with the ***Flexible Pavement Design Manual*** with the following additional requirements within the toll loop pavement area:

(1) Stabilized subgrade, 12-inch thick

(2) Optional base group (OBG) 11 (7-inch Type B-12.5)

(3) 4-inch Type SP Structural Course (PG 76-22 in top lift)

(4) 1.5-inch FC-12.5 with PG 76-22

221.2.2 Ramp Travel Lanes

The minimum flexible pavement design for new construction of ramp travel lanes and shoulders must comply with the ***Flexible Pavement Design Manual*** with the following additional requirements within the toll loop pavement area:

(1) Stabilized subgrade, 12-inch thick

(2) OBG 9 (6-inch, Type B-12.5)

(3) 3-inch Type SP Structural Course (PG 76-22 in top lift)

(4) 1.5-inch FC-12.5 with PG 76-22

221.3 Resurfacing, Restoration and Rehabilitation for Existing Flexible Pavement Toll Sites

Pavement rehabilitation must comply with the ***Flexible Pavement Design Manual*** with the following additional requirements within the toll loop pavement area:

(1) Pavement rehabilitation within the toll loop pavement area must include milling of sufficient depth to remove any existing loop saw cuts and existing distress.

(2) Milling and resurfacing existing pavement for a new toll loop pavement area is only permitted when the existing lanes and shoulders meet or exceed the new construction minimum pavement design criteria identified in ***GTR 221.2***.

(3) The new structural pavement layer must be at a minimum 3 inches thick, inclusive of 1.5 inches of FC-12.5 with PG 76-22.

(4) When plans call for phased milling and resurfacing for a portion of the toll loop pavement area, the limits of milling activities must not extend past the centerline of the stripe of the adjacent lane / shoulder with loops remaining active in that phase.

(5) See ***GTR 223.3*** for MOT requirements.

221.4 Rigid Pavement Design

Rigid pavement must meet the requirements of the ***Rigid Pavement Design Manual*** and the following additional criteria:

(1) Metals must not be embedded in the concrete pavement (reinforcement, dowels, tie bars, dowel chairs, etc.). Alternatives such as glass-fiber-reinforced-polymer (GFRP) reinforcement, dowels, tie-bars, and non-metallic chairs may be used.

(2) Rigid pavement must contain polymeric fibers. The concrete mix design must meet ASTM C1116 and have an average residual strength of no less than 215 psi.

(3) Rigid pavement must be a minimum of 12-inch thick.

(4) Rigid pavement must be poured after installation of loop conduit stub-ups as identified in ***Exhibit 232.3-1*** and ***Exhibit 232.3-3***. Loop conduits and loop conduit stub-ups must be positionally secured and protected from physical damage during concrete pavement installation including the concrete pouring operation.

221.5 Toll Loop Pavement Area Restrictions

(1) Rumble strips are not permitted within the toll loop pavement area.

(2) The toll loop pavement area must be free of metal objects at or below grade.

(3) Curb and gutter, and shoulder gutter as shown in ***Standard Plans***, ***Index 520-001*** must not be installed within the toll loop pavement area limits except:

(a) ~~for~~When the toll header curb is required.

~~(a)~~(b) When toll loop infrastructure does not cross the curb and gutter and / or shoulder gutter.

See ***GTR 220***, ***GTR 230***, and ***GTR 231*** for additional requirements for the toll loop pavement area.

221.6 Shoulders Approaching and Departing the Toll Loop Pavement Area

221.6.1 Grading and Drainage

At the shoulder transitions approaching and departing the toll loop pavement area:

(1) Avoid abrupt elevation and cross slope changes.

(2) Provide positive drainage to prevent ponding.

(3) See ***Exhibit 221.6-1*** for typical ponding issues to avoid.

221.6.2 Single Lane Ramps

Toll equipment centered over a single lane ramp needs periodic maintenance that requires widened shoulders per ***GTR 221.1.2***. Therefore, the width and length of the shoulders approaching and departing the toll loop pavement area must be designed to support using the widened shoulder under the gantry as a travel lane for this maintenance activity to avoid closing the entire ramp.

Exhibit 221.6-1~~221.6-1~~~~221.6-1~~ Approach and Departure Shoulder Transition Drainage Concerns

See "Redacted" GTR for updated Exhibit.

222 Toll Site Signs and Pavement Markings

222.1 Signs at the Toll Site

Signage of any kind must not be attached to the toll gantry.

See ~~See~~ ***Appendix 4*** for signage within new or existing toll sites.

222.2 Sign TOL-7 "Do Not Stop"

(1) Sign TOL-7 must be located at least 50 feet from the centerline of the gantry. See ~~Sign TOL-7 must be located at least 50 feet from the centerline of the gantry. See~~ ***Appendix 4*** or additional information.

(2) Sign TOL-7 location must be coordinated to avoid conflict with pull boxes or other obstructions.

(3) Sign TOL-7 ~~Sign TOL-7~~ is not required at toll sites on managed lanes.

222.3 Sign TOL-8 "Authorized Vehicles Only"

(1) Sign TOL-8 is required at all maintenance pull-off areas.

(2) Sign TOL-8 must be ground-mounted and located within 12-inches from the end of the concrete barrier adjacent to the maintenance pull-off area access point. See the ~~See the~~ ***TEB Site Plans*** and the ***RTC Site Plans*** in ***GTR 231.***

222.4 Pavement Markings at the Toll Site

(1) See ***Appendix 4*** for pavement marking ~~pavement marking~~ requirements at the toll site. See the ***Traffic Engineering Manual*** (TEM) for pavement marking and EL marker requirements at express lanes.

(2) Pavement marking must be centered at the edge of travel way within the toll loop pavement area. Transition the pavement marking over a 25-feet distance beyond the limits of the toll ~~Pavement marking must be centered at the edge of travel way within the toll loop pavement area. Transition the pavement marking over a 25-feet distance beyond the limits of the toll~~ loop pavement area from the layout shown in ***Standard Plans***, ***Index 546-010***.

223 Toll Site Construction Phasing Requirements

The plans and specifications must be prepared to account for the following construction phase requirements.

223.1 General Requirements

(1) Demolition at existing toll site can only begin after the new toll system on the replacement toll site is installed, commissioned, tested and activated such that it is collecting tolls.

(2) Include in the contract documents schedules for notification and salvage time frames at existing toll sites to be demolished and/or renovated.

(3) See ***GTR 250.1*** for gantry types. Lane closure requirements for gantries are as follows:

  (a) Non-Accessible – Lane closures are required at the toll loop pavement area to perform tolling equipment installation and must be included in the TTCP.

  (b) Accessible – While some of the activities associated with toll equipment installation can be performed from the gantry, lane closures are required for other activities and must be included in the TTCP. Coordinate with Turnpike Tolls Design for project specific activities requiring lane closure.

(4) The construction stage phasing must be designed to accommodate the following:

  (a) Utility relocations, removal of piping, metal objects, etc. within the toll site must be complete and the final riding surface of the pavement with final striping in its final alignment must be constructed at all equipped lanes and shoulders and the site turned over to the Department before the TEC begins toll equipment installation.

  (b) The TEC must have 21 consecutive TEC working days of exclusive and uninterrupted access per movement, at each toll site for their installation commissioning and testing work.

  (c) The Department must have 35 consecutive TEC working days of access to the project for End-to-End testing for express lanes.

  (d) The TEC working days must not include weekends, holidays, special events, and work period shutdowns.

(e) See ***GTR Part 2*** appendices for additional requirements on the Primary Walk-throughs and Operational Testing Walk-throughs:~~Appendix 1,~~

i. **TEB Sites: *GTR Part 2 Appendix 2,*** TSP Section for ***Project Closeout for TEB Sites*** ~~for additional requirements on the Primary Walk-throughs and Operational Testing Walk-throughs~~.

~~i.~~ii. **RTC Sites: *GTR Part 2 Appendix 3*** for TSP ***Acceptance Procedures for Toll Facilities at RTC Toll Sites***.

(5) See ***GTR 260.7*** for communications criteria during construction phasing.

(6) Maintain all existing toll operations with no interruption to toll collection during construction.

(7) Maintain toll operations during construction for express lanes, including dynamic rate setting systems, consistent with the existing tolling plan and operations.

223.2 Maintenance of Traffic (MOT)

The traffic control plans and specifications must detail the MOT required for work associated with constructing a toll site including lane and roadway closures and detours to facilitate the following:

(1) Construction of the gantry.

(2) TEC's installation, commissioning, and testing for each movement at each toll site.

(3) Department's End-to-End testing for express lanes.

223.3 Toll Site Temporary Traffic Control

223.3.1 Temporary Traffic Control Plan (TTCP)

(1) Develop a TTCP (in accordance with ***FDM 240*** through ***FDM 243***) for all work associated with the toll site construction, TEC activities, and express lanes commissioning and testing activities.

(2) The installation of the toll gantry foundations must be identified in the construction phasing as early as possible to allow sufficient time for foundation surveys to be included in the toll gantry shop drawings. Additional subphases may be required to accommodate the construction of the toll gantry foundations prior to the construction of the remainder of the toll site.

(3) TTCP for installation of toll gantry foundations cannot be changed without written consent by Turnpike Design Engineer.

(4) TTCP must develop detailed phasing for all activities associated with toll equipment installation, commissioning, and testing which typically requires partial or full closures at all ramp and mainline tolling movements as follows:

(a) Separate phasing must be provided in the TTCPs for each tolling movement along with the details and quantities for the MOT at each tolling point.

(b) Typical sections for all traffic control sub-phases must be shown for each toll site.

(c) The phasing must be coordinated with The Turnpike to determine whether toll equipment installation can be scheduled during off-peak hours, weekends or only at night.

(d) Maintain existing toll sites in operation as identified in ***GTR 223.3.3*** and ***GTR 223.4*** and while construction of new toll sites is undertaken.

(5) Lane closure analysis must be provided to determine if the toll site or tolling movements require one MOT setup for the duration of the toll equipment installation, commissioning, and testing period or if nightly MOT setups are required during the toll equipment installation, commissioning, and testing period.

(6) Proposed detours that avoid increased tolling through the detour are preferred. Where such increases cannot be avoided, a Detour Toll Analysis M~~m~~emorandum (DTAM) with options to address the impact to customers is required. T ~~T~~he following scenarios would require an analysis and memorandum to be submitted:

(a) The detour sends users to a toll site with a higher toll or through multiple toll sites.

(b) The detour closes tolled lanes with a cash-only option and sends users to a SunPass only lane.

(c) The detour reduces the number of tolled lanes.

(7) During toll equipment installation, commissioning, and testing, approach and departure roadway segments must be available to allow testing vehicles to accelerate to the final roadway condition posted speed prior to entering the tolling loop pavement area and decelerate upon departure. Approach and departure pavement limits are as follows:

(a) 3,500 feet of roadway at each mainline tolling gantry (2,000 feet of approach and 1,500 feet of departure).

(b) 2,500 feet of roadway at each ramp tolling gantry (1,500 feet of approach and 1,000 feet of departure) or as length of ramp permits for the TEC testing activities' posted speed.

223.3.2 Tolling Sub-Phase Requirements

(1) Partial closures must be designed to allow a full lane or full shoulder in a single sub-phase for TEC installation activities.

(2) Full closures are required to allow the TEC to test and commission the equipment at each ramp tolling movement.

(3) Express Lane End-to-End Testing:

(a) The phase at which the express lane End-to-End testing takes place must be clearly identified.

(b) If existing express lanes are extended or are being concurrently constructed, the End-to-End testing may require full closures of the express lanes beyond the limits of the project. Coordination with The Turnpike must take place to determine the need for closing express lanes beyond the project limits.

223.3.3 AET Toll Sites in Production

Traffic control at toll sites that are collecting revenue must comply with the following:

(1) Lane and shoulder widths must not be modified.

(2) Shoulders must not be used as travel lanes.

(3) Vehicle straddling between two lanes or between a lane and a shoulder is not permitted.

(4) Do not pin temporary barriers within the limits of the toll loop pavement area.

223.4 Existing Toll Site Traffic Control

The traffic control at toll sites must accommodate the current lane operation schedule. Consult with The Turnpike for the latest toll site lane operation schedules for all toll sites that are impacted by the project.

Comply with the requirements of ***GTR 223*** for Projects where no work is anticipated at existing tolls sites.

223.4.1 General Requirements

(1) Coordinate with Turnpike Tolls Design prior to Phase II submission for any traffic control phase that includes lane closures at a toll site.

Modification for Non-Conventional Projects:
Replace Item (1) above with the following: (1) Coordinate with Turnpike Tolls Design prior to the 90% submission for any traffic control phase that includes lane closures at a toll site.

(2) Traffic control plans must include specific measures to prevent tolling loops and tolling pavement from being damaged when paving equipment or other heavy equipment is at any toll site.

(3) When milling and resurfacing the toll loop pavement area, the TTCP phasing and schedule must include the TEC installation, commissioning, and testing periods for the affected toll site.

(4) When any lane at an existing toll plaza is scheduled to be converted from cash/violations operational mode to “Toll by Plate” operational mode (also known as AET-Lite), the TTCPs must include the traffic control (phasing notes, plans, and details) required during and after AET-Lite conversion.

223.4.2 Non-AET Facilities

Traffic control must comply with the following for all lanes at non-AET toll sites:

(1) The toll collection type (cash or electronic toll collection) must not be changed.

(2) Electronic toll collection lanes and cash toll lanes must available in all phases; however, the number of each type of toll lanes needed must be submitted to Turnpike Toll Systems Project Manager for approval by Toll Systems Program Manager with enough total tolled lanes to process current traffic volumes. Written documentation (email or meeting notes documentation) of concurrence from the Toll Systems Program Manager or designee is acceptable.

230 Toll Site Design

230.1 General Requirements

Toll facility site plans must be coordinated with all other drawings and component sets. Toll site design restrictions include:

(1) **RTC Sites:** RTCs can only be utilized for up to five (5) equipped lanes and shoulders per tolling movement. Each RTC can support only one tolling movement. See ***GTR 120.2*** for use of RTC toll sites and associated criteria.

(2) **TEB Sites:** TEBs are required for mainline toll sites with TLs and all toll sites where an RTC Cabinet design is not feasible. See ***GTR 242.1*** for maximum lane requirements.

230.2 Infrastructure Placement

The following infrastructure that interferes with toll equipment operations must not be located at or near a toll site:

(1) Electromagnetic field emitting sources must be located at least 5 feet from the toll site envelope and loop infrastructure.

(2) Except for gantry mounted power conductors and secondary power conductors for the toll facility electrical service, low voltage power lines (120/240 V or 480V) AC or DC power must be located at least 5 feet from the toll site envelope. This includes roadway light poles, conduits, conductors, etc.

(3) Low voltage circuits (120/240 V or 480V) AC or DC power must be located at least 5 feet from the loop conduit(s).

(4) Pipes carrying or intending to convey fluids must be located at least 10 feet from the toll site envelope and at least 5 feet from the loop conduit(s).

(5) Existing and proposed utilities, mechanically stabilized earth (MSE) metallic wall straps, drainage structures, box culverts, or bridge foundations must be located at least 5 feet from the toll site envelope.

(6) When MSE walls with non-metallic wall straps are proposed, these wall plans must require that strap layout and associated slabs must not conflict with toll site infrastructure (conduits and foundations).

(7) Walls and wall foundations with metallic reinforcement must not be located within the toll site envelope.

230.3 High Voltage Circuits

(1) Overhead circuits or conductors that operate at high voltage (> 600VAC RMS or VDC) must be located at least 200 feet from the toll site envelope.

(2) If existing high voltage lines are unavoidable within 200 feet of a proposed toll site envelope, provide the following information for Turnpike Tolls Design to evaluate the site for toll system interference.

(a) The line's voltage and location relative to the toll site.

(b) The northing and easting of all four corners of the toll loop pavement area.

230.4 Wireless Communication Devices

(1) Toll sites must be located at least 500 feet from any devices operating within the 902 MHz to 928 MHz frequency band.

(2) If there is existing FDOT equipment, such as travel time system readers, operating in the ISM/LMS Frequency Band 902MHz-928MHZ within 1 mile of an existing or proposed toll site, develop a remediation approach in conjunction with Turnpike Tolls Design. Include the identified remediation in the plans.

(3) ISM/LMS Frequency Band 902MHz–928MHz wireless two-way communication devices licensed or unlicensed (Spread Spectrum) emitters are not permitted within any distance in which the referenced emitter produces an in-band signal interference level greater than -68dBm at the input to the toll site gantry antennas.

230.5 Existing Toll Sites

New toll sites must be located such that existing toll facilities continue to operate until the new toll sites are commissioned and collecting tolls.

230.5.1 General Requirements

See ***GTR 223.1*** for additional requirements for scheduling of existing toll site demolition.

230.5.2 Building Demolition Plans and Permits

(1) Demolition permits are required for each location and must be separate from building permits required for new, modified, and renovated buildings.

(2) All building roof systems identified to remain must be protected from damage and water intrusion caused by required demolition and any additional new work to retain roof integrity and warranty.

(3) Repairs to existing roof systems must be accomplished by using materials of the original system and repair procedures as required by the original roof system manufacturer and performed by an authorized roof system installer.

(4) All total demolition, selective demolition, and renovation activities must consider results of asbestos and/or paint testing reports.

(5) Dispose all hazardous materials per all applicable State and hazardous materials handling guidelines.

230.5.3 Salvage and Disposal

Coordinate with the Turnpike Toll Systems Project Manager for identifying:

(1) All items that are desired to be salvaged and identified as such in the contract documents.

  (a) All existing fire extinguishers and brackets must be returned to the FTE for all buildings to be demolished.

  (b) All flag poles and associated up lighting must be removed. Flags must be returned to the Turnpike.

  (c) Other equipment to be salvaged and returned to the Turnpike.

(2) Existing equipment to be salvaged by the Turnpike.

  (a) Salvage of existing equipment may be required at non-AET toll sites, TEB sites, and at RTC sites.

  (b) Traffic control phasing must include time for salvage.

  (c) Salvage of existing equipment includes equipment located on the gantry. Equipment removal/salvage will require coordination with the traffic phasing.

230.5.4 Proposed Infrastructure with Potential Frequency Interference Near Existing Toll Sites

New infrastructure not related to toll equipment, that operates within the 902 MHz to 928 MHz frequency band must be located at least 1,000 feet from existing toll sites.

231 Toll Site Layout

231.1 General Requirements

(1) Unless otherwise noted, all new toll sites must comply with the site elements, layout, and detailing of the typical site plans in their entirety. Typical site plan layouts are shown in:

(a) **TEB Site Plans:** ***Exhibit 231.1-1***, ***Exhibit 231.1-2***, ***Exhibit 231.1-3***, ~~and~~ ***Exhibit 231.1-4***, and ***Exhibit 231.1-12***.

~~(b)~~ **RTC Site Plans**: ***Exhibit 231.1-5***

~~(c)~~(b) , ***Exhibit 231.1-6***, ***Exhibit 231.1-7***, ***Exhibit 231.1-8***, ***Exhibit 231.1-9***,~~and~~ ***Exhibit 231.1-10***, and ***Exhibit 231.1-12***.~~.~~

(c) **Toll Sites on a Horizontal Curve**:

i. Use the following distances for each toll site element measured to the front edge of the barrier at the gutter line:

I. TEBs: 7 feet at narrowest point

II. RTC toll site equipment slabs: 7 feet at narrowest point

III. Each pull box: 3 feet at the narrowest point

ii. The array of loop pull boxes can follow the roadway's horizontal curve

iii. The parallel portion of the maintenance driveway that does not taper back to the shoulder must follow the roadway's horizontal curve.

~~i.~~iv. Concrete sidewalks and toll site equipment slabs must be perpendicular or parallel to the TEB or RTC as applicable. Maintain a minimum of 18 inches between loop pull boxes and the back edge of the sidewalk.

(2) The design of the toll site, inclusive of all exterior components except gantries, must comply with the requirements of the high velocity hurricane zone for Miami-Dade County, regardless of project location. For gantry design requirements see ***GTR 251.1***.

(3) When toll loop infrastructure does not extend through a wall / barrier, the toll site envelope terminates at the gutter line of the wall / barrier adjacent to the toll loop pavement area.

(4) Concrete barrier in accordance with ***Standard Plans***, ***Index 521-001*** must be installed as follows:

(a) Adjacent to the loop pull boxes along the toll loop pavement area.

(b) GFRP reinforcement must be provided for all concrete barrier within the toll site envelope.

(c) Concrete barrier free end and thrie-beam connection, as applicable, must be located beyond the toll loop pavement area.

(d) To protect the maintenance vehicle parking.

(e) See the ***TEB Site Plans*** and the ***RTC Site Plans*** for their respective site specific barrier wall layouts.

(5) Concrete median barrier in accordance with ~~***Developmental***~~ ***Standard Plans***, ***Index 521-005*** ~~***Concrete Barrier at Toll Sites***~~ must be installed to accommodate median loop pull box installations and median gantry uprights. Use of Developmental Standard Plans requires approval by the FDOT Central Office.

(6) The finish floor elevation of the TEB and exterior equipment slabs must be at least 18 inches higher than the following:

(a) The highest 100-year floodplain elevation within 500 feet of the toll site.

(b) 100-year design stage of all adjacent stormwater management facilities.

(7) There must be an unobstructed perimeter of at least 5 feet around the TEB and exterior wall mounted equipment.

(8) See the ***TEB Site Plans*** and the ***RTC Site Plans*** for additional critical clearance dimensions.

(9) At toll sites supported on walls:

(a) Provide traffic barrier, wall coping, and associated junction slabs along the maintenance pull-off area up to the toll site envelope. See ***Standard Plans***, ***Index 521-512, and Index 521-610.***

(b) Provide pedestrian railing on top of the wall in accordance with ***Standard Plans***, ***Index 515-052*** or ***Index 515-062*** along the perimeter of the toll site envelope that is not subject to vehicle impacts.

(c) See ***Standard Plans***, ***Index 521-611*** for FRP concrete barrier / junction slab wall coping.

(10) Strut channel frames for ground-mounted equipment must be installed as follows:

(a) Maintenance access/clearance must be provided per NEC and manufacturer's requirements. The more stringent criteria must be used for site layout design.

(b) See ***Exhibit 231.1-13*** for the various frame layout details.

(c) See ***GTR Part 2*** appendices for the requirements for frames as follows:

- **TEB Sites:** ***GTR Part 2 Appendix 2***, TSP Section for ***Metal Fabrications for TEB Sites***.
- **RTC Sites:** ***GTR Part 2 Appendix 3***, TSP for ***Hangers and Supports for Electrical Systems at RTC Toll Sites.***

(11) The fuel tanks must be located to allow refueling by fuel trucks with up to 100-foot-long hoses.

(12) ADA compliant slopes and grades must be provided for all concrete sidewalks, slabs, and paved walkways within the toll site.

(13) The generator/fuel tank must be a minimum of 8 feet from the front edge of the barrier at the gutter line~~the edge of shoulder/toe of barrier~~.

(14) The dry well must be located as shown in the ***TEB Site Plans*** and the ***RTC Site Plans***.

(a) **TEB Sites:** Connect condensate piping from each AC unit in accordance with ***Exhibit 244.3-1***. Route the condensate piping from each AC unit in accordance with ***Exhibit 244.2-1***.

(b) **RTC Sites:** Provide a condensate receptor with air gap in accordance with ***Exhibit 244.3-1*** at each cabinet AC unit. Each cabinet AC unit, as shown in the ***RTC Site Plans***, must be provided with condensate piping that connects to the dry well in accordance with the layouts shown in ***Exhibit 231.1-11***. Include condensate piping for the future RTC cabinet.

(15) At least 100 feet of sodding must be provided beyond the toll pavement area around each toll site. Sodding must be extended to the right-of-way lines for all areas that are disturbed by construction activities. Sodding limits must be shown on the appropriate roadway component plans.

Exhibit 231.1-1~~231.1-1231.1-1~~ Non-Accessible Gantry TEB Standard Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-2~~231.1-2~~~~231.1-2~~ Accessible Gantry TEB Standard Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-3~~231.1-3~~~~231.1-3~~ ~~EL~~ Non-Accessible Gantry TEB Detached Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-4~~231.1-4~~231.1-4 ~~EL~~ Accessible Gantry TEB Detached Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-5~~231.1-5~~~~231.1-5~~ Single Movement Gantry RTC Standard Site Plan – On-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-6~~231.1-6~~~~231.1-6~~ Single Movement Gantry RTC Standard Site Plan – Off-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-7~~231.1-7~~~~231.1-7~~ ~~EL~~ Dual Movement ~~Span Gantry~~ RTC Detached Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-8~~231.1-8~~~~231.1-8~~ Single Movement RTC Remote Site Plan - On-Site Power Service~~EL Single Movement Median Cantilever Gantry RTC Site Plan (1 of 2)~~

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-9~~231.1-9~~~~231.1-9~~ ~~EL~~ Single Movement ~~Median Cantilever Gantry~~ RTC Remote Site Plan ~~(2 of 2)~~- Off-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-10~~231.1-10~~ Dual Movement RTC Remote Site Plans

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-11~~231.1-11~~ RTC Condensate Piping Plans and Details

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-12~~231.1-12~~ Single Movement TEB and RTC Remote Site Plan(s)

See "Redacted" GTR for updated Exhibit.

Exhibit 231.1-13~~231.1-13~~~~231.1-11~~ -TEB and RTC Ground-Mounted Strut Channel Frame Layouts

See "Redacted" GTR for updated Exhibit.

231.2 Maintenance Access

Maintenance pull-off areas must ~~also~~ be provided for access of roadside ground mounted toll infrastructure, except when only pull boxes and / or gantry uprights are present.~~, use barrier access.~~

231.2.1 Maintenance Pull-Off Area

(1) Maintenance pull-off areas must be provided for access to the TEB and RTC.

~~(2) Maintenance pull-off areas must also be provided for access of roadside ground mounted toll infrastructure, except when only pull boxes are present.~~

~~(3)~~(2) The maintenance pull-off areas must allow for entry and exit, maintenance vehicle parking, and staging of at least two maintenance vehicles with concrete bumper guard(s).

~~(4)~~(3) Maintenance vehicles include box vans, lift trucks, bucket trucks, scissor lift trucks, etc. with a design size of 100 inches wide x 300 inches long.

~~(5)~~(4) The maintenance pull-off areas must be stabilized and physically protected from traffic by concrete barrier. See ***Standard Plans***, ***Index 521-001***.

~~(6)~~(5) At a minimum, the maintenance pull-off pavement must match the pavement design of the adjacent paved roadway shoulder, beyond the toll loop pavement area. See ~~***Section***~~ ***GTR 221*** for pavement design requirements.

~~(7)~~(6) See the ***TEB Site Plans*** and the ***RTC Site Plans*** for additional geometric requirements regarding pull-off areas and site related details.

~~(8)~~(7) The maintenance pull-off parking must be dedicated to Tolls use only and must not be designed as a shared access for any other maintenance vehicles.

~~(9)~~(8) Maintenance pull-off areas must be designed to allow for vehicle outriggers of the bucket truck or scissor lift truck to be deployed adjacent to the accessible gantry access stair structure.

231.2.2 Barrier Access

Provide barrier access at the departure end of the toll loop pavement area as follows:

(1) ~~for loop pull box access w~~When continuous traffic barriers are present and extend beyond the limits of the toll loop pavement area~~. S~~, use~~e~~ Case I ~~and~~or Case II in ~~.~~***Exhibit 231.2-1***.

(2) When the traffic barrier ends at the limits of the toll loop pavement area, use Case III in ~~n ***Exhibit 231.2-2***~~***Exhibit 231.2-2***.

~~Exhibit 231.2-1 Toll Site Barrier Access~~

Exhibit 231.2-1~~231.2-1~~ Toll Site Barrier Access (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 231.2-2~~231.2-2~~ Toll Site Barrier Access (2 of 2)

See "Redacted" GTR for updated Exhibit.

231.3 Sidewalks

(1) All concrete sidewalk must be 6-inch thick minimum.

(2) The concrete sidewalk encircling a TEB must be a minimum 5-foot wide.

(3) Sidewalk must be continuous and not contain any curbs or abrupt elevation differences in its path.

(4) Asphalt pavement elevation must be flush with the adjacent sidewalk.

(5) At a minimum, a 5-foot wide clear path of must be available from the maintenance pull-off area to TEBs and RTCs unless noted otherwise in the ***RTC Site Plans***.

(6) Sidewalk must be flush with the adjacent equipment slabs within the toll site envelope.

(7) TEB finished floor elevation must be ½-inch higher than the sidewalk at the door threshold.

(8) Concrete sidewalk joints must be constructed in accordance with ***Standard Plans***, ***Index 522-001.***

(9) Expansion joints must be installed between concrete sidewalk and the following:

(a)	Equipment concrete slabs	(d)	Drywells
(b)	Gantry foundations	(e)	TEB
(c)	Concrete barriers	(f)	Pull boxes

(10) Sidewalk joints are not permitted at the same location as loop pull boxes except along the edge. Coordinate sidewalk joints with site infrastructure locations, loop pull boxes, and other site features, including dry well, communications and ITS pull boxes, and surface mounted equipment.

231.4 Pipe Bollards

(1) Removable pipe bollards must be provided around any items exposed to vehicles or maintenance equipment and as required to protect above-ground utilities and site infrastructure.

(2) See ***Exhibit 231.4-1*** and ***Exhibit 231.4-2*** for additional requirements for removable pipe bollards.

(3) Pipe bollards must be spaced no more than 4 feet apart around all generators, fuel tanks, AVI ~~AVI~~ reader ground mounted frame, gantry stair foundation, and wire troughs. Pipe bollards must be placed 3 feet apart around the utility transformer pad. See the ***TEB Site Plans*** and the ***RTC Site Plans*** for bollard layouts.

(4) Pipe bollards must be located to allow for unobstructed access and operation of the AVI r~~AVI r~~eader ground mounted frames and wire troughs.

~~(5)~~ See ***Exhibit 231.4-3*** for requirements for permanent pipe bollards.

~~(6)~~

Exhibit 231.4-1~~231.4-1~~~~231.4-1~~ Removable Pipe Bollards in Gravel

See "Redacted" GTR for updated Exhibit.

Exhibit 231.4-2 Removable Pipe Bollards in Asphalt

See "Redacted" GTR for updated Exhibit.

Exhibit 231.4-3 Permanent Pipe Bollards

See "Redacted" GTR for updated Exhibit.

231.5 Toll Site Equipment Slabs and Toll Equipment Building Foundations

(1) The transformer pad must be designed in compliance with the utility company requirements.

(2) **~~For Toll~~TEB Sites** ~~with TEBs,~~: ~~a~~ A single slab must be designed for the generator and fuel tank as follows:

(a) The slab must be a reinforced monolithic concrete slab designed for the bearing conditions at each site and for the wind load criteria specified in ***GTR 241***.

(b) The slab must be flush with the adjacent sidewalk/pavement and allow for positive drainage away from the TEB.

(c) See ***Exhibit 231.5-1*** for fuel tank hold-down details.

(d) Geotechnical investigation must be in accordance with ***GTR 280.2***.

(3) See ***GTR 241.3*** for additional TEB foundation requirements.

(4) **RTC Sites**: ~~For Toll Sites with RTCs s~~See the ***RTC Site Plans*** for limits of equipment slabs and the layout of the RTC, OCC and other site components.

(a) Utilize the following equipment loads and areas for equipment slab design:

	Dead Load lbs	Footprint SF	Front Elevation SF	Side Elevation SF
RTC	2700	30	84	22
OCC	625	9	20	20
Generator with Fuel Tank	Site specific – Coordinate with Electrical EOR			

(5) **RTC Sites**: Slab(s) must be designed as reinforced concrete for the bearing conditions at each site and for the wind load criteria specified in ***GTR 241***.

(a) The slab must be flush with the adjacent sidewalk/pavement and allow for positive drainage of the site.

(b) Geotechnical investigation must be in accordance with ***GTR 280.1***.

(c) The generator slab must be a minimum of 12 inches thick.

(d) A minimum 6-inch (unless noted otherwise) concrete slab must be provided under all other above grade electrical infrastructure ~~A minimum 6-inch (unless noted otherwise) concrete slab must be provided under all other above grade electrical infrastructure~~.

~~(5)~~ The slab must include provisions for the concrete encased electrode conductor as shown in ***Exhibit 232.4-1***.~~The slab(s) must be designed as reinforced concrete for the bearing conditions at each site and for the wind load criteria specified in ***GTR 241***.~~

~~(a) The slab must be flush with the adjacent sidewalk/pavement and allow for positive drainage of the site.~~

~~(b) Geotechnical investigation must be in accordance with ***GTR 280.1***.~~

~~(c) A minimum 6-inch (unless noted otherwise) concrete slab must be provided under all other above grade electrical infrastructure.~~

(6) ~~The slab must include provisions for the concrete encased electrode conductor as shown in ***Exhibit 232.4-1***.~~

Exhibit 231.5-1 Fuel Tank Hold-Down Details

See "Redacted" GTR for updated Exhibit.

231.6 Toll Site Grading

(1) Sites must be graded to maintain positive drainage. Grading details must be provided for the entire site.

(2) The elevation of adjacent concrete walks and driveways surrounding TEBs, generators, fuel tanks, equipment concrete pads, power distribution frames, and gantry foundations must be designed to allow positive drainage away from these elements.

(3) Site grading within the gravel limits surrounding the bollards must be 1:6 or flatter.

(4) Adjacent top of ditches and swales must be at least 5 feet from toll site envelope.

(5) A minimum grade slope of 0.3% must be provided for concrete sidewalks and slabs.

(6) Site must be graded to set the elevation of the toll loop pull boxes and intermediate pull boxes lower than the following:

(a) TEB finished floor

(b) RTC / OCC concrete slab(s)

(7) Median pull boxes are not subject to the requirements of item (6) above.

231.7 Fencing for Toll Sites

Fencing must be provided if there are pedestrian facilities adjacent to a toll site or if a toll site is located outside of limited access right-of-way.

(1) The toll site must be fenced using ***Standard Plans***, ***Index 550-002***, fence Type B. The fence must enclose the perimeter of the toll site infrastructure including generators, fuel tanks, ~~E6 ground~~AVI reader ground mounted frames, equipment concrete pads, and power distribution frames. Locate the pad-mounted transformer and power meter outside the fence.

(2) The fenced area must be gated and allow for opening safely within the maintenance pull-off area. The clear opening for the gate must be at least 5 feet wide.

232 Toll Site Electrical

232.1 Toll Site Electrical Layout

(1) The electrical infrastructure between gantries, generators, fuel tanks, pull boxes, TEBs, RTCs, OCCs, and miscellaneous equipment must be provided. Electrical equipment must be accessible for operation and maintenance activities.

(2) Design site conduit routing in accordance with the enlarged electrical site plans below:

(a) **TEB Sites**: ***Exhibit 232.1-1***, ***Exhibit 232.1-2***, ***Exhibit 232.1-3***, and ***Exhibit 232.1-4***.~~***Exhibit 232.1-3***.~~

(b) **RTC Sites**:~~***Exhibit 232.1-4***,~~ ***Exhibit 232.1-5***, ***Exhibit 232.1-6***, ***Exhibit 232.1-7***, ***Exhibit 232.1-8***, ***Exhibit 232.1-9***, ***Exhibit 232.1-10***, and ***Exhibit 232.1-11***.

(c) See ***GTR 232.3*** for additional applicable exhibits for both TEB and RTC sites.

(3) Underground duct banks must be encased in concrete. Encasement is not required if the duct bank is routed underneath concrete sidewalks, equipment concrete slabs or pavement.

(4) See ***Standard Plans***, ***Index 630-001*** for minimum conduit burial depths unless noted otherwise.

(5) Conduits under the guardrail must be installed at least 2 feet below the guardrail post burial depth. For guardrail post burial depths, see ***Standard Plans***, ***Index 536-001.***

(6) Pull boxes for gantry power and gantry data as shown in, ***Exhibit 232.1-3***, ***Exhibit 232.1-4***, ***Exhibit 232.1-6***, ***Exhibit 232.1-7***, ***Exhibit 232.1-8***, ***Exhibit 232.1-9***, and ***Exhibit 232.1-10***~~,~~ and must be detailed as follows:

(a) All at-grade power and data pull boxes must be set on a foundation of pea rock having a minimum thickness of 12 inches as shown in ***Exhibit 232.3-1***, and ***Exhibit 232.3-2***.

(b) All raised median pull boxes must be set on a foundation of concrete with drainage per the loop pull box detail as shown in ***Exhibit 232.3-3***, and ***Exhibit 232.3-4***.

Exhibit 232.1-1~~232.1-1~~~~232.1-1~~ Single Movement Non-Accessible Gantry TEB ~~Enlarged~~ Electrical Standard Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-2~~232.1-2~~~~232.1-2~~ Dual Movement Non-Accessible Gantry TEB ~~Enlarged~~ Electrical Standard Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-3~~232.1-3~~ ~~232.1-3~~ Dual Movement Accessible Gantry TEB ~~Enlarged~~ Electrical Standard Site Plan

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-4~~232.1-4~~232.1-4 Dual Movement TEB Electrical Remote Site Plan ~~RTC Enlarged Electrical Site Plan~~

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-5~~232.1-5~~~~232.1-5~~ Single Movement RTC Electrical Standard Site Plan – On-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-6~~232.1-6~~232.1-6 ~~EL Dual~~Single Movement ~~Span Gantry~~ RTC ~~Enlarged~~ Electrical Standard Site Plan – Off-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-7~~232.1-7~~~~232.1-7~~ ~~EL Median Cantilever Gantry~~Dual Movement RTC ~~Enlarged~~ Electrical Detached Site Plan – On-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-8~~232.1-8~~~~232.1-8~~ Single Movement ~~EL Median Cantilever Gantry~~ RTC ~~Enlarged~~ Electrical Remote Site Plan – ~~Off~~On-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-9 Single Movement RTC Electrical Remote Site Plan – Off-Site Power Service

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-10 Dual Movement RTC Electrical Remote Site Plans

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-11~~232.1-9~~232.1-9 ~~—~~RTC Site Generator and Working Space Details

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-12 Single Movement TEB and RTC Electrical Remote Site Plan (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-13 Single Movement TEB and RTC Electrical Remote Site Plan (2 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 232.1-14 TEB Standard Loop Conduit Routing Plans

See "Redacted" GTR for updated Exhibit.

232.2 Toll Site Power Utilities

(1) New and/or modifications to existing underground electrical power service, electric meter, meter base, and all associated components must be provided for each toll site with on-site power service.

(2) Toll sites must have dedicated electric power services on site except for RTC sites with off-site power services.

(3) Toll sites must have dedicated secondaries from the utility transformer to the utility power meter and must not be shared with non-tolling electrical loads.

(4) Coordination must take place with the utility power service providers for the primary power extension from the utility power point of presence to each toll site.

(5) Coordination with electrical power service provider for each toll site includes:

(a) Cost estimate and schedule for new service connection.

(b) Written commitment to provide electrical service to each toll site.

(6) All power service lines in FDOT right-of-way must be underground.

(7) The power service conduits must be as specified by the power service providers as required for the completion of electrical service to each site.

(8) **TEB Sites:** Power services must be 400 Amp, 120/240 Volt, single phase, 3-wire, grounded.

(9) **RTC Sites with On-Site Power Service:** Power services must be 200 Amp, 120/240 Volt, single phase, 3-wire, grounded.

232.3 Toll Loop Infrastructure

The design of toll loop infrastructure must account for TEC furnishing and installing the loop wiring and cabling from the pavement to the TEB or RTC. The loop infrastructure is installed by the TEC after toll site acceptance.

232.3.1 Toll Loop Conduits

(1) Provide one 1-inch toll loop conduit stub-up for each equipped lane/shoulder, to each toll loop pull box from the toll loop pavement area, with a minimum of five loop conduit stub-ups per loop pull box. See ***Exhibit 250.2-1*** and ***Exhibit 250.2-2***, for determining the number of equipped lanes and shoulders.

(a) Rigid Pavement

i. At least one loop conduit must stub up in each slab segment bounded by pavement joints of any type. Coordination with the Turnpike must take place for vendor specific toll loop conduit stub-up locations.

ii. The longitudinal and lateral positioning of all conduit layouts in the pull boxes must comply with ***Exhibit 232.3-1*** and ***Exhibit 232.3-3*** and must be stubbed up in the lanes as stated above.

(b) Flexible Pavement

i. The 1-inch toll loop conduits from the loop pull boxes must stub up in the 12-inch wide toll header curb adjacent to the concrete barrier. See ***Exhibit 232.3-2*** and ***Exhibit 232.3-4***.

ii. Coordinate with Turnpike Tolls Design for conduit stub-up locations along the concrete barrier to avoid future TEC loop conflicts.

(2) See ***Exhibit 232.3-1***, ***Exhibit 232.3-2***, ***Exhibit 232.3-3***, and ***Exhibit 232.3-4*** for the toll loop conduit layout details.

(3) At toll sites with no ELs, loop conduit must be routed as follows:

(a) Two or fewer lanes – Route to toll loop pull boxes adjacent to either the inside or outside shoulder.

(b) Three or more lanes – Provide toll loop pull boxes adjacent to the outside and inside shoulders and route loop conduits to the nearest side.

(4) At toll sites where, TLs and ELs are tolled at the same location, loop conduit must be routed as follows:

(a) TLs – Route to toll loop pull boxes adjacent to the TL shoulder.

(b) ELs – Route to toll loop pull boxes adjacent to the EL shoulder.

(5) When only express lanes are tolled, toll loop conduit must be routed as follows:

(a) ELs – Route to toll loop pull boxes adjacent to the EL shoulder.

(b) GULs and TLs adjacent to the buffer – Route to toll loop pull boxes adjacent to the EL shoulder.

232.3.2 Toll Loop Pull boxes

(1) Seven (7) toll loop pull boxes must be provided per tolling direction.

(2) Additional toll loop pull boxes are required for remote, bi-directional or reversible tolling sites depending on the home run conduit routing design. See ~~e~~ ~~***Exhibit 232.1-3***~~, ~~***Exhibit 232.1-4***~~***Exhibit 232.1-3***, ***Exhibit 232.1-4***, ***Exhibit 232.1-7***, ***Exhibit 232.1-8***, ***Exhibit 232.1-9***, and ~~***Exhibit 232.1-10***~~ ***Exhibit 232.1-10*** for additional information.

(3) Coordination with Turnpike Tolls Design must take place for a pull box layout for any tolling movement supporting more than six equipped lanes and shoulders.

(4) The toll loop pull boxes must be located behind concrete barriers. The use of guardrail in place of concrete barrier is not permitted when adjacent to toll loop pull boxes. See ***GTR 231.1*** for additional requirements regarding the concrete barrier.

(5) The toll loop pull box must be positioned as follows:

(a) See the ***TEB Site Plans*** and the ***RTC Site Plans*** in ***GTR 231*** for toll loop pull box layouts.

(b) Toll loop pull boxes must not be located in roadway pavement lanes or shoulders.

(c) If cable distances cannot be met, coordination with Turnpike Tolls Design must take place for alternative toll loop pull box locations.

(d) At ramp toll sites with a single tolling movement, the toll loop pull boxes must be located on the TEB or RTC side of the roadway, behind the shoulder and concrete barrier.

(e) Toll loop pull boxes placed within median barrier must be elevated to align with the tops of the walls as shown in the ***Standard Plans***, ~~***Concrete Barrier at Toll Sites***~~ ***Index 521-005.***

(6) The toll loop conduits entering the median toll loop pull boxes must be coordinated with the gantry foundation(s), concrete barrier, and the reinforcement placement in these elements. See ***Exhibit 232.3-3*** and ***Exhibit 232.3-4*** for additional requirements.

(7) The toll loop pull boxes for each tolling movement must be encased in concrete that encompasses all toll loop pull boxes as a group for that tolling movement. Individual toll loop pull box concrete encasements are not permitted.

(8) A minimum of 6-inch separation between the toll loop conduits inside the pull box must be provided.

(9) Provide in-grade intermediate pull boxes or hand holes lower than the following floor / slab elevations:

(a) At TEB sites when the top of any in-grade pull box or hand hole that directly connects to the TEB is located at a higher elevation than the TEB finished floor elevation.

(b) At RTC sites when the top of any in-grade pull box or hand hole that directly connects to the OCC and / or RTC is located at a higher elevation than the toll site equipment slab elevation at the reference points to the OCCs and / or RTCs.

(c) See ***TEB Site Plans*** and ***RTC Site Plans*** in ***GTR 231*** for intermediate pull box placement where required above.

(10) Toll loop and intermediate pull boxes must be 30-inches wide x 48-inches long x 24-inches deep. They must have an open bottom and include a one-piece cover.

(a) All at-grade pull boxes must be set on a foundation of pea rock having a minimum depth of 12 inches. See ***Exhibit 232.3-1*** and ***Exhibit 232.3-2***.

(b) All raised median pull boxes must be set on a foundation of concrete as shown in ***Exhibit 232.3-3*** and ***Exhibit 232.3-4***.

232.3.3 Toll Loop Home ~~r~~Runs

(1) See ***Exhibit 232.1-1***, ***Exhibit 232.1-2***, ***Exhibit 232.1-3***, and ~~***Exhibit 232.1-4***~~***Exhibit 232.1-4***, ~~for~~ for the routing of 3-inch conduits between pull boxes and for home runs to TEBs.

(2) See ***Exhibit 232.1-5***, ***Exhibit 232.1-6***, ***Exhibit 232.1-7***, ***Exhibit 232.1-8***, ~~***Exhibit 232.1-9***, and ***Exhibit 232.1-10***~~ ***Exhibit 232.1-9***, and ***Exhibit 232.1-10***~~f~~ for the routing of 3-inch conduits between pull boxes and for all home runs to RTCs.

(3) See ***Exhibit 232.3-1***, ***Exhibit 232.3-2***, ***Exhibit 232.3-3***, and ***Exhibit 232.3-4*** for the toll loop home run details at the pull box locations.

(4) When one set of toll loop pull boxes serves two directions of travel, toll loop home runs for each direction of travel must run in separate conduits.

(5) Home runs must be routed to the TEB or RTC via underground duct banks, directional bores, pull boxes, splice vaults, wireways, conduits, and building or cabinet penetrations.

(6) See ***GTR 232.1*** for conduit burial depth requirements.

Exhibit 232.3-1 Toll Loop Pull Box Details for Rigid Pavement

See "Redacted" GTR for updated Exhibit.

Exhibit 232.3-2 Toll Loop Pull Box Details for Flexible Pavement

See "Redacted" GTR for updated Exhibit.

Exhibit 232.3-3 Elevated Toll Loop Pull Box Details for Rigid Pavement

See "Redacted" GTR for updated Exhibit.

Exhibit 232.3-4 Elevated Toll Loop Pull Box Details for Flexible Pavement

See "Redacted" GTR for updated Exhibit.

232.4 Toll Site Power Distribution

(1) Toll site power panels distribute power to the toll site and must be dedicated to toll site loads only. They must not be shared with non-tolling electrical loads.

(2) **TEB Sites:** See ***GTR 242.4*** for power panel requirements.

(3) **RTC Sites with on-site power:**

(a) Provide one new emergency distribution panel (EDP) rated 200 amps, 120/240 volts, along with associated components. See ***Exhibit 232.4-1*** for the RTC power riser diagram.

(b) See ***GTR 232.4.1*** for all circuits to be fed by panel EDP.

(c) The electrical loads used in load calculations must be rated full load of the equipment.

(4) **RTC sites with off-site power:**

(a) Review the cost efficiency of using off-site power for an RTC site by comparing costs of installing copper feeder conductors versus cost of an on-site generator and utility connection (typical viable distances are at approximately 750 feet).

(b) Power must be fed from a RTC site with an on-site power service. See ***Exhibit 232.4-1*** for the RTC power riser diagram.

(c) Provide one new emergency panel (EP1) rated 100 amps, 120/240 volts, along with associated components.

(d) See ***GTR 232.4.2*** for all circuits to be fed by panel EP1.

(5) Panelboards must comply with the requirements in ***GTR Part 2,*** appendices as follows:

~~(5) Panelboards must comply with the requirements in ***GTR Part 2,*** appendices as follows:~~

(a) **TEB Sites: *GTR Part 2 Appendix 2***, TSP Section for ***Panelboards for TEB Sites*** ~~for additional requirements on the Primary Walk-throughs and Operational Testing Walk-throughs~~.

~~(a)~~(b) **RTC Sites: *GTR Part 2 Appendix 3***, TSP ~~Section~~ for ***Panelboards at RTC Toll Sites***.

232.4.1 Circuits from Roadside Tolling Cabinet On-Site Power Panel EDP

(1) Provide circuit breakers in panel EDP:

(a) Two (2) 15A, 240V branch circuits, one for each air-conditioner in the OCC.

(b) One (1) 20A, 240V feeder for the 2 KVA UPS in the OCC for the OCC components.

(c) One (1) 30A, 240V feeder for the 5 KVA UPS in the OCC for each RTC.

(d) One (1) 20A, 120V branch circuit for the convenience receptacle and light fixtures in the OCC.

(e) For each RTC:

i. Two (2) 20A, 240V branch circuits, one for each air-conditioner.

ii. One (1) 20A, 120V branch circuit for the convenience receptacle and light fixtures.

(f) For the Future RTC:

i. Two (2) 20A, 240V branch circuits, one for each air-conditioner.

ii. One (1) 20A, 120V branch circuit for the convenience receptacle and light fixtures.

(2) Provide circuit breakers in panel EDP, and associated conductors for the following:

(a) Generator:

i. One (1) 20A, 120V branch circuits, for the battery charger.

ii. One (1) 20A, 120V branch circuit for the jacket water heater.

(b) Lighting: One (1) 20A, 120V branch circuit on the power distribution frame.

232.4.2 Circuits from Roadside Tolling Cabinet Off-Site Power Panel EP1

(1) Provide circuit breakers in panel EP1:

(a) Two (2) 15A, 240V branch circuits, one for each air-conditioner in the OCC.

(b) One (1) 20A, 240V feeder for the 2 KVA UPS in the OCC for the OCC components.

(c) One (1) 30A, 240V feeder for the 5 KVA UPS in the OCC for each RTC.

(d) One (1) 20A, 120V branch circuit for the convenience receptacle and light fixtures in the OCC.

(e) For the RTC:

i. Two (2) 20A, 240V branch circuits, one for each air-conditioner.

ii. One (1) 20A, 120V branch circuit for the convenience receptacle and light fixtures.

(f) For the Future RTC:

i. Two (2) 20A, 240V branch circuits, one for each air-conditioner.

ii. One (1) 20A, 120V branch circuit for the convenience receptacle and light fixtures.

(2) Provide circuit breakers in panel EP1, and associated conductors for the lighting with one (1) 20A, 120V branch circuit on the power distribution frame.

232.4.3 Circuits from OCC

(1) For components in the OCC: Provide power output ports from the 2 KVA UPS for the following OCC components:

(a) SCADA: cord and plug connection, 120V 15A

(b) Network Video Recorder (NVR): cord and plug connection, 120V 15A

(c) WAN Switch: two (2) cord and plug connections, 120V 20A

(2) For each RTC: Provide one 30A 240V hard-wired power circuit from each 5 KVA UPS.

Exhibit 232.4-1~~232.4-1~~ RTC Power Riser Diagram

See "Redacted" GTR for updated Exhibit.

232.5 Electrical Equipment Frame Layout

There are multiple types of strut-channel frames supporting the electrical equipment needed for toll sites.

See ***GTR 231.1*** for site layout requirements of the ground-mounted frames.

232.5.1 Equipment Mounted to ~~E6~~AVI Reader Ground-Mounted Frame

(1) See ***GTR 255.5.6*** for determining when ~~E6~~AVI reader ground-mounted frames must be used.

(2) See ***Exhibit 232.5-2*** for the ~~E6~~AVI reader fiberglass NEMA 4 enclosure layouts.

(3) Provide a NEMA 3R, 12-inch H x 12-inch W x 24-inch L wire trough.

(4) See ***Exhibit 250.2-3*** for equipment loads

232.5.2 Roadside Tolling Cabinet Equipment Mounted to Power Distribution Frames

(1) Provide toll site power panels and associated SPDs.

(2) Provide lighting on each face.

(3) [redacted]

(4) See ***Exhibit 232.5-1*** f or the details of both ~~On~~ On-Site Power Service and ~~Off~~ Off-Site Power Service, power distribution frames.

Exhibit 232.5-1~~232.5-1~~ RTC Power Distribution Frame Layouts

See "Redacted" GTR for updated Exhibit.

Exhibit 232.5-2~~232.5-2232.5-2~~ ~~E6~~AVI Reader Ground-Mounted Frame Layouts

See "Redacted" GTR for updated Exhibit.

232.6 Lighting at Toll Sites

(1) See ***GTR 242.2*** for TEB lighting requirements.

(2) See ***GTR Part 2, Appendix 2,~~Appendix 1~~*** TSP Section for ***Lighting Fixtures, Lamps, and Ballasts at TEB Sites*** for additional requirements.

~~(2)~~(3) Lighting requirements for RTC Sites:

(a) An exterior lighting system must be provided consisting of at least two strut channel-~~-~~mounted light fixtures with integral photocells.

(b) Light fixtures must be installed at 87-inches above finished grade to the center of the fixture.

(c) Use Type B fixture from ***Exhibit 242.2-1*** light fixture schedule.

(d) See ***Exhibit 232.5-1*** for fixture location mounting details.

(e) See ***GTR 232.4.1*** and ***GTR 232.4.2*** for lighting circuit requirements.

(f) See ***GTR Part 2 Appendix 3***, TSP for ***Lighting Fixtures and Lamps at RTC Toll Sites*** for additional requirements.

232.7 Generators, Fuel Tanks, and Automatic Transfer Switches

(1) Diesel emergency generator packages, automatic transfer switches, and fuel tanks must be provided at all toll sites except RTC sites with off-site power service.

(2) The toll site emergency power system must not serve non-tolling related electrical loads such as ITS systems, roadway lighting, etc.

(3) See ***GTR 231.1*** for additional generator and fuel tank requirements.

(4) **TEB Sites:**

(a) Provide separate fuel tank and generator as shown on the ***TEB Site Plans*** in ***GTR 231***.

~~(a)~~(b) See ***GTR Part 2, Appendix 2***,TSP Section for ***Automatic Transfer Switches at TEB Sites*** and ***Emergency Generator~~mergency~~ at TEB Sites*** for additional requirements.

(5) **RTC Sites:**

(a) Provide a generator with integral base tank as shown on the ***RTC Site Plans*** in ***GTR 231***.

(b) See ***GTR Part 2 Appendix 3***, TSP for ***Automatic Transfer Switches at RTC Tolls Sites*** and ***Emergency Generator ~~mergency~~at RTC Tolls Sites*** for additional requirements.

232.8 Surge Protection Devices (SPDs)

(1) **TEB Sites:** See ***GTR 242.10*** for SPD requirements.

(2) **RTC Sites:**

(a) SPDs must be provided for all power panels and transfer switch.

(b) See ***GTR Part 2 Appendix 3***, TSP for ~~See *GTR Part 2, Appendix 1, TSP Section for*~~ ***Surge Protective Devices*** ***1KV or less at RTC Toll Sites*** for additional requirements.

232.9 Toll Site Security

232.9.1 Closed Circuit Television (CCTV) System

(1) Conduit, junction boxes, fittings, connections, power cabling, pull ropes and other infrastructure required for the Turnpike installed CCTV equipment must be provided.

(2) See ***Exhibit 232.9-1*** and ***Exhibit 232.9-2*** for quantity and layout of boxes to support the CCTV cameras.

(3) The Turnpike will furnish and install the security system, cabling and all cameras on the site.

(4) **TEB Sites:** Raceways to the data side of the ceiling mounted cable tray for each building mounted CCTV surveillance camera must be provided in accordance with ***Exhibit 242.1-6*** and ***Exhibit 242.1-7***.

(5) **RTC Sites:** See ***Exhibit 232.5-1*** for CCTV mounting details.

232.9.2 Site Access Control

When toll site fencing and gates are required per ***GTR 231.7***:

(1) All necessary conduit, junction boxes, fittings, connections, and miscellaneous hardware must be provided for power and data cabling required for the access control system.

(2) Coordinate with Turnpike Toll Systems Department and Turnpike Tolls Design for determination of owner furnished devices.

Exhibit 232.9-1 CCTV Camera Site Locations for TEB Sites

See "Redacted" GTR for updated Exhibit.

Exhibit 232.9-2 CCTV Camera Site Locations for RTC Sites

See "Redacted" GTR for updated Exhibit.

232.10 Toll Site Supervisory Control and Data Acquisition (SCADA) Systems

(1) One SCADA control panel must be provided for each toll site.

(2) **TEB Sites:** See ***GTR 242.6*** for TEB sites SCADA system requirements.

(3) **RTC Sites:** SCADA system for RTC sites must be in accordance with the following:

(a) The SCADA system must connect to the toll site assets as shown in ***Exhibit 232.10-1*** and ***Exhibit 232.10-2***.

(b) For electrical power to the SCADA panel refer to ***GTR 232.4.3***.

Exhibit 232.10-1~~232.10-1~~ RTC SCADA Riser Diagram (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 232.10-2~~232.10-2~~ RTC SCADA Riser Diagram (2 of 2)

See "Redacted" GTR for updated Exhibit.

232.11 Electrical Infrastructure for Roadside Tolling Cabinet Sites

(1) Vertical raceways that originate from the gantry must terminate as described in ***GTR 255.5.1***.

(2) See ~~***Exhibit 232.1-11***~~ ***Exhibit 232.1-11*** for working space details and conduit layouts under the site equipment.

(3) Loop pull box raceways must be routed to the stub up, under the appropriate working spaces under the RTCs and the future RTC pull box.

(4) All conduits must be stubbed up to 1-inch above the finished equipment slab elevation with a cable ground bushing installed at both ends of all metallic conduits.

(5) Conduits from each wire trough must terminate as follows:

(a) CCTV: [redacted]

(b) Data: Three 3-inch data conduits (not associated with CCTV) must be routed from data wire trough to the appropriate working spaces of each RTC and the future RTC pull box.

(c) ~~E6~~AVI Readers on ground-mounted frame:

i. Two 4-inch rigid conduits must be routed from the bottom of the upright and terminate at the ~~E6~~AVI reader frame as shown in ***Exhibit 232.5-2***.

ii. Two 3-inch rigid conduits must be routed from the bottom of the ~~E6~~AVI reader frame wire trough and stub up in the appropriate working spaces of each RTC and the future RTC pull box.

iii. See ***GTR 255.5.6*** for additional requirements.

(d) ~~E6~~AVI Readers mounted on the gantry: Two 3-inch rigid conduits must be routed from the bottom of the ~~E6~~AVI reader wire trough and stub up in the appropriate working spaces of each RTC and the future RTC pull box.

(e) Power: Two 2-inch rigid conduits must be routed to the appropriate working spaces of each RTC and the future RTC pull box.

(6) Generator underground cable routing must be as follows:

(a) One 2-inch conduit for the generator power feeders to the ATS.

(b) One 1-inch conduit to the ATS for generator control wiring.

(c) [redacted]

(d) One 1-inch conduit to EDP for engine jacket heater circuit.

(e) One 1-inch conduit to the BCU for the generator battery circuit.

(7) See ***GTR 255.5.8*** and **GTR 255.5.9** for cantilever gantry conduit routing requirements.

232.12 Department Provided Infrastructure for Roadside Tolling Cabinet Sites

232.12.1 Equipment

The following components are provided by the Department:

(1) Within the OCC:

(a) [redacted]

(b) WAN ethernet switch

(c) [redacted]

(2) RTC(s) provided via the Department's TEC

(a) TEC equipment

(b) Dual air conditioners and related controls

(c) In-cabinet lighting

(d) Cable management

(e) PDUs

(f) [redacted]

(3) [redacted]

232.12.2 Conductor and Cable Terminations

(1) Provide coiled conductors with sufficient slack to allow the Department to terminate power conductors between:

(a) EDP and RTC(s)

(b) EP1 and RTC

(c) OCC and RTC(s)

(2) Provide coiled cables with sufficient slack to allow the Department to terminate data cables between the OCC and the RTC(s) (SCADA, FOC, and Access Control)

233 Toll Site Lightning Protection

233.1 Lightning Protection for Site Infrastructure

Lightning protection must bond to each applicable toll site element listed below:

(1) TEB counterpoise loop (provide additional ground rods)

(2) ~~RTC~~ OCC

~~(2)~~(3) RTC(s) (provide additional ground rods adjacent to the RTC(s) and future RTC ~~ground bar~~)

~~(3)~~(4) Generator and fuel tank (provide additional ground rod)

~~(4)~~(5) Gantry uprights counterpoises (provide additional ground rods)

~~(5)~~(6) Toll site ground-mounted strut channel frames

~~(6)~~(7) Any additional metallic site elements

233.2 Lightning Protection Separation Distances

(1) The underground lightning protection system conductors must be at least 36 inches vertical or horizontal, from conduits that serve the tolling equipment.

(2) Lightning conductors must not be routed under the toll pavement area. The underground lightning protection system conductors must be at least 36 inches horizontally from the toll loop pavement area limits except as allowed in the item below.

(3) The lightning conductors for median barrier gantry uprights must be routed to maximize the distance between the toll loop pavement area(s) and the conductor.

234 Cable Distance Limitations

234.1 Definitions and Measurement

Calculated cable distance is the distance between the originating and terminating devices of a cable run including all bends, turns, and elevation differences.

The following must be added to the calculated cable distance as measured in plan and elevation:

(1) 15 percent for cable runs that are in directional bores or drills.

(2) 10 percent for cable runs that are not in directional bores or drills.

234.2 Boosters and Amplifiers

The use of cable signal boosters or amplifiers (boosters) is not permitted.

234.3 Cable Distance Limitations

(1) The cable distance between an AVI antenna and its corresponding ~~E6~~AVI reader must not exceed 100 feet.

(2) The ethernet cable distance between the ~~E6~~AVI reader and the toll equipment working spaces inside the TEB or RTC must not exceed 250 feet.

(3) The cable distance between any remaining toll equipment mounted to the J-arms and the toll equipment working spaces inside the TEB or RTC must not exceed 250 feet.

(4) The cable distance between any tolling loop and the toll equipment working spaces inside the TEB or RTC must not exceed 250 feet.

(5) See ***Exhibit 234.3-1*** for an example how to calculate cable distance for each toll equipment for toll sites with TEBs. The cable distances for toll sites with RTCs are calculated in a similar manner to toll sites with TEBs.

Exhibit 234.3-1 Calculated Cable Distances

See "Redacted" GTR for updated Exhibit.

240 Toll Equipment Building Design

240.1 General Requirements

(1) The term “building” refers to the TEB.

(2) Design of buildings and building sites (not including RTC sites) including all plans, specifications, and other contract documents must comply with the latest adopted edition and supplements of the FBC at the time of permitting. Under no circumstances must the requirements be reduced because of code changes that occur during design.

241 Toll Equipment Building Architectural

241.1 General Requirements

TEBs must be designed as follows:

(1) Provide a building that is a six-sided pre-engineered precast concrete box structure.

(2) The building must be 21 feet long by 12 feet, 6 inches (12’-6”) wide measured from exterior faces.

(3) A new interior fire extinguisher and bracket must be provided in all new buildings.

(4) See ***GTR 241.6*** for additional architectural requirements related to the prefabricated building.

241.2 Toll Equipment Building Structural Design

TEB structural design must include:

(1) The design layout of the TEB including overall building size, form, and locations and sizes of all penetrations.

(2) Requirements for the TEB manufacturer to develop signed and sealed shop drawings and calculations for a complete TEB design.

(3) The foundation design for the TEB.

241.2.2 Hurricane Wind Requirements

(1) The design must comply with Risk Category IV buildings per ***FBC***, ***Section 1620*** “High Velocity Zones - Wind Loads” for Miami-Dade County, regardless of project location.

(2) See ***GTR 231.1*** for additional wind design requirements.

241.2.3 Live Load

(1) The minimum roof load must be 65 pounds per square foot (PSF).

(2) The minimum floor load must be 125 PSF.

241.3 Foundation Slab

(1) Geotechnical investigation for the TEB foundation must be in accordance with ***GTR 280.2***.

(2) Design calculations for bearing capacity and settlement analyses for TEB foundation design must be provided.

(3) The floor penetration locations must be designed as shown in ***Exhibit 241.6-1***.

(4) A monolithic slab with a turned down edge designed for the allowable bearing conditions must be provided at each precast concrete building and for the wind load criterion specified above.

(5) Set the precast concrete building in a notch-troweled grout or mortar bed with a minimum thickness of ¼ inch over the entire foundation slab surface to create a uniform bearing between the precast concrete floor slab and the foundation slab.

(6) Provide a notch troweled mortar bed min. ¼" the entire cast-in-place foundation surface prior to setting the precast building in plaza.

(7) The foundation reinforcement layout must be designed to accommodate tolling and electrical conduit stub-up locations.

(8) The foundation design must include provisions for the concrete encased electrode conductor as required in ***GTR 242.13*** and shown in ***Exhibit 241.6-1***.

(9) Steel plate connections must be provided to tie the precast concrete building to the foundation slab. See ***Exhibit 241.6-1*** for additional requirements.

241.4 Toll Equipment Building Roof

The TEB roof system must be designed per the following:

(1) Styrene-Butadiene-Styrene (SBS) modified bitumen roof system and associated items must have State of Florida or Miami-Dade County product control Notice of Acceptance (NOA) and comply with requirements for high velocity hurricane zone Miami-Dade County regardless of location.

(2) The side of the building closest to and parallel to the roadway must be the high roof side of the building. The roof must slope to the side of the building furthest from the roadway.

(3) The high roof side and the two ends of the building must have parapets topped with a prefinished fluoropolymer coating metal coping system.

(4) R-19 minimum (aged value) tapered roof insulation must be provided. Roofing base and flashing material must be extended over top of parapet.

(5) Two roof penetrations must be provided for lightning protection at opposite corners of the roof 24 inches from the exterior faces.

(6) The roof parapet must be detailed in accordance with ***Exhibit 241.4-1***.

(7) A continuous gutter along the low roof side of the building with downspouts on each end must be provided. The gutter assembly must be secured with anchors sized and spaced to withstand the design wind loads. See ***Exhibit 241.4-1*** below for additional criteria.

Exhibit 241.4-1 TEB Wall Sections

See "Redacted" GTR for updated Exhibit.

241.5 Exterior Equipment

(1) New fire extinguisher and bracket must be provided near the generator and fuel storage tank area.

  (a) The fire extinguisher must be in an area hidden from general public view.

  (b) An appropriate weather resistant enclosure must be provided with mounting hardware, and signage.

(2) Fire extinguisher and electrical meter must not be located over building reveals.

241.6 Pre-Engineered Precast Concrete Toll Equipment Buildings

(1) All exposed concrete floors in interior spaces must be coated with a clear coat sealer to reduce concrete dust.

(2) All block outs must be designed to accommodate tolling and electrical conduit stub-up locations. See ***Exhibit 241.6-1*** for additional layout and size criteria.

(3) All wall penetrations through the TEB must be coordinated with the electrical devices for which they serve. See ***Exhibit 241.6-2*** for additional layout criteria.

(4) Vertical and horizontal reveals must be provided on the exterior of all building walls. See ***Exhibit 241.6-2*** and ***Exhibit 241.6-3*** for additional requirements.

(5) Door and Frame

  (a) Exterior door frame and door must have State of Florida or Miami-Dade County product control NOA and comply with requirements for high velocity hurricane zones in Miami-Dade County requirements regardless of location.

  (b) The TEBs must have one door made of steel with a steel frame cast in the wall. All door and conduit openings must be suitably protected and sealed to prevent the ingress of water, moisture, dust, and wind driven rain.

  (c) The TEB door must swing open at least 170 degrees and be unobstructed to provide access for maintenance technicians and tolling equipment.

  (d) Door jamb guards, kick plates, and other items must be provided as shown in the ***Exhibit 241.6-4***.

(6) Interior Walls and Ceilings

  (a) See ***Exhibit 241.4-1*** for basis of design.

  (b) Interior wall and ceiling system (not inclusive of the precast concrete) must not exceed 21/8-inch in thickness.

  (c) Design of the insulation system must satisfy the Florida Building Code – Energy Conservation.

(d) Design the wall and ceiling systems with the capacity to support TEB wall and ceiling mounted equipment.

(e) Calculations must be provided for the type, size, length, and minimum embedment depth of fasteners required to support all wall mounted equipment without compromising the precast wall.

(f) Design the wall and ceiling with a painted or equivalent surface finish.

(g) Design the wall to include resilient base.

(7) Exterior and interior color schedule must be as follows:

(a) Exterior walls, door, and AC pipe chases: Federal Standard 595 No. 17886.

(b) Exterior metal coping, gutter, and downspout: Brown – Federal Standard No. 20062.

(c) Interior walls, interior door frame, interior door: White Federal Standard 595 No. 17925.

(d) Interior ceiling: White Federal Standard 595 No. 17925.

Exhibit 241.6-1 TEB Foundation

See "Redacted" GTR for updated Exhibit.

Exhibit 241.6-2 TEB Exterior Elevations

See "Redacted" GTR for updated Exhibit.

Exhibit 241.6-3 TEB Reveal Details

See "Redacted" GTR for updated Exhibit.

Exhibit 241.6-4 TEB Door Details

See "Redacted" GTR for updated Exhibit.

241.7 Equipment Support Frames

241.7.1 Toll Equipment Support Frame

A raised aluminum cabinet support frame must be provided to support the TEC provided tolling equipment in each TEB. The raised aluminum cabinet support frames must meet the following requirements:

(1) Raised aluminum cabinet support frames must be 159 inches long x 36 inches wide x 8 inches high.

(2) The frame area where the cabinets sit must be a minimum 2.5 inches wide or as required to allow for all cabinets to be properly placed over the frame.

(3) The frame must have two (2) aluminum cross ribs. The cross ribs shall be 4 inches wide and provide a minimum of 4 inches clear between the finish floor and cross rib bottom. See ***Exhibit 241.7-1*** for additional requirements.

241.7.2 Condensing Units Support Frame

(1) Provide stainless steel angle equipment support frame shop welded. Coordinate exact size and clearance requirements with the specified condensing unit.

(2) See ***Exhibit 241.7-2*** for frame design intent.

Exhibit 241.7-1 Toll Equipment Support Frame

See "Redacted" GTR for updated Exhibit.

Exhibit 241.7-2 Condensing Units Support Frame

See "Redacted" GTR for updated Exhibit.

242 Toll Equipment Building Electrical

This section applies to all TEBs (new or existing) unless noted otherwise.

242.1 General Requirements

(1) The TEB electrical components layout and interconnections must be provided as shown in ***Exhibit 242.1-1***, ***Exhibit 242.1-2***, ***Exhibit 242.1-3***, ***Exhibit 242.1-4***, ***Exhibit 242.1-5***, and ***Exhibit 242.1-6***, except as modified by ***GTR 242.5***, ***GTR 242.7***, and ***(2)*** below.

(2) One toll equipment space is required for each tolling movement up to maximum of 6 equipped lanes and shoulders per tolling movement.

(3) All cables and conductors must be installed in raceways.

(4) All wall-mounted wiring devices must be provided in accordance with ***Exhibit 242.1-7***.

(5) Power cables from the critical power panel(s) must route to the power side of the ceiling mounted cable tray. See ***Exhibit 242.3-1*** for additional requirements.

Exhibit 242.1-1 TEB Power Riser Diagram

See "Redacted" GTR for updated Exhibit.

Exhibit 242.1-2 TEB Electrical Layout

See "Redacted" GTR for updated Exhibit.

Exhibit 242.1-3 Interior Electrical Elevations (1 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 242.1-4 Interior Electrical Elevations (2 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 242.1-5 Interior Electrical Elevations (3 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 242.1-6 Interior Electrical Elevations (4 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 242.1-7 Wall Mounted Wiring Device Details

See "Redacted" GTR for updated Exhibit.

242.2 Toll Equipment Building Lighting

(1) An interior lighting system must be provided consisting of at least six pendant mounted light fixtures to maintain average lighting levels of 40 foot-candles.

(2) Light fixtures must be installed at 96-inches above finished floor to the bottom of the fixture.

(3) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Lighting Fixtures, Lamps, and Ballasts*** ***for TEB Sites*** for additional requirements.

(4) Lights must be provided on the exterior of all four walls of the TEB.

(5) See ***Exhibit 242.2-1*** for additional requirements for interior and exterior lighting.

Exhibit 242.2-1 TEB Lighting

See "Redacted" GTR for updated Exhibit.

242.3 Critical Power Receptacles

(1) Dedicated 20A twist-lock receptacles and associated circuits must be provided from the critical power panel(s) and mounted to the power side of the cable tray above the toll equipment and toll communication cabinet.

(2) See ***Exhibit 242.3-1*** for critical power receptacle layout requirements except as modified by ***GTR 242.5***, ***GTR 242.7***, and ***GTR 242.1 (2)***.

(3) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Wiring Devices*** ***for TEB Sites*** for additional requirements.

Exhibit 242.3-1 Receptacles Over Tolling Equipment

See "Redacted" GTR for updated Exhibit.

242.4 Electrical Power Panels

(1) One new main distribution panel (MDP) must be provided for all TEBs. New MDPs must be rated 400 amps, 120/240 volts, and comply with the requirements in ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Panelboards*** ***for TEB Sites***.

(2) One new emergency distribution panel (EDP) must be provided, rated 400 amps, 120/240 volts, along with associated components for all TEBs. The EDP must comply with the requirements in ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Panelboards*** ***for TEB Sites***.

(a) The indoor and outdoor lighting, fuel tank monitor, UPS, UPS by-pass, AC units, generator battery charger, generator engine jacket heater, and [redacted]

(b) The electrical loads used in load calculations must be rated full load of the equipment.

242.5 Critical Power Panels

(1) Critical power panels and panel breakers must be as specified in ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Toll Equipment Critical Power Panelboard*** ***for TEB Sites***.

(2) One critical power panel must be provided for TEBs supporting a single tolling equipment enclosure and two critical power panels for TEBs supporting two to four tolling equipment enclosures.

(3) The critical power panel must be rated for 100A, 42 circuits, 120/240V, 1-phase, 3-wire.

(4) The critical power panel must only serve the following systems: tolling, communications, [redacted]

(5) The following dedicated circuits must be provided from Panel C1 if only one critical panel is provided:

(a) 2 circuits for PDU-A

(b) 2 circuits for PDU-B

(c) 2 circuits for WAN Switch

(d) 8 circuits for each instance of toll equipment

(e) 1 circuit for TELCO, if required

(6) The following dedicated circuits must be provided if two critical panels are provided:

(a) 1 circuit from panel C1 and 1 circuit from panel C2 for PDU-A

(b) 1 circuit from panel C1 and 1 circuit from panel C2 for PDU-B

(c) 1 circuit from panel C1 and 1 circuit from panel C2 for WAN switch

(d) 4 circuits from panel C1 and 4 circuits from panel C2 for each instance of toll equipment

(e) 1 circuit from panel C1 for TELCO, if required

242.6 SCADA System

(1) One SCADA control panel must be provided for each TEB.

(2) The SCADA control panel must meet the requirements of ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***SCADA System for TEB Sites***.

(3) The SCADA system must connect to the toll site assets as shown in ***Exhibit 242.6-1***, ***Exhibit 242.6-2***, and ***Exhibit 242.6-3*** as applicable. See ***GTR Part 2, Appendix 2***, TSP Section for ***SCADA System for TEB Sites*** for additional requirements.

~~(3)~~(4) For electrical power to the SCADA panel refer to ***GTR 242.5.***

Exhibit 242.6-1 SCADA Riser Diagram (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 242.6-2 SCADA Riser Diagram (2 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 242.6-3 TEB SCADA and Security System Plan

See "Redacted" GTR for updated Exhibit.

242.7 UPS

(1) One UPS must be provided for TEBs supporting a single tolling instance and two UPSs for TEBs supporting two to four tolling instances.

(2) UPS must be sized for the total connected critical power panel load. UPSs must be 15 KVA at a minimum.

(3) One ¾-inch conduit must be provided from each UPS communication port card area to the pendant mounted cable tray.

(4) Refer to ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Static Uninterruptible Power Supplies*** ***for TEB Sites*** for additional UPS requirements.

242.8 UPS Maintenance By-pass Switches (BPS)

(1) A wall mounted external manual maintenance BPS must be provided for each new UPS.

(2) The BPS must be fed by two separate power sources (two separate breakers, two separate feeders, and two separate conduits) from the appropriate power panel.

(3) The feeders must not be spliced or routed through any disconnects prior to terminating in the BPS.

(4) Other devices or equipment must not be located directly under the BPS.

(5) The BPS must not cause a power outage to the critical power panel when it is put in either by-pass mode and/or UPS mode.

(6) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Static Uninterruptible Power Supplies*** ***for TEB Sites*** for additional requirements.

(7) See ***Exhibit 242.8-1*** and ***Exhibit 242.8-2*** for additional details and requirements.

Exhibit 242.8-1 UPS and BPS Riser Diagram (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 242.8-2 UPS and BPS Riser Diagram (2 of 2)

See "Redacted" GTR for updated Exhibit.

242.9 Cable Trays

(1) Pendant mounted ladder type cable trays must be provided to accommodate data and power cables.

(2) The cable tray length must be as follows:

(a) At minimum, the “main core” of the cable tray must run the entire length of the largest dimension (length or width) of the room.

(b) For any buildings requiring wall penetrations, the cable tray must span between the wall penetration points and the main core of the cable tray

(c) The cable tray must be located above the toll equipment spaces and also the communication cabinet inside the TEB.

(3) Transition fittings, attachments, and supports must be provided for all conduits terminating in the cable tray.

(4) Bond the cable tray and each metal conduit with grounding bushings and a #10 AWG, minimum bare copper equipment grounding conductor that originates from the critical power panel(s) in the TEB.

(5) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Cable Trays*** ***for TEB Sites*** for additional requirements.

242.10 Surge Protection Devices (SPDs)

(1) SPDs must be provided for all conductive cabling that originates outside the TEB walls and terminates within the building.

(2) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Surge Protective Devices*** ***for TEB Sites*** for additional requirements.

242.11 Emergency Power Off (EPO) Stations

(1) EPO stations must be provided.

(2) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Emergency Generator*** ***for TEB Sites*** for additional requirements.

(3) See ***Exhibit 242.11-1*** for additional requirements.

Exhibit 242.11-1 EPO Riser and Wiring Diagram

See "Redacted" GTR for updated Exhibit.

242.12 Access Control System

(1) Access control and security system devices and wiring must be provided. See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Sections for***~~ ***Door Hardware and Access Control System*** ***for TEB Sites*** for additional requirements.

(2) All necessary conduit, junction boxes, fittings, connections, and miscellaneous hardware must be provided for power and data cabling required for the access control system.

(3) See ***Exhibit 242.12-1*** for additional requirements.

Exhibit 242.12-1 Access Control Details

See "Redacted" GTR for updated Exhibit.

242.13 Grounding and Bonding

(1) See ***Exhibit 242.13-1*** and ***Exhibit 242.13-2*** for grounding and bonding requirements.

(2) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Grounding and Bonding for Electrical Systems*** ***for TEB Sites*** for additional requirements.

Exhibit 242.13-1 TEB Grounding Details

See "Redacted" GTR for updated Exhibit.

Exhibit 242.13-2 Grounding Details

See "Redacted" GTR for updated Exhibit.

242.14 Electrical Raceways from Site to New TEBs

(1) Vertical raceways that originate from the gantry must terminate as described in ***GTR 255.5.1*** and ***255.6.4.***

(2) Working space 1 is the area between the toll equipment spaces 1 and 3. Working space 2 is the area between toll equipment spaces 2 and 4. See ***Exhibit 241.7-1***.

(3) Loop pull box raceways must be routed to the stub up, under the appropriate working spaces in the TEB.

(4) All conduits must be stubbed up through the building floor slab and cut to 1-inch above the building finished floor elevation with a cable ground bushing installed at both ends of all metallic conduits.

(5) See ***Exhibit 242.14-1*** for the conduit stub-ups below the toll equipment support frame for each working space inside the TEB.

(6) Conduits from each wire trough must terminate as follows:

(a) CCTV: [redacted] See ***Exhibit 260.2-1***.

(b) AVI reader conduits routed as follows:

- AVI Reader Mounted in the Building: Two 4-inch rigid conduits must be routed from the bottom of the AVI reader wire trough and stub up under the wall mounted AVI reader backplane. See ***Exhibit 242.1-6***.
- AVI Readers Ground Mounted Frame: Two 4-inch rigid conduits must be routed from the bottom of the upright and terminate at the AVI reader frame. See ***Exhibit 232.5-2***.
- AVI Readers Mounted on the Gantry: For each direction of travel served by the wire trough, two 4-inch rigid conduits must be routed from the bottom of the AVI reader wire trough and stub up in the appropriate working spaces in the TEB. For additional information see ***Exhibit 241.7-1*** and ***Exhibit 242.14-1***.

(c) Data not associated with CCTV must be routed to stub-up under the appropriate working space in the TEB. For additional information, see ***Exhibit 241.7-1*** and ***Exhibit 242.14-1***.

(d) Power must be routed to stub up under the appropriate working space in the TEB except as stated in (e) below. For additional information, see ***Exhibit 241.7-1*** and ***Exhibit 242.14-1***.

(e) Power to the receptacles and lighting on the gantry must be routed to stub up under the EDP in the TEB.

(7) The underground cable routing for ~~E6~~AVI readers that are located on a ground-mounted frame, must be as follows:

(a) Two 4-inch conduits per direction of movement must be routed to the toll equipment working spaces.

(b) See ***GTR 255.5.6*** for additional requirements.

(8) Generator underground cable routing must be as follows:

(a) Conduits sized by the EOR for the generator power feeders must be routed to the ATS.

(b) One 1-inch conduit must be routed to the ATS for generator control wiring and EPO wiring.

(c) [redacted]

(d) One 1-inch conduit to EDP for engine jacket heater circuit.

(e) One 1-inch conduit to the battery charging unit for the generator battery circuit.

(9) Fuel tank monitor underground cable routing must be as follows:

(a) [redacted]

(b) One 3/4-inch conduit to EDP for fuel tank monitor circuit.

(10) See ***GTR 255.5.8*** and ***GTR 255.5.9*** for cantilever gantry conduit routing requirements.

Exhibit 242.14-1 Working Space Conduit Stub-up

See "Redacted" GTR for updated Exhibit.

242.15 Electrical Raceways from Site to Existing TEBs

The Turnpike Toll Systems can elect to re-use an existing building to house the new tolling system provided by the TEC.

Coordination must take place with Turnpike Tolls Design on the termination point of the conduits incoming from the gantry and roadside during the gantry and site design. Written documentation (email or meeting notes documentation) of concurrence from the Turnpike Tolls Design Administrator or designee is acceptable.

(1) The wall penetrations for raceways at existing buildings must be from wall-mounted enclosures as follows:

(a) The enclosures must be mounted to the exterior side of the wall at the ceiling level such that cabling transitions to the ceiling mounted cable trays in the interior of the building.

(b) The enclosures must be stainless steel NEMA 4X. The enclosures must be attached to the wall with stainless steel galvanized strut channel supports and labeled “Data” or “Power” depending on the conduits it serves.

(c) The enclosures and associated conduits must be painted to match the adjacent surfaces.

(d) The number of conduit penetrations must match the number of incoming conduits from the gantry and roadside.

(e) The conduit penetration design must maintain the structural integrity of the wall.

(f) The seal around each conduit penetration must provide a waterproof and dust proof wall penetration. The conduit penetrations and enclosures must be constructed to prevent dirt intrusion and water intrusion from rain, and hose-down water test. See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Cutting and Patching for TEB Sites*** for additional requirements.

(2) The conduits must be sloped away from the building interior such that water originating from the outside or from condensation does not make its way inside of the building.

(3) All wireways, wire troughs, enclosures, conduit, chases, pull boxes, and cable trays must be terminated and supported using the appropriate hardware and fittings in accordance with ***GTR 210*** and the NEC.

243 Toll Equipment Building Lightning Protection

243.1 General Requirements

(1) A lightning protection system must be provided for all new toll sites and associated toll site infrastructure.

(2) Each TEB lightning protection system must be connected to the applicable site elements identified in ***GTR 233.1***.

(3) See ***GTR 233.2*** for lightning protection separation distance requirements.

(4) Lightning protection conduit penetrating the exterior wall must not be exposed. See ***Exhibit 243.1-1***and ***Exhibit 243.1-2*** for additional criteria.

(5) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Lightning Protection*** ***for TEB Sites*** for additional requirements.

Exhibit 243.1-1 Down Conductor Conduit

See "Redacted" GTR for updated Exhibit.

Exhibit 243.1-2 TEB Lightning Protection Plan

See "Redacted" GTR for updated Exhibit.

244 Toll Equipment Building Mechanical

244.1 General Requirements

(1) Fuel tank and fuel oil piping must be provided to support the emergency generator ~~emergency generator~~.

(2) Two ductless split AC systems with wall mounted air handling units (AHUs) and outdoor condensing units (CUs) with inverter-driven twin rotary compressors and CUs with seacoast protection must be provided for each TEB. See ***Exhibit 244.2-1*** for additional requirements.

(3) Outdoor condensing units must be wall mounted in accordance with ***GTR 241.7.2***.

244.2 Air Conditioning (AC) System

(1) The AC system must be sized to account for all design factors including TEB size, equipment normal operation, temperature and humidity requirements, heat loads, etc.

(2) Each unit must be sized for 100% of the building load and be redundant to the other unit. Coordination must take place with Turnpike Tolls Design if the cooling capacity of a single unit is insufficient to satisfy 100% of the building load.

(3) Cooling load calculations must account for 100% of the building load, including electrical equipment, ultimate tolling equipment, and the building envelope. Each AC system's cooling capacity must maintain 75ºF with 50% relative humidity when the outside air temperature is at design conditions.

(4) Building minimum and maximum operating parameters: A single AC unit shall maintain the interior temperature of the building between 73 degrees (dry bulb) Fahrenheit, and 77 degrees (dry bulb) Fahrenheit, and maintain the humidity in the building of not more than 55%.

(5) The AC system must be equipped with a remote controller for the dual unit control system and thermostat, to periodically and automatically switch between the primary and secondary units. See ***GTR Part 2, Appendix 2***, TSP Sections for ~~***GTR Part 2, Appendix 1, TSP Sections for***~~ ***Ductless Split System AC for TEB Sites*** and ***Dual Air Conditioner Control System and Sequence of Operations for TEB Sites*** for additional requirements.

(6) The sensible heat gain calculations must take into account the following:

  (a) The heat output of each tolling equipment space and toll communications cabinet must be included in the calculation at a rate of 1.0kW.

  (b) Refer to ***GTR 242*** for the number of tolling equipment spaces per TEB.

  (c) See ***Exhibit 244.2-1*** for additional requirements for AC infrastructure.

Exhibit 244.2-1 AC Infrastructure

See "Redacted" GTR for updated Exhibit.

244.3 Condensate Piping and Dry Well

(1) Dry well for AC condensate must be provided.

(2) See ***Exhibit 244.3-1*** for additional requirements.

(3) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Sections for***~~ ***Piping and Specialties*** ***for TEB Sites***.

Exhibit 244.3-1 Dry Well and AC Condensate Piping Details

See "Redacted" GTR for updated Exhibit.

244.4 Fuel Storage Tanks, and Fuel Oil Piping

(1) See ***Exhibit 244.4-1*** and ***Exhibit 244.4-2*** for fuel oil piping routing and accessories.

(2) See ***Exhibit 231.5-1*** for fuel tank hold-down details.

~~(3) See ***Exhibit 231.51*** for fuel storage tank hold-down details.~~

~~(4)~~(3) See ***GTR Part 2, Appendix 2***, TSP Sections for ~~***GTR Part 2, Appendix 1, TSP Sections for***~~ ***Concrete Protected Above-Ground Fuel Storage Tank*** ***for TEB Sites*** and ***Fuel Oil Piping*** ***for TEB Sites*** for additional requirements.

Exhibit 244.4-1 Generator Fuel Tank Piping

See "Redacted" GTR for updated Exhibit.

Exhibit 244.4-2 Fuel Tank Details

See "Redacted" GTR for updated Exhibit.

250 Toll Gantries

250.1 Gantry Types

(1) Non-accessible gantries – See ***GTR 251.4.*** The two types of non-accessible gantries are:

(a) Non-accessible cantilever – See ***GTR 251.5***

Non-accessible cantilever gantries may be installed at ramp toll sites and express lane toll sites, only where the design satisfies the span limitations identified in ***GTR 250.2***, ***GTR 251*** and ***GTR 253,*** and cable distances identified in ***GTR 234*** can be met.

(b) Non-accessible span – See ***GTR 251.6***

Non-accessible span gantries may be installed at ramp toll sites, and express lane toll sites.

See ***Exhibit 250.1-1*** to identify the various elements of a non-accessible gantry.

(2) Accessible gantries (span only) – See ***GTR 251.7***

A detailed investigation is required for the selection of the gantry type. Mainline toll gantries are assumed to be accessible gantries. A study must include justification that shall be documented in the Toll Siting Technical Memorandum (TSTM), to determine when a mainline toll site will be a non-accessible gantry. Investigation considerations should include but are not limited to existing and proposed site conditions, manufacturing limitations, maintainability, site safety, and project costs. The gantry type shall be determined during the PD&E phase in accordance with ***GTR 202.2***. ~~An accessible gantry and a TEB must be installed at mainline toll sites except for:~~

~~express~~ Express ~~lane-only toll sites.~~

~~The project scope or RFP requires use of the mainline non-accessible gantry~~

The accessible gantry provides a deck (walkway) to install and maintain equipment over live traffic and allows for secured access to the deck via an elevated platform and connecting stairway accessible by maintenance vehicles such as scissor lift or bucket truck. See ***Exhibit 250.1-2***, ***Exhibit 250.1-3***, ***Exhibit 250.1-4***, ***Exhibit 250.1-5***, ***Exhibit 250.1-6***, ***Exhibit 250.1-7***, and ***Exhibit 250.1-8*** to identify the various elements of an accessible gantry.

Exhibit 250.1-1 Non-Accessible Gantry Elements

See "Redacted" GTR for updated Exhibit.

Exhibit 250.1-2 Accessible Gantry Elements

See "Redacted" GTR for updated Exhibit.

Exhibit 250.1-3 Accessible Gantry Swing Gate and Grating

See "Redacted" GTR for updated Exhibit.

Exhibit 250.1-4 Accessible Gantry Stair Platform Landing

See "Redacted" GTR for updated Exhibit.

Exhibit 250.1-5 Accessible Gantry J-Arm Retraction Assembly

See "Redacted" GTR for updated Exhibit.

Exhibit 250.1-6 Accessible Gantry Gear Box and Mounting

See "Redacted" GTR for updated Exhibit.

Exhibit 250.1-7 Accessible Gantry Access Stair Structure

See "Redacted" GTR for updated Exhibit.

Exhibit 250.1-8 Accessible Gantry Swing Gate Post

See "Redacted" GTR for updated Exhibit.

250.2 Gantry Design Criteria based on Toll Equipment Requirements

(1) See ***GTR 220.2*** for gantry positioning requirements.

(2) The tolling equipment positioning depends on the TEC and the roadway configuration at the gantry. See ***Exhibit 250.2-1*** and ***Exhibit 250.2-2*** for toll equipment layout and positioning over the lanes for each gantry type. See ***Exhibit 250.2-3*** for equipment loading.

(3) All lanes and shoulders within the toll loop pavement area must receive toll equipment as identified in ***Exhibit 250.2-1*** and ***Exhibit 250.2-2***.

(4) The gantry must be designed to accommodate the TEC requirements for the following roadway configurations:

- (a) Each interim condition
- (b) The ultimate condition
- (c) Each potential MOT phase required to transition from the interim to the ultimate condition

(5) A single gantry structure design must allow the J-arms to be installed laterally along the gantry to accommodate all vendor equipment layouts for all interim and ultimate configurations.

(6) Gantry design must take into account layout for the following:

- (a) Horizontal and vertical supports
- (b) Raceways and wiring
- (c) Toll equipment clearances
- (d) J-arm adjustments
- (e) Equipment positioning, and separation
- (f) Line-of-sight of illuminators, auditing cameras, Violation Enforcement System (VES) cameras, and lasers/sensors
- (g) ~~E6~~AVI Readers and their enclosures/cabinets
- (h) All associated equipment mounting hardware

(7) Cantilever Gantry must extend a minimum one foot beyond:

~~(a) **Express Lane Sites**: the centerline of the adjacent GUL~~

~~(a) **All other Sites**: the centerline of the far shoulder~~

(a) **Express Lane Sites**: the centerline of the adjacent GUL

(b) **All other Sites**: the centerline of the far shoulder

Exhibit 250.2-1 TransCore Gantry Toll Equipment Layout

See "Redacted" GTR for updated Exhibit.

Exhibit 250.2-2 Conduent Gantry Toll Equipment Layout

See "Redacted" GTR for updated Exhibit.

Exhibit 250.2-3 Toll Equipment Loads

See "Redacted" GTR for updated Exhibit.

250.2.1 J-arm Positioning on the Gantry

The approach and departure J-arm centerlines must be equidistant from the gantry centerline as per the following:

(1) Non-accessible gantry – 5 feet, 9 inches

(2) Accessible gantry – 5 feet, 9½ inches

250.2.2 Vertical Clearance

(1) The following vertical clearances must be provided within the toll loop pavement area, for all interim and ultimate conditions:

   (a) Eighteen feet, six inches (18’-6”) to the bottom of the J-arm for all gantry-mounted toll equipment devices except the vehicle detection and classification system (VDAC) laser unit. The VDAC laser unit system must be twenty four feet, six inches (24’-6”) to the top of the J-arm. This clearance is the distance above the traffic lane or shoulder directly below.

   (b) A minimum of 18-feet for any gantry structural element. This clearance is the least distance between the lowest point of any structural element (gantry or support framing) and the traffic lane or shoulder directly below.

(2) Use the APE to set the truss elevation to ensure that the J-arm adjustability above the roadway surface as defined in ***GTR 252.1.2*** is not exceeded along the cross slope of the toll loop pavement area. See ***GTR 220.2*** for additional information.

   (a) The truss elevation must be a constant across each gantry span.

   (b) For a single span across both directions of travel, a single APE must be calculated using both directions of travel.

   (c) The APE is applied separately to each direction of travel for non-accessible span gantries, when a center column is used.

   (d) A single APE must be calculated using both directions of travel, for accessible gantries, when a center column is used and the truss elevation must be constant across both gantry spans.

250.2.3 Toll Equipment Operation and Maintenance

(1) The toll equipment operation and maintenance must not be compromised by any mounting hardware or gantry element.

(2) Non-accessible gantry elements must allow the J-arms to be located anywhere along the horizontal support pipes.

(3) Non-accessible gantry W-section member spacing must be as follows:

   (a) Equipment layout conflicts: Avoid physical conflicts with Toll Equipment layout for all vendors.

(b) Multiple equipped lanes at span gantries: ½ the width of the equipped lane. When equipped lane and shoulder widths under the gantry are not identical, the width of the majority of the equipped lanes and shoulders must be used.

(c) Single lane ramps: Gantry W-section member spacing must be 6 feet.

(d) Truss web angle connection plates: W-section members must not be located in the same longitudinal position with truss web angle connection plates.

(e) W-section members closest to the upright may deviate from the spacing described in (b) and (c) above to ensure there are no conflicts per (a) and (d) above.

(f) W-section members are required where needed to support all longitudinal cable trays along the gantry over equipped and non-equipped lanes.

(4) Accessible gantry swing gate post spacing must be:

(a) Evenly spaced except as noted in item (c) below.

(b) No greater than 6 feet from centerline of post to centerline of post.

(c) Adjusted as necessary to avoid equipment conflicts.

(5) There must be a 5/8-inch minimum vertical clearance between any gantry element and any gantry-mounted toll equipment in both operation and maintenance positions. See exhibits from ***GTR 254.2*** for toll equipment operation and maintenance positions at an accessible gantry.

(6) Field splices must be located to avoid conflicts for all interim and ultimate conditions as follows:

(a) Non-accessible gantry W-section member layout

(b) Accessible gantry equipment retraction assembly inclusive of gate posts, gear box layout, etc.

(7) See ***GTR 254.3 (3)*** for additional layout requirements for accessible gantries.

251 Toll Gantry Structural

251.1 General Structural Requirements

(1) Gantries must be treated as sign structures when applying the requirements of the current ***Standard Plans***.

(2) Gantries must be designed as per LRFD LTS-1 and applicable interims, and ***Structures Manual***, ***Volume 3*** for the 700-year Extreme Event Limit State wind speed based on location.

(3) Gantries must be designed as per LRFD LTS-1 and applicable interims, and ***Structures Manual***, ***Volume 3*** fatigue requirements.

(4) See exhibits from ***GTR 250.2*** for the toll equipment type, position, and wind areas for all TEC systems. See ***GTR 250.2.3*** for additional requirements.

(5) Tolling Equipment Dead Load:

Gantries must be designed to carry all attached items (toll equipment, toll equipment structure mounting hardware, retraction assemblies, raceways, strut channel supports, etc.):

(a) The design dead load of the tolling equipment mounted on each toll equipment arm must be at least 55 pounds or the actual weight of the equipment, whichever is greater. The 55-pound allowance does not include the weight of the toll equipment support arm, J-arm, and latch mechanism or retraction assemblies.

(b) Gantries must support a minimum uniform superimposed dead load of 200 pounds per linear foot across the entire structure, divided as appropriate among the superstructure chords, to account for the self-weight of the raceways, and other associated electrical items.

(6) The horizontal truss element for each span of a two-span gantry must be designed as simply supported independent spans.

(7) Gantry foundations must use steel reinforcing.

(8) Signs of any type must not be attached to the gantry.

(9) Gantries must be detailed as per the ***Structures Manual***.

(10) All gantries must be hot-dipped galvanized. No other coatings (paint, etc.) can be applied unless approved by the District Materials Office. Written documentation (email or meeting notes documentation) of concurrence from the District Materials Office is acceptable.

(11) Toll gantries must be designed to meet the following fabrication restrictions:

(a) If field welding is permitted by the CEI in accordance with the ***Standard Specifications***, the welding procedures shall be reviewed and approved by Turnpike Materials Office.

(b) Shop welded splices of main chords are not permitted.

(c) Shop welded splices of uprights are not permitted except as allowed in ***Standard Plans*** ***Index 700-041***. If splices are required, they must be detailed in the structural plans for the gantry subcomponent.

251.2 Gantry Superstructure

(1) Gantries must have a multi-chord truss superstructure system for the horizontal element.

(2) The gantry truss must be horizontal and level (not parallel to the cross slope of the roadway).

(3) The natural frequency of any element that supports the equipment must be less than 500 Hz. Equipment is defined as any electronic device that is mounted to the gantry.

(4) Movements due to wind loads must meet the following criteria for the averaged effect on the top and bottom truss chords:

(a) Span gantries subject to wind speed of 30 mph:

- Movement of any point along the chords must not exceed 1.25 inches relative to the position of any other point along the chords.
- Rotational orientation of any point along the chords must not exceed 8 milliradians (0.47 degrees) relative to the rotational orientation of that point at rest, for all three rotational axes.

(b) Cantilever gantries subject to wind speeds between 25 and 45 mph:

- Movement of any point along the chords must not exceed 2.2 inches relative to the position of any other point along the chords.
- Rotational orientation of any point along the chords must not exceed 14 milliradians (0.80 degrees) relative to the rotational orientation of that point at rest, for all three rotational axes.

(5) All structural elements supporting gantry-mounted electronic devices must:

(a) Meet all rigidity/frequency requirements indicated above for the gantry.

(b) Attach to the gantry with a redundant connection system.

251.3 Minimum Material Requirements

Include protection against galvanic corrosion when dissimilar materials are used. Dissimilar metals must be separated by inert dielectric material.

251.3.1 Steel

(1) Upright and Truss Chords (Steel Pipe): API 5L X42 PSL2, 42 ksi yield or ASTM A500, Grade B (Min.).

(2) Steel Angles, Structural Plates and Bars: ASTM A709 grade 36 or 50 (as required by design).

(3) Bolts, Nuts and Washers:

- (a) High Strength Bolts: ASTM F3125, Grade A325 Type 1
- (b) Nuts: ASTM A563 Grade DH Heavy-Hex Nuts
- (c) Washers: ASTM F436 Type 1, one under turned element.

(4) Anchor Bolts, Nuts and Washers:

- (a) Anchor Bolts: ASTM F1554, Grade 55
- (b) Nuts: ASTM A563 Grade DH heavy-hex, 5 per bolt
- (c) Plate Washers: ASTM F436, Type 1, 2 per bolt.

(5) U-Bolt Assemblies

- (a) U-Bolts: ASTM A193
- (b) Nuts: ASTM A194, 4 per bolt
- (c) Washers: ASTM F436, Type 1, 2 per bolt

(6) Galvanization: Components must meet the requirements of ***Standard Specifications*** **Section 962-11**.

251.3.2 Aluminum

(1) Components must meet the requirements of ***Standard Specifications*** ***Section 965***.

(2) Bars, Plates, Stiffeners, Backing Ring, Shims, Shapes must be Alloy 6061-T6.

251.3.3 Stainless Steel

(1) Plates: Type 304L per ASTM A240

(2) Structural Shapes and U-bolt Assemblies: Type 316L per ASTM A276

(3) Stainless Steel Screws, Bolts, Washers and Nuts: Grade 18-8, unless otherwise noted.

251.4 Non-Accessible Gantries

(1) Non-accessible gantries must be a tri-chord truss as shown in ***Exhibit 251.4-1***.

(2) A channel assembly must be used to support the vertical conduit routing along the upright for gantry power, data, and AVI cables. See ***Exhibit 251.4-2*** and ***Exhibit 251.4-3***.

(3) Bent plates must be used to connect the vertical and horizontal W-Section members as shown in ***Exhibit 251.5-2***.

Exhibit 251.4-1 Non-Accessible Gantry Typical Section

See "Redacted" GTR for updated Exhibit.

Exhibit 251.4-2 Cantilever Plan and Upright Structural Details for Conduit Support

See "Redacted" GTR for updated Exhibit.

Exhibit 251.4-3 Span Upright Structural Details for Conduit Support

See "Redacted" GTR for updated Exhibit.

251.5 Non-Accessible Cantilever Gantry Structural Requirements

(1) Structural configuration of cantilever gantries must be based on the ***Standard Plans*** ***Index 700-040,*** Cantilever Sign Structure, except for the offsets between the centerline of upright and centerline of truss chords and the location of the back chord gusset plates closest to the upright as shown in ***Exhibit 251.4-1*** and ***Exhibit 251.4-2***. These modifications provide space for longitudinal cable trays as described in ***GTR 255.5.2***. and ensure there is no conflict between the upright and web members.

(2) Cantilever gantries must have three (3) truss chords with a single upright in a cantilever configuration.

(3) Cantilever truss span lengths must be 30, 36, 42, or 48 feet.

(4) Toll equipment layout and horizontal support pipe requirements may control the cantilever span length by increasing to the next allowable span length. See ***GTR 250.2*** and ***GTR 253*** and item (3) above.

(5) When a chord splice is required and permitted by the ***Standard Plans***, an alternate splice connection detail (bolted flange connection), similar to the connection shown ***Standard Plans*** ***Index 700-041,*** Span Sign Structure must be provided. No other type of splice connections for the truss chords are permitted.

(6) The gantry must be designed for one future sign panel, 12 feet wide by 10 feet high, centered over the combined travel lanes. Other future signs (as defined in ***Volume 3*** of the ***Structures Manual***,) need not be considered. The gantry design must always account for the toll equipment simultaneously with load cases with and without the future sign panel to produce the worst-case loading effect.

(7) Toll equipment support elements including but not limited to horizontal support pipe, J-arms and mounting hardware must not extend beyond the end of the longest truss chord.

(8) The upright must be filled with concrete for the full height. Upright handholes are not required.

(9) Provide an angle along the upright to mitigate the effects of vortex shedding as shown in ***Exhibit 251.5-3***.

(10) Use ***Exhibit 251.5-1*** to confirm compliance with strength and fatigue requirements for the site-specific cantilever gantry conditions. If compliance cannot be demonstrated, then a non-accessible span gantry is required.

(11) The structural element requirements noted below provide compliance with vibration, rotation, natural frequency and other dynamic effects. Use ***Exhibit 251.5-1*** and ***Exhibit 251.4-2*** for the structural element requirements as follows:

(a) The upright height (A) is a site-specific dimension, not to exceed 24 feet.

(b) The remaining element sizes and dimensions must not be changed and must be as shown in the Table of Variables in ***Exhibit 251.5-1*** and ***Exhibit 251.4-2***.

(c) Calculate the back rake (G) for the site-specific conditions.

Exhibit 251.5-1 Table of Structure Variables

See "Redacted" GTR for updated Exhibit.

Exhibit 251.5-2 Non Accessible Gantry Bent Plate Detail

See "Redacted" GTR for updated Exhibit.

Exhibit 251.5-3 Cantilever Median Upright Structural Details for Conduit Support

See "Redacted" GTR for updated Exhibit.

251.6 Non-Accessible Span Gantry Structural Requirements

(1) Structural configuration of non-accessible span gantries must be based on the ***Standard Plans*, *Index 700-041*,** Span Sign Structure**.**

(2) When a chord splice is required, and permitted by the ***Standard Plans***, an alternate splice connection detail (bolted flange connection), as shown in ***Standard Plans*, *Index 700-041***, must be provided. No other type of splice connections for the truss chords are permitted.

(3) Truss depth must meet the span-to-depth requirements for DMS structures as specified in the ***Structures Manual*, *Volume 3.***

(4) Maximum span length and truss depth must be as specified for sign structures in the ***FDM 261.1***.

(5) The gantry must be designed for one future sign, 12 feet wide by 10 feet high, centered over the combined travel lanes in each direction of travel. Other future signs (as defined in the ***Structures Manual*, *Volume 3***) need not be considered. The gantry design must always account for the toll equipment simultaneously with load cases with and without the future sign panel to produce the worst-case loading effect.

(6) Gantry panel layout must be adjusted to accommodate W-section member spacing as described in ***GTR 250.2.3(3)(b).***

251.7 Accessible Span Gantry Structural Requirements

(1) The accessible gantry is a trapezoidal quad-chord truss supported on two (2) uprights as a span configuration. See ***Exhibit 251.7-1***.

(2) The site-specific structural items that can be changed include: foundation size, length and reinforcement, upright height, and thickness (not diameter) of structural elements.

(3) The accessible gantry design must allow the J-arm retraction assembly system elements to be located anywhere along the horizontal support members.

(4) Configuration of truss chord splice must be in accordance with ***Exhibit 251.7-22***.

(5) Gantry must be designed for future signs, 12 feet wide by 10 feet high, one on each upright at the height of the truss. Other future signs (as defined in the ***Structures Manual*, *Volume 3***) need not be considered. The gantry design must always account for the toll equipment simultaneously with load cases with and without the future sign panel to produce the worst-case loading effect.

(6) Access Elements

Gantry design must include a deck (upper platform) to maintain equipment over live traffic. This allows for secured access to the deck via a lower platform and connecting stairway accessible by maintenance vehicles such as a scissor lift or bucket truck. See ***Exhibit 251.7-2*** for additional requirements.

(7) See exhibits below for required accessible gantry elements:

(a) Truss Connections – ***Exhibit 251.7-3***, ***Exhibit 251.7-4***

(b) Lower Chord Connection – ***Exhibit 251.7-5***

(c) Upper Chord Connection – ***Exhibit 251.7-6***

(d) Upright Structural Details for Wireway Support – ***Exhibit 251.7-7***

(e) Lower Grating – ***Exhibit 251.7-8***

(f) Upper Grating – ***Exhibit 251.7-9***

(g) Stairs and Platforms – ***Exhibit 251.7-10***, ***Exhibit 251.7-11***, ***Exhibit 251.7-12***, ***Exhibit 251.7-13***

(h) Swing Gates and Latches – ***Exhibit 251.7-14***, ***Exhibit 251.7-15***, ***Exhibit 251.7-16***, ***Exhibit 251.7-17***

(i) Platform Panels – ***Exhibit 251.7-18***, ***Exhibit 251.7-19***

(j) Fall Restraint System – ***Exhibit 251.7-20***

(k) Reinforced Opening in Channels for Cable Tray Pass Thru - ***Exhibit 251.7-21***

(l) Camber and Splice Details - ***Exhibit 251.7-22***

Exhibit 251.7-1 Accessible Gantry Typical Section

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-2 Accessible Gantry Deck and Access Stairway

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-3 Truss Connection Details (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-4 Truss Connection Details (2 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-5 Lower Chord Connection

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-6 Upper Chord Connection

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-7 Upright Structural Details for Wireway Support

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-8 Lower Grating Detail

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-9 Upper Grating Detail

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-10 Stair and Platforms

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-11 Stair Column Details

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-12 Platform Details

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-13 Upper Stair Landing Detail

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-14 Swing Gate (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-15 Swing Gate (2 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-16 Swing Gate Latch (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-17 Swing Gate Latch (2 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-18 Upper Platform End Panels

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-19 Upper Platform Panels

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-20 Fall Restraint System Details

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-21 Reinforced Opening in Channels for Cable Tray Pass Thru

See "Redacted" GTR for updated Exhibit.

Exhibit 251.7-22 Camber and Splice Details

See "Redacted" GTR for updated Exhibit.

251.8 Foundation Systems

(1) Gantries must be supported by a deep foundation system. Shallow foundation systems are not permitted.

(2) Geotechnical investigations for gantry foundations must be in accordance with ***GTR 280.3***.

(3) Design drilled shafts and driven piles per the requirements of ***Soils and Foundations Handbook***.

(4) Driven Piles

(a) At least one test pile per gantry must be dynamically monitored with a Pile Driving Analyzer (PDA) or Embedded Data Collector (EDC) and following ***Standard Specifications, Section 455***.

(b) All preformed pile holes installed in rock must be grouted following ***Standard Specifications Section 455,*** to restore lateral stability of the foundation, unless the rock is modeled as non-cohesive soil in design and sand backfill is used following the Specification requirements.

(5) Drilled Shafts

Thermal integrity (TITDS) tests are required at every drilled shaft. The TITDS tests will be performed by FDOT.

Modification for Non-Conventional Projects:
Replace the above paragraph with the following: Thermal integrity (TITDS) tests are required at every drilled shaft. The TITDS tests will be performed by the Design-Build Team. The signed and sealed report must be included in the Foundation Certification Package.

(6) Do not use of micropiles or auger cast piles.

251.8.2 Foundation Length

(1) After foundation length is determined based on design analyses add:

(a) 4 feet to the required foundation length when subsurface soil or rock is modeled as non-cohesive material.

(b) 6 feet to the required foundation length when any soil or rock is modeled as cohesive material in design.

(2) Design of the drilled shaft must include reduction of skin friction in limestone associated with the use of temporary casing.

252 Toll Equipment J-Arms

252.1 General Requirements

J-arms must be in accordance with ***Exhibit 252.1-1***.

252.1.1 J-Arm Attachment Hardware

The J-arms must be mounted to the horizontal support pipes (non-accessible gantries) or to the support arms (accessible gantries) as follows:

(1) Non-accessible gantry J-arm attachment hardware must be in accordance with ***Exhibit 252.1-2***, ***Exhibit 253.2-1***, ***Exhibit 253.2-2***, and ***Exhibit 253.2-3***.

(2) Accessible gantry J-arm attachment hardware must be in accordance with ***Exhibit 252.1-2***, ***Exhibit 254.2-5***, ***Exhibit 254.2-6***, ***Exhibit 254.2-7***, and ***Exhibit 254.2-8***.

(3) Telescoping brackets or supports are not allowed.

(4) All hardware connections must be designed to prohibit loosening over time.

(5) See ***GTR 251*** for rigidity and vibration requirements.

252.1.2 J-Arm Point of Attachment

(1) The point of attachment of the J-arm must be in the longest straight section of the J-arm. See ***Exhibit 251.4-1***, ***Exhibit 252.1-1***, and ***Exhibit 254.2-5***.

(2) All J-arms must accommodate 26 inches of vertical adjustability (13 inches up/down) from the reference point (neutral position of the J-arm). See ***Exhibit 252.1-1*** for the reference point on the J-arm.

(3) Horizontal adjustability limits with respect to the J-arms must be within the limits identified in ***Exhibit 252.1-3*** and ***Exhibit 252.1-4***. For all other toll equipment, the centerline of J-arm coincides with the centerline of the toll equipment.

Exhibit 252.1-1 J-Arm Detail

See "Redacted" GTR for updated Exhibit.

Exhibit 252.1-2 J-Arm Attachment Hardware

See "Redacted" GTR for updated Exhibit.

Exhibit 252.1-3 Toll Equipment Adjustability (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 252.1-4 Toll Equipment Adjustability (2 of 2)

See "Redacted" GTR for updated Exhibit.

253 Horizontal Support Pipes for Non-Accessible Gantries

253.1 General Requirements

(1) Horizontal support pipes must be provided for attaching J-arms to the structural W-section of the gantry. See ***Exhibit 252.1-2***, ***Exhibit 253.2-1***, ***Exhibit 253.2-2***, and ***Exhibit 253.2-3*** for assembly details.

(2) The horizontal support pipes must be staggered to allow the J-arms to be on the same centerline offset, as required in ***GTR 250.2.1***.

(3) The W-section members' location must not conflict with the J-arms' position required for toll equipment installation. There must be a minimum of 7 1/2 inches between the centerline of the W-section and the centerline of the J-arm, resulting in a minimum of 1 inch of lateral clearance between any J-arm attachment hardware and the W-section supporting the horizontal support pipes as shown in ***Exhibit 253.2-3***.

253.2 Horizontal Support Pipes

(1) Horizontal support pipes must span between each set of adjacent W-section members over equipped lanes and shoulders.

(2) Horizontal support pipes must be provided to hold all J-arms. There must be horizontal pipes on both the approach and departure sides of the gantry above equipped lanes and shoulders.

(3) All horizontal support pipes will be 6'-6" long except when cantilevered as described in (8) below. Horizontal support pipes must be identical in diameter, wall thickness and material for each gantry.

(4) Each horizontal support pipe must hold a maximum of three (3) J-arms.

(5) Horizontal support pipes must have an outside diameter of 4.5 inches and must be attached to the structural members (W-section) by pipe saddles and U-bolts. See ***Exhibit 251.4-1***.

(6) Horizontal support pipes must extend a minimum of 3 inches beyond the pipe saddle U-bolt assembly that secures the horizontal pipes to the W-section members. The extension must not conflict with J-arm mounting installation.

(7) All horizontal support pipes must be level.

(8) Only on 42-foot and 48-foot cantilever gantry spans, horizontal support pipes can be cantilevered beyond the last W-section member for supporting equipment on the cantilevered portion. These cantilevered horizontal support pipes must not extend beyond the end of the longest chord.

(9) For horizontal support pipes cantilevered from the gantry, J-arm mounting hardware must be a minimum of 3 inches inside the unsupported edge of the horizontal support pipe.

Exhibit 253.2-1 Horizontal Support Pipe Attachment Hardware (1 of 3)

See "Redacted" GTR for updated Exhibit.

Exhibit 253.2-2 Horizontal Support Pipe Attachment Hardware (2 of 3)

See "Redacted" GTR for updated Exhibit.

Exhibit 253.2-3 Horizontal Support Pipe Attachment Hardware (3 of 3)

See "Redacted" GTR for updated Exhibit.

254 Equipment Retraction Assembly for Accessible Gantries

The equipment retraction assembly includes the gear box, support arm, J-arm and associated hardware. The retraction assembly system allows the toll equipment to be retracted to the deck (walkway) where it can be serviced over live traffic by trained technicians.

254.1 General

(1) One equipment retraction assembly must be provided for each J-arm as shown in the exhibits included in this subsection.

(2) The number and positioning of gear boxes and support arms must be determined from the equipment layout.

(3) The equipment retraction assembly must fully retract each equipped J-arm individually without requiring other equipped J-arms to be retracted.

254.2 Support Arm Assembly

(1) The support arm assemblies must retract the J-arm mounted tolling equipment devices to the gantry walkway, as shown in ***Exhibit 254.2-1***, ***Exhibit 254.2-2***, ***Exhibit 254.2-3***, and ***Exhibit 254.2-4***.

(2) The support arms (“support arm”) must be as shown in ***Exhibit 254.2-5***, ***Exhibit 254.2-6***, ***Exhibit 254.2-7***, and ***Exhibit 254.2-8***. Each support arm must be attached to a single gear box.

(3) Where toll equipment layout results in the latch plate conflicting with the latch bar brace:

  (a) Offset the support arm assembly per the adjustability as shown in ***Exhibit 252.1-3***, and ***Exhibit 252.1-4***.

  (b) Where toll equipment is not adjustable, an alternate latch plate must be designed to avoid the conflict with the latch bar brace.

(4) Stop plates must be used to restrict the movement of the support arms as they swing into the maintenance position over the walkway. Type and mounting position of stop plates will vary for each piece of toll equipment. See ***Exhibit 254.2-1***, ***Exhibit 254.2-2***, ***Exhibit 254.2-3***, ***Exhibit 254.2-4***, and ***Exhibit 254.2-10*** for stop plate types and mounting.

Exhibit 254.2-1 Equipment Retraction Assembly Rotation (1 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-2 Equipment Retraction Assembly Rotation (2 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-3 Equipment Retraction Assembly Rotation (3 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-4 Equipment Retraction Assembly Rotation (4 of 4)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-5 Equipment Retraction Assembly Support Arm (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-6 Equipment Retraction Assembly Support Arm (2 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-7 Equipment Retraction Assembly Details (1 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-8 Equipment Retraction Assembly Details (2 of 2)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-9 Latch Bar Assembly

See "Redacted" GTR for updated Exhibit.

Exhibit 254.2-10 Stop Plate Types and Details

See "Redacted" GTR for updated Exhibit.

254.3 Gear Boxes

The gear boxes must be provided in accordance with the ***Exhibit 254.3-1***, and ***Exhibit 254.3-2***.

(1) Swing gate posts must be removable so that they can be repositioned along the kick plate to adjust the position of swing gates for interim to ultimate configurations to accommodate gear box attachment system flexibility. See ***Exhibit 254.3-3***.

(2) Gear boxes must be oriented such that fixed gantry elements (gantry top chord field splices, swing gate support posts, other gear boxes, latch bar brace supports, etc.) do not prevent or impair retraction of the toll equipment.

(3) For each interim and ultimate layout:

  (a) Each TEC equipment layout must have the same quantity of left gearboxes.

  (b) Each TEC equipment layout must have the same quantity of right gearboxes.

Exhibit 254.3-1 Gear Box Details (1 of 3)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.3-2 Gear Box Details (2 of 3)

See "Redacted" GTR for updated Exhibit.

Exhibit 254.3-3 Gear Box Details (3 of 3)

See "Redacted" GTR for updated Exhibit.

254.4 Gear Box Attachment System

(1) The gear box attachment system to the gantry must allow a minimum 6-inch lateral clearance between the centerline of the gear box input shaft and the centerline of the nearest swing gate post.

(2) The horizontal support member for the support of gear boxes that spans between swing gate posts must be as long as possible, up to 12 feet in length. The angles that connect these horizontal supports must only attach at swing gate posts and on each side of upper chord field splices. See ***Exhibit 254.3-3*** for additional details.

255 Gantry Electrical

255.1 General Requirements

Equipment and raceway placement must avoid conflicts with access to all site elements.

255.2 Cable Tray

(1) The ~~E6~~AVI section of the cable tray must be used for the antenna RF cables.

(2) The data section of the cable tray must be used for data and composite cables rated less than 50V.

(3) The power section of the cable tray must be used for 120V power cabling.

(4) Bond cable trays and metal conduits with grounding bushings and a #10 AWG, minimum bare copper equipment grounding conductor.

(5) The ~~E6~~AVI data cable may be routed through either the ~~E6~~AVI section or the data section of the cable tray.

(6) See ***GTR 255.5*** for non accessible gantry cable tray requirements.

(7) See ***GTR 255.6*** for accessible gantry cable tray requirements.

255.3 Wire Troughs

(1) Wire troughs must not be located between the gantry column and the roadside barrier.

(2) All wire troughs must be mounted on galvanized strut channel supports such that the bottom of the enclosure is 4 feet above the concrete slab or sidewalk below, as shown in ***Exhibit 255.3-1***, except for the AVI wire trough on the AVI reader ground-mounted frame.

(3) Drain fittings must be provided at the bottom of the wire trough as shown in ***Exhibit 255.3-1***. The drain fittings must maintain the NEMA 3R rating of the wire troughs.

(4) The data and power conduits/wireways must terminate in their respective wire troughs.

(5) The ~~E6~~AVI conduits/wireways from the gantry must either terminate into the ~~E6~~AVI wire trough or at the ~~E6~~AVI reader ground-mounted frame.

(6) Raceways terminating into wire troughs from non-accessible gantries must be in accordance with ***GTR 255.5.1***.

(7) Raceways terminating into wire troughs from accessible gantries must be in accordance with ***GTR 255.6.4***.

(8) **For TEB Sites:** See ***GTR 242.14 (6)*** for conduit termination requirements from the wire troughs to the TEB.

(9) **For RTC Sites:** See ***GTR 232.11 (5)*** for conduit termination requirements from the wire troughs to the RTC and OCC.

255.3.1 Toll Equipment Building Sites

(1) Non-accessible gantry wire troughs must be rated NEMA 3R and sized 12-inch H x 12-inch W x 24-inch L.

(2) Accessible gantry power wire troughs must be rated NEMA 3R and sized 12-inch H x 12-inch W x 24-inch L.

(3) Accessible gantry data/~~E6~~AVI wire troughs must be rated NEMA 3R and sized 12-inch H x 12-inch W x 96-inch L.

255.3.2 Roadside Tolling Cabinet Sites

(1) Non-accessible gantry power and ~~E6~~AVI wire troughs must be rated NEMA 3R and sized 12-inch H x 12-inch W x 24-inch L.

(2) Single movement sites: Non-accessible gantry data wire troughs must be rated NEMA 3R and sized 12-inch H x 12-inch W x 24-inch L

(3) Dual movement sites: Non-accessible gantry data wire troughs must be rated NEMA 3R and sized 12-inch H x 12-inch W x 36-inch L.

Exhibit 255.3-1 Wire Trough

See "Redacted" GTR for updated Exhibit.

255.4 Lightning Protection

(1) Two grounding studs (lugs) must be installed at the base of each gantry upright for connecting to the lightning protection system.

(2) All ground mounted metallic enclosures, supports, and equipment must be connected to an underground lightning protection system conductor at the base of the gantry foundations by lightning protection bonding conductors.

(3) See ***Exhibit 255.4-1*** for bonding and grounding of uprights, stair columns and wire troughs.

Exhibit 255.4-1 Gantry Upright Lightning Protection Detail

See "Redacted" GTR for updated Exhibit.

255.5 Non-Accessible Gantry

Conduit, cable tray, ~~E6~~AVI reader ground-mounted frames, ~~E6~~AVI reader placement in TEBs, ~~E6~~AVI reader mounting system on the gantry, lightning protection, duct banks, directional bores, loop pull boxes, and TEB penetrations must be provided as described herein for the connection of the gantry and roadside tolling equipment to the TEB or RTC.

255.5.1 Conduit

(1) Vertical conduit from the horizontally mounted cable tray must be located on the gantry upright and terminated into wire troughs at the base of the gantry, except for median cantilever gantries as described in ***GTR 255.5.8***.

(2) Conduits must not terminate into the top of the wire trough.

(3) See ***Exhibit 251.4-2***, ***Exhibit 251.4-3***, ***Exhibit 255.5-1***, and ***Exhibit 255.5-2*** for conduit layout and support requirements.

Exhibit 255.5-1 Span Upright Conduit Layout

See "Redacted" GTR for updated Exhibit.

Exhibit 255.5-2 Cantilever Upright Conduit Layout

See "Redacted" GTR for updated Exhibit.

255.5.2 Longitudinal Cable Trays

(1) Provide 5-inch high aluminum ladder type cable tray with dividers to separate ~~E6~~AVI, data, and power cabling.

(2) Cable tray must be no less than 9” wide and no greater than 24” wide.

(3) ~~E6~~AVI, data, and power sections of the cable tray must be at least 8” wide.

(4) Provide waterfall fittings as needed for all cables that transition out of the longitudinal cable trays as shown in ***Exhibit 255.5-1***, ***Exhibit 255.5-2***, and ***Exhibit 255.5-3***.

(5) Extend the longitudinal cable tray to within 12” of the end of the upright cable tray below. Longitudinal cable tray must not extend beyond the nearest end of the upright cable tray below.

(6) Cable tray must be supported by strut channel frame as shown in ***Exhibit 255.5-1*** and ***Exhibit 255.5-2***. Strut channel must be secured to the gantry structure with beam clamps as shown in ***Exhibit 255.5-3***.

255.5.3 Equipment Cable Tray

(1) Equipment cable tray must be provided to support all cabling between the longitudinal cable tray and the equipment on the J-arms. A galvanized threaded rod assembly for field installation of galvanized strut channel to W-section members must be provided at NEC required spacing. These mechanically fastened assemblies must have galvanized self-locking nuts with washers installed above and below the W-members as shown in ***Exhibit 255.5-3***.

(2) Equipment cable trays must span along the entire W-section within 12 inches from the centerline of the approach and departure J-arms, except as stated below.

(3) In accordance with ***GTR 250.2.3***, VCARs must open for maintenance without conflict. When installation of the equipment cable tray as described in item (2) above results in impacts to VCAR maintainability, equipment cable tray must terminate 42 inches from the centerline of the applicable J-arm.

255.5.4 Upright Cable Tray

(1) An upright cable tray must be provided as a termination point for the vertical conduit installed on the uprights and support cables transitioning to the longitudinal cable trays located on the gantry truss as shown in ***Exhibit 255.5-1*** and ***Exhibit 255.5-2***.

(2) Weatherproof blind end covers must be provided on ends of the cable tray.

(3) A factory cable tray with a pitched cover must be provided over the vertical conduit terminations to prevent water intrusion. Extend the cover from the end of the cable tray to at least 18 inches beyond the conduit terminations.

(4) Vertical conduit terminations into the cable trays must be provided with manufacturer supplied fittings.

(5) Vertical conduit installed on the uprights must extend 1 inch above the bottom of the cable tray.

(6) Cable tray must be supported by strut channel frame as shown in ***Exhibit 255.5-1*** and ***Exhibit 255.5-2***. Strut channel must be secured to the gantry structure with beam clamps as shown in ***Exhibit 255.5-3***.

Exhibit 255.5-3 Toll Equipment Cable Tray

See "Redacted" GTR for updated Exhibit.

255.5.5 ~~E6~~AVI Reader Placement in Toll Equipment Building

For toll sites with only one critical power panel and where the cable distances allow, the ~~E6~~AVI readers must be wall-mounted inside the associated TEB as shown in ***Exhibit 242.1-6***.

See ***GTR 242.14*** for additional requirements on ~~E6~~AVI cable routing for ~~E6~~AVI reader placement in the building.

255.5.6 ~~E6~~AVI Reader Ground-Mounted Frames

(1) ~~E6~~AVI reader ground-mounted frames must be used:

(a) At TEB sites when ~~E6~~AVI Reader placement in TEBs cannot meet the requirements of ***GTR 255.5.5***.

(b) At RTC and TEB sites when antenna to AVI reader cable distance requirements identified in ***GTR 234.3 (1)*** can be met.

(2) See ***Exhibit 232.5-2*** for ~~E6~~AVI reader ground-mounted frames.

(3) See ***GTR 242.14*** and ***GTR 232.11*** for additional requirements on ~~E6~~AVI cable routing.

255.5.7 ~~E6~~AVI Reader Gantry-Mounted Frame

(1) If the ~~E6~~AVI readers cannot be placed inside the TEB or on ~~E6~~AVI reader ground-mounted frames, mount the ~~E6~~AVI readers over a shoulder on the gantry:

(a) Use the inside shoulder for EL-only toll sites.

(b) Use the outside shoulder for all other toll sites.

(c) Mount ~~E6~~AVI readers on the departure side where possible.

(2) Provide galvanized strut channels on the non-accessible gantry truss for the TEC to vertically mount each TEC-provided ~~E6~~AVI reader fiberglass NEMA 4 enclosure as shown in ***Exhibit 255.5-4***.

(3) TEC equipment enclosure, ~~E6~~AVI reader fiberglass enclosures, and associated elements must not be in conflict with any gantry elements supporting interim and ultimate lanes.

(4) See ***GTR 242.14*** and ***GTR 232.11*** for additional requirements on ~~E6~~AVI cable routing.

Exhibit 255.5-4~~255.5-4~~~~255.5-4~~ ~~E6~~AVI Reader Non-Accessible Gantry Mounting Detail

See "Redacted" GTR for updated Exhibit.

255.5.8 Cantilever Gantry Mounted on Median Barrier

(1) Each vertical conduit from the horizontally mounted cable tray must terminate in a vertically-mounted handhole (pencil pull box). The conduit and pencil pull box supports must be designed such that they do not conflict with the gantry upright stiffener plates. See ***Exhibit 255.5-5*** for additional requirements.

(2) Cantilever gantries must be designed according to the requirements for typical non-accessible span gantries with the following exceptions:

(a) The 3-inch power and data conduits routing below the median must be located a minimum of 5 feet away from the 1-inch roadway pavement loop conduits.

(b) Conduits on the upright consists of three 3-inch RGS conduits for data and one 3-inch RGS conduit for power extending from the upright cable tray above.

(c) When the toll loop pavement area is located on the same side as the TEB, [redacted] data and power conduits must route to separate pull boxes for cantilever data, and cantilever power, located in the median barrier as shown in ***Exhibit 232.1-13****~~Error! Reference source not found.~~*.

(d) When the toll loop pavement area is located on the opposite side from the TEB, [redacted] data and power conduits must route directly to separate pull boxes for cantilever data, and cantilever power, located adjacent to the TEB. See ***Exhibit 232.1-4*** for dual movement example.

(e) When the RTC site serves a single movement median cantilever gantry, [redacted] data and power conduits must route to the OCC as shown in ***Exhibit 231.1-7*** and ***Exhibit 231.1-13****~~Error! Reference source not found.~~*.

(f) When the RTC site serves dual movement median cantilever gantries, [redacted] data and power conduits must route to the OCC associated with each gantry as shown in ***Exhibit 232.1-6*** and ***Exhibit 232.1-10***.

(3) A non-accessible span gantry may be considered to satisfy cable distance requirements from ***GTR 234***.

255.5.9 Cantilever Gantry Mounted Behind Concrete Barrier

Cantilever gantries electrical must be designed according to the requirements for typical non-accessible span gantries when the cantilever gantry is mounted behind the concrete barrier.

Exhibit 255.5-5~~255.5-5~~~~255.5-5~~ Cantilever Gantry Upright Conduit Layout

See "Redacted" GTR for updated Exhibit.

255.6 Accessible Gantry

255.6.1 General Requirements

(1) The following elements must be provided as part of the accessible gantry electrical layout:

(a) [redacted]

(b) Maintenance receptacles

(c) Cable trays

(d) TEC equipment enclosure and ~~E6~~AVI reader mounting assemblies

(e) Wireways and associated strut channel supports

(f) Lighting control

(g) Lighting for platform and stairway

(2) See ***Exhibit 255.6-1*** for details of the electrical infrastructure of the accessible gantry.

(3) The 120 VAC branch circuits serving power outlets, lighting, or equipment on the gantry must be installed in the power section of the cable tray from panel EDP.

(4) Transverse cable trays must be provided connecting the power outlets, lighting and toll equipment conductors to the power cable tray on the gantry as shown in ***Exhibit 255.6-3***.

(5) A minimum of one (1) maintenance receptacle must be provided per direction of travel. Additional receptacles are required along the gantry at maximum longitudinal spacing of 100 feet.

(a) See ***Exhibit 255.6-3*** for the two types of receptacle mounting details.

(b) Cables above the upper grating must be installed in conduits with CGB fittings for cable strain relief.

(6) Lighting fixtures must not be mounted on moveable swing gates or associated swing gate posts.

(7) Lighting and associated infrastructure must not impede the swing gates' operational requirements that allow toll equipment to be rotated to the maintenance position.

Exhibit 255.6-1 Accessible Gantry Electrical Plan

See "Redacted" GTR for updated Exhibit.

255.6.2 Cable Trays

(1) The following cable trays must be provided along the entire horizontal section(s) of the gantry as shown in ***Exhibit 255.6-2***:

(d) A minimum of two (2) 24-inch wide aluminum ladder type cable trays for data/~~E6~~AVI.

(e) A minimum of two (2) 6-inch wide aluminum ladder type cable trays for power.

(2) Cables installed in cable trays must be UL or other NRTL listed and rated as "Tray Cable (TC) Rated".

(3) The data/~~E6~~AVI cable trays must be used to route data cabling for [redacted] tolling cameras, illuminators, TEC equipment, ~~E6~~AVI cables, and antenna RF cables.

(4) 6-inch wide channel type transverse power cable trays must be used to route 120 VAC power cabling for TEC equipment, maintenance receptacles, gantry lighting, and gantry walkway lighting. See ***Exhibit 255.6-3*** for additional requirements.

Exhibit 255.6-2 Accessible Gantry Cable Tray Layout

See "Redacted" GTR for updated Exhibit.

Exhibit 255.6-3 Accessible Gantry Transverse Cable Tray

See "Redacted" GTR for updated Exhibit.

255.6.3 ~~E6~~AVI Reader Accessible Gantry-Mounted Frame

(1) The positioning of each ~~E6~~AVI reader fiberglass enclosure and TEC equipment enclosure on the accessible gantry and the adjacent light fixtures, receptacles, switches, etc. must be as shown in ***Exhibit 255.6-4***, and ***Exhibit 255.6-6***.

(2) ~~E6~~AVI reader fiberglass enclosures, TEC equipment enclosure, associated elements, strut channel, and mounting plates must not be located on the moveable swing gates or where swing gate elements would conflict with ~~E6~~AVI reader enclosure access and associated light fixtures.

(3) ~~E6~~AVI reader and TEC equipment enclosure mounting locations must not interfere with future toll equipment arm assemblies for existing or future lanes.

(4) A galvanized strut channel must be provided on the accessible gantry maintenance walkway at ~~E6~~AVI reader and TEC equipment enclosure mounting locations as shown in ***Exhibit 255.6-4***. The element is used by the TEC to vertically mount each TEC-provided AVI reader fiberglass NEMA 4 enclosure and TEC equipment enclosure to the accessible gantry structure.

Exhibit 255.6-4 Accessible Gantry AVI Reader Enclosure Layout

See "Redacted" GTR for updated Exhibit.

255.6.4 Wireway Transition to Wire Troughs

(1) The horizontal cable tray sections along the gantry truss must terminate in a minimum of seven (7) 6-inch x 6-inch fiberglass wireways dual rated NEMA 12/3R.

(2) The fiberglass wireways must run horizontally on the truss prior to descending the gantry upright as shown in ***Exhibit 255.6-6***, and ***Exhibit 255.6-8***.

(3) The horizontal ends of the wireways must be protected from stormwater intrusion as shown in ***Exhibit 255.6-6***, and ***Exhibit 255.6-7***.

(4) The wireways must descend on the column located on the TEB side of the roadway and terminate in their respective NEMA 3R wire troughs as shown in ***Exhibit 255.6-5***, and ***Exhibit 255.6-8***. Wireways must not terminate into the top of the wire trough.

(5) Drain fittings must be provided at the bottom vertical to horizontal transition prior to wire trough termination as shown in ***Exhibit 255.6-8***. The drain fitting must maintain the NEMA 12/3R rating of the wireways.

(6) All wireways must be routed and supported with galvanized strut channels as they descend the gantry upright as shown in ***Exhibit 255.6-8***.

Exhibit 255.6-5 Accessible Gantry Typical Wire Trough Layout

See "Redacted" GTR for updated Exhibit.

Exhibit 255.6-6 Accessible Gantry Typical Electrical Layout

See "Redacted" GTR for updated Exhibit.

Exhibit 255.6-7 Accessible Gantry Typical Wireway to Cable Tray Detail

See "Redacted" GTR for updated Exhibit.

Exhibit 255.6-8 Accessible Gantry Upright Electrical Wireway Details

See "Redacted" GTR for updated Exhibit.

255.6.5 Lighting for Platform and Stairway

(1) LED rope light must be used along the entire length of the accessible gantry platform around the full perimeter as shown in ***Exhibit 255.6-1*** and ***Exhibit 255.6-6***. See ***Exhibit 255.6-9*** for rope lighting mounting details.

(2) AVI reader area lighting must be provided on either side of the AVI reader mounting assembly as shown in ***Exhibit 255.6-4***.

(3) Stair and platform luminaire must be the same as specified for the TEB exterior walls without the photocell accessory. This fixture must be affixed to the stair rail and the non-moveable portion of the swing gate structural system as shown in ***Exhibit 255.6-10***.

(4) Timer switches must be provided at the lower platform and upper platform to independently control the lighting for the stairs, AVI reader area lighting, and rope lighting. See ***Exhibit 255.6-1***, ***Exhibit 255.6-6***, and ***Exhibit 255.6-10*** for timer switch locations.

Exhibit 255.6-9 Accessible Gantry Rope Light Mounting Details

See "Redacted" GTR for updated Exhibit.

Exhibit 255.6-10 Accessible Gantry Stair and Platform Lighting

See "Redacted" GTR for updated Exhibit.

255.7 CCTV System

(1) See ***GTR 232.9*** for site-wide CCTV requirements.

(2) See ***Exhibit 232.9-1*** and ***Exhibit 232.9-2*** for location of gantry mounted CCTV cameras.

(3) [redacted]

(4) Location of accessible gantry mounted CCTV cameras 7, 8, 9, and 10 must be coordinated to avoid conflicts with gate operations and J-arm retraction systems. See ***Exhibit 232.9-1*** for quantity and layout of boxes to support the CCTV cameras.

Exhibit 255.7-1 CCTV Camera Gantry Backbox Mounting Details

See "Redacted" GTR for updated Exhibit.

260 Communications

260.1 General Requirements

(1) At least two physically redundant fiber optic infrastructure paths must be provided to establish communications between a toll site and the Turnpike's tolls data centers.

(2) A toll-fiber optic lateral must be provided for each TEB and OCC.

(3) Coordinate with Turnpike Tolls Design for the tolls communications requirements of existing buildings that are re-used.

(4) All TEBs and OCCs must be directly connected to the backbone.

260.2 Communications Cabinets

260.2.1 Toll Equipment Building Toll Communications Cabinet

(1) One toll communications cabinet must be provided in each TEB.

(2) Wall-mounted toll communication cabinet, rack, fiber distribution panel(s) and all associated accessories and hardware must be provided as shown in ***Exhibit 242.3-1*** and ***Exhibit 260.2-1***.

(3) See ***GTR Part 2, Appendix 2***, TSP Section for ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Toll Communications Cabinet*** ***for TEB Sites*** for additional requirements.

260.2.2 Roadside Tolling Cabinet Site Outdoor Communications Cabinet

(1) One OCC must be provided at each RTC site with the components and accessories shown in ***Exhibit 260.2-2***. See ***GTR Part 2, Appendix 3***, TSP Section for ***Outdoor Communication Cabinet at RTC Toll Sites*** for additional requirements.

(2) Provide underground infrastructure supporting the outdoor communications cabinet power and interconnectivity as shown in RTC site enlarged electrical site plans described in ***GTR 232.1 Item (2)***.

(3) Provide two (2) factory-installed side-mounted 2430V, 1-phase AC units each ~~at 230V, 1-phase~~. Each unit shall be shop-mounted on different sides of the enclosure (never on the same side or on the front or back). Design the cooling system such that one cooling unit will keep the interior enclosure temperature from exceeding 85 degrees Fahrenheit on a sunny day with outside ambient temperature of 95 degrees Fahrenheit with the electronic equipment inside the enclosure. See below for the heat rejection for each component in the OCC:

(a) [redacted]

(b) Network Video Recorder (NVR) ..... 341 BTU/h
(c) WAN Switch..... 2,047 BTU/h
(d) RTC UPS..... 500 BTU/h
(e) OCC UPS ..... 600 BTU/h

Exhibit 260.2-1 Toll Communications Cabinet, Conduit, and Cable Routing

See "Redacted" GTR for updated Exhibit.

Exhibit 260.2-2 Outdoor Communications Cabinet

See "Redacted" GTR for updated Exhibit.

260.3 Tolls Fiber Allocation

(1) Fibers allocated to the Turnpike must be for exclusive use by the Turnpike. The Turnpike allocated fibers must be "patched or spliced through" and must not traverse District/tolling agency switches.

(2) Splice vault (SV) installations must take into consideration that both ITS and Tolls may need to co-locate splice enclosures in the same SV, for the purpose of extending the backbone or for providing lateral connections. ITS and Tolls fiber laterals must be labeled accordingly.

(3) For Districts or other tolling agencies, The Turnpike must be provided with Department (District other than The Turnpike) and/or tolling agency fiber optic strands to communicate with The Turnpike Tolls Data Center(s).

(4) When the Department (District other than the Turnpike) and/or tolling agency engages in construction such that new backbone fiber optic cable is installed, Turnpike Toll Systems requires two buffer tubes (specifically Red and Black) comprising twenty four (24) strands for their exclusive and irrevocable right to use, as part of the single cable trunk, in a contiguous strand count (96, 144, 288, etc.). All fiber must be SMFOC. All fiber splicing must be by fusion splicing.

(5) When the Department (District other than the Turnpike) and/or tolling agency engages in construction such that existing backbone fiber optic cable is used, tolls must be granted a minimum of four (4) fiber strands for their exclusive and irrevocable right to use. All fiber shall be SMFOC. All fiber splicing must be by fusion splicing.

260.4 Toll Fiber Optic Lateral and Infrastructure

All TEBs and OCCs must fully connect to the backbone using underground conduits with a toll fiber optic lateral as described herein:

(1) Each toll fiber optic lateral connection consists of a minimum of two (2) 2-inch conduits (one spare). The connection must be made from new or existing splice vaults and must terminate in a rack mounted, pre-terminated fiber optic distribution panel (patch panel) located inside the toll communications cabinet in the TEB or in the OCC.

(2) Toll fiber optic lateral and conduits must be routed to the TEB or OCC via directional bore or open trench installation with pull boxes as required. The conduit must enter the TEB or OCC via the ITS interface pull box located in the toll site. Conduits must be stubbed out five (5) feet beyond the edge of the concrete sidewalk prior to sidewalk construction. The conduits must terminate as shown in ***Exhibit 260.4-1***.

(3) Each tolls fiber optic lateral connection must be made via a single 48-strand SMFOC (two (2) 24-strand cables must not be provided) composed of blue, orange, green, and brown buffer tubes.

(4) For existing buildings without a fiber optic lateral connection or other available raceways, provide conduits that must enter the building via the same wall penetrations as used for the gantry and loop conduits.

(5) Standard route marker(s) (SRM) must be provided for all toll fiber optic laterals in accordance with ***Standard Specifications, Section 630***. Label each SRM with the following, “TURNPIKE TOLLS SunWatch Operations (877) 786-3375”, for Turnpike projects.

Exhibit 260.4-1 Fiber-optic Interface

See "Redacted" GTR for updated Exhibit.

260.5 Splicing and Termination of Tolls Fiber Optic Lateral

Each fiber optic lateral connection must be configured as follows:

(1) All lateral fiber strands must be fusion-spliced in the splice vault enclosure as shown in ***Exhibit 260.5-1***. Use splice trays with a minimum capacity of 24, one tray for red backbone buffer and one tray for black backbone buffer.

(2) Black buffer backbone must be spliced to lateral Blue buffer going North or East. Black buffer backbone must be spliced to lateral Orange buffer going South or West.

(3) When Red buffer backbone is spliced, it must be spliced to lateral Green buffer going North or East and to the lateral Brown buffer going South or West.

(4) Patch panel cassettes must be places such that Position A is Blue buffer, Position B is Orange buffer, Position C is Green buffer, and Position D is Brown buffer.

(5) All 48 FDP fiber strands must be fusion spliced to factory polished, pre-terminated pig tails in cassette assemblies, connectorized as SC duplex pairs. The patch panel will be mounted in the toll communications cabinet located inside the TEB or in the OCC.

(6) There must be one patch panel (including all associated accessories) for each toll fiber optic lateral.

(7) For each patch panel, jumper all ports with SC to SC single mode duplex fiber optic jumpers so as not to interrupt data communications. Jumpers must be the minimum length necessary and neatly routed in cable management with no sharp bends.

Exhibit 260.5-1 Fiber-Optic Lateral Splice Diagram

See "Redacted" GTR for updated Exhibit.

260.6 Leased Circuit Digital Communication Lines

The following infrastructure must be provided for all toll facilities regardless of whether a leased circuit is actually procured:

(1) Two (2) 2-inch conduits (inclusive of pull ropes, splice vaults, pull boxes, etc.) must be provided between the Telco's nearest splice vault or point of presence and each toll site. The conduit must be installed as depicted in ***Standard Plans, Index 630-001 and Standard Specifications, Section 630.***

(2) A dedicated 24-inch x 36-inch pull box must be provided at each toll site for the Telco leased line connectivity as shown in ***Exhibit 260.6-1***.

(3) If there is no physically redundant (at least two paths) layer 1 fiber optic infrastructure to establish communications between a toll site and the Department's tolls data centers, provide a notice to the Department to procure a leased line at least 200 days prior to primary walk-through.

(4) For TEB sites provide the following:

(a) 24-inch x 48-inch wall space within the building for Telco use. The plywood finished wall space must be painted gray or white and all equipment must be placed such that space is conserved for future equipment.

(b) An orange colored 120 Volt, 20 Amp duplex receptacle adjacent to the proposed Telco equipment space for Telco use. The 120 VAC receptacles must be served from the critical power system.

Exhibit 260.6-1 Leased Line Digital Communication Interface

See "Redacted" GTR for updated Exhibit.

260.7 Impacting Existing Tolls Communications

(1) Communications must be maintained at existing toll facilities as follows:

(a) Until a replacement toll system is installed, commissioned, tested, and actively collecting tolls.

(b) Preserve master/slave relationships until the slave communication dependencies are not required.

(2) All new toll fiber optic lateral spliced to an active fiber optic backbone will cause an outage to the Department's data communications system. The Maintenance of Communication (MOC) documents for each project must include information relating to toll site related outage as described herein:

(a) An outage request must be submitted to the Department's CEI for approval for all planned outage work. The Department must have five working days to review the outage request and respond to the Contractor. The outage request must contain the following requirements at a minimum:

- Outage Request Contact Name:
- Caller Call Back Name/Cell #:
- Project FPID:
- Planned Date:
- Planned Date #2:
- Planned Start Time:
- Planned Stop Time:
- Reason:
- Prime Contractor/Cell #:
- ITS Subcontractor/Cell #:
- Splice Subcontractor/Cell #:
- Location (MP and Facility):
- Location #1:
- Location #2:

(b) In order to minimize impacts to the Department's existing data communications system, proposed work requiring communication outages (i.e., fusion splice, etc.) must be performed between 10:00 pm and 5:00 am.

(c) Once the new tolling systems are collecting tolls as described, the existing toll fiber optic lateral must be fully removed from end to end between the splice vault and the patch panel. The existing fibers between Toll Facilities must also be removed in their entirety.

(d) Once a toll fiber optic lateral is removed, the backbone must be fusion spliced color to color in the existing splice enclosure and splice tray where that toll fiber optic lateral was removed. Identify how this can be accomplished without causing an outage to the Department's data communications system. If an outage is unavoidable ensure that the plans and specifications call for outage notification in accordance with the requirements stated above.

270 Building Permits

270.1 Introduction

(1) Florida's Turnpike Enterprise is authorized by the Florida Statutes to enforce the FBC for Toll Collection Facilities. The Turnpike may issue its own building permits for toll collection facilities.

(2) The Turnpike applies for permits through local building departments having jurisdiction for any buildings that are not toll collection facilities.

(3) State Fire Marshal will issue permits separately for toll collection facilities.

270.2 Building Code Administrator

The Turnpike has acquired the services of a Building Code Administrator (BCA) to perform permitting services for toll collection facilities.

270.3 Building Permit Coordinator

(1) The Turnpike has a Building Permit Coordinator who is the liaison to the Building Code Administrator.

~~(2)~~ The Building Permit Coordinator's ~~shipping~~ information is~~:~~ posted on the submission information is posted on the Florida's Turnpike Public Website in a document labeled ***Toll Facility Code Compliance and Permit Procedures***.

~~(2) Mr. David Aguilera~~
~~(3) Building Permit Coordinator~~
~~(4) Phone: David Aguilera – (954)934-1156 (office)~~
~~(5) E-Mail: *David.Aguilera@dot.state.fl.us*~~
~~(6)~~
~~(7) Shipment:~~
~~(8) Florida's Turnpike Operations Center~~
~~(9) Florida's Turnpike Milepost 65~~
~~(10) Pompano Beach, FL 33069~~
~~(11)~~
~~(12) Or USPS:~~
~~(13) P.O. Box 9828~~
~~(14) Ft. Lauderdale, FL 33310~~
~~(15)~~
~~(16) Copy: Mr. Alfonso Chao (back-up to David Aguilera)~~
~~(17) Phone: (305) 804-0154 (cell)~~
~~(18) E-Mail: *alfonso.chao@dot.state.fl.us*~~

~~(3)~~(2)

~~(4)~~(3) Plans review for permitting and permit issuance must be processed by the BCA and the State Fire Marshal via the Building Permit Coordinator.

270.4 Permit Requirements

(1) Each new TEB in the project must have a separate building permit and a separate State Fire Marshal approval for new TEBs. Separate permits are also required for demolition, modifications or renovations to existing toll facilities, and site improvements.

(2) All compliance documentation for toll facilities such as, construction documents for permitting must be submitted through the Building Permit Coordinator for review by the BCA and State Fire Marshal for plans review and permitting purposes.

(3) Prepare and submit signed and sealed contract documents for permit(s) review.

(4) Contract document revisions require BCA and State Fire Marshal review of revised plans and specifications.

(5) All submitted contract documents, must be signed and sealed by the professional Architect/Engineer of record registered in the State of Florida.

(6) The documentation that must be submitted to the Building Permit Coordinator must include the following. Additional requirements may be required depending on the specific site conditions.

(a) Signed and sealed plans of all building and site disciplines (civil, structural, architectural, mechanical, electrical, and plumbing). This includes all plans for the building plus plans of all associated site work including maintenance pull-off areas, generator, fuel tanks, transformer, ~~E6~~AVI reader ground mounted frames, etc.

(b) Signed and sealed TSP for all building and site disciplines (civil, structural, architectural, mechanical, electrical, and plumbing).

(c) Project cost estimate for all vertical construction and adjacent applicable site construction for each toll site.

(d) Separate sets of permitting documentation are required for:

i. Each building site location, including civil, electrical, and associated utilities.

ii. Each building type including civil, architecture, structural, mechanical, electrical, and associated utilities

iii. Construction cost estimates for each building and each building site. Develop a cost estimate using the template for Toll Site EOR-AOR Estimate of Values which is located at: ***https://floridasturnpike.com/business-opportunities/design/tolls-design/***

iv. Separate permits are required for demolition of existing toll sites.

(7) The plans are subject to the latest adopted edition of procedures titled "***Toll Facility Code Compliance and Permit Procedures***" (including amendments).

(8) Coordinate with the Building Permit Coordinator for the electronic delivery of permitting documentation that is required. E-Submittals files must be under 24mb.

The electronic delivery should conform to the following file naming conventions:

(a) Toll Facility Plans.....FPID_TS#_Plan.pdf

(b) Technical Special Provisions .....FPID_TSP.pdf

(c) Toll Facility Cost Estimates.....FPID_TS#_Cost Estimate.pdf

(9) For each building site, the Building Permit Coordinator has thirty working days from receipt to review and accept the provided building permitting documents. Upon acceptance, the Building Permit Coordinator will forward the documents to BCA and State Fire Marshal for approval. Working day periods do not include weekends, holidays, special events, and work period shut downs prescribed by all applicable contract documents.

(10) The Building Permit Coordinator's review of the plans prior to letting is for conformance to the documentation requirements. It is the sole responsibility of the AOR/EOR to ensure the permitting documents for BCA and State Fire Marshal approval are complete and correct.

(11) See ***GTR Part 2, Appendix 2***,TSP Section for ***Building*** ~~***GTR Part 2, Appendix 1, TSP Section for***~~ ***Permits*** ***for TEB Sites*** for additional requirements.

280 Geotechnical

280.1 Roadside Tolling Cabinet Site(s)

(1) Geotechnical investigation shall consist of one SPT boring per RTC site. Test boring shall be located within 20 feet of proposed slab(s) and advanced to a minimum depth of 20 feet below the bottom of proposed slab(s).

(2) If the gantry SPT boring is within 20 feet of the toll site equipment slab a separate boring is not required.

280.2 Toll Equipment Building Foundation

(1) Geotechnical investigation shall consist of one SPT boring per TEB. Test boring shall be located within 20 feet of proposed TEB and advanced to a minimum depth of 20 feet below the bottom of proposed foundation.

(2) If the gantry SPT boring is within 20 feet of the TEB a separate boring is not required.

280.3 Gantry Foundation

Geotechnical investigation and foundation design must be in accordance with the Overhead Sign Structure requirements of the ***Soils and Foundations Handbook*** with the following modifications:

(1) At least one test boring for each gantry foundation. However, one boring may suffice for more than one foundation only if it meets the requirements of ***Soils and Foundations Handbook*** Section 3.2.2.7 (1).

(2) The test boring must have a minimum depth of 10 feet below the design tip elevation.

Modification for Non-Conventional Projects:
Append GTR 280.3 with the following: (3) Foundation installation plans and foundation certification packages must be submitted for all the gantry foundations following the requirements in the ***FDOT's Design-Build Specifications***, ***Section 455***.

Appendix 1

TECHNICAL SPECIAL PROVISION SECTIONS FOR TEB AND RTC TOLL SITES

See ***GTR 210*** for additional requirements.

Appendix 2

TECHNICAL SPECIAL PROVISION SECTIONS FOR TOLL SITE WITH A TEB

See ***GTR 210*** for additional requirements.

Appendix 3

TECHNICAL SPECIAL PROVISION SECTIONS FOR RTC TOLL SITES

See ***GTR 210*** for additional requirements

.

Appendix ~~24~~ 4

SIGNING AND PAVEMENT MARKING AT TOLL SITES

See ***GTR 222*** for additional requirements.