947 Toll Facilities Plans

947.1 General

This chapter provides the requirements for the development of Toll Facilities Plans. See **FDM 280** through ***FDM 287*** for toll facility governance and design requirements.

The Toll Facilities Plans component is comprised of a series of sub-component plan sets. Each sub-component plan set must be prepared as described herein.

Each sub-component plan set includes a Key Sheet with the sub-component Index of Sheets.

A Google Earth ready KMZ/KML file must be prepared and submitted with each toll project. The file must have both existing and proposed information for each discipline. KMZ/KML files must be created in the format described in the Turnpike's KMZ Deliverable Standards, which are located at:

https://floridasturnpike.com/business-opportunities/design/roadway/

The requirements provided here and in the ***CADD Manual*** form the basis for contract plans format and assembly.

- Sheet file names must follow drawing number convention.
- Reference files created for the toll component must be in accordance with the requirements of the Architectural Design Naming Convention as identified in ***Section 5.7*** of the ***CADD Manual***.
- Levels/layers naming convention for the toll component must be in accordance with the requirements for architectural levels/layers and symbology identified in ***Section 5.9*** of the ***CADD Manual***.
- Line styles/line type symbology and line weight symbology for the toll component must be in accordance with the requirements of ***Section 5.9*** of the ***CADD Manual***; however, custom line style/line types are open to user discretion.
- Text for the toll component must be in accordance with the requirements of ***Section 5.10*** of the ***CADD Manual***. Text styles specific to architectural elements are open.
- Cell libraries/block drawings for the toll component must be in accordance with the requirements of ***Section 5.11*** of the ***CADD Manual***.

Toll sites must be fully integrated into the 3D roadway model when required by the contract documents.

Prerequisites:

- The Preliminary Toll Siting Technical Memorandum (TSTM) for the preferred alternative must be developed during the PD&E.
- The Draft TSTM must be developed from the Preliminary TSTM during 15% Line and Grade development.
- All outstanding comments must be resolved in the Final TSTM and accepted by Turnpike Tolls Design prior to Phase II submittal.
- All Deviations must be approved prior to the Phase III submittal. See ***GTR 110*** for the Deviation process.

Modification for Non-Conventional Projects:
Delete the "Prerequisites" above and replace with the following: • The Final TSTM is developed during RFP Development phase. • A revised Final TSTM is required where identified in ***GTR 202***. • All new Deviations must be approved prior to the 90% Component Plans submission. See ***GTR 110*** for the Deviation process.

947.2 Sheet Borders

All sheets, other than the Key Sheet, must use the Structures Border cell "Sheet-Border" as identified in the ***CADD Manual*** ***Section 7.6.8.1***.

The border has two types of numbering:

- Sheet Number – This starts with the Master Key Sheet as sheet number 1 and is numbered sequentially through the master plan set, continuing through all the sub-component plan sets.
- Drawing Number – Each sheet of the toll facilities component set has a unique drawing number based on the sub-component and type of drawing. See the information below and ***Exhibit 302.3-1***, ***Exhibit 302.4-1***, ***Exhibit 302.5-1***, ***Exhibit 302.6-1***, and ***Exhibit 302.7-1*** for additional information on drawing numbering requirements.

947.3 Toll Facility Plans Component Sheets

947.3.1 Master Key Sheet

The Key Sheet is the first sheet of each Toll Facilities Plans set. The Signature Sheet, when required, is placed behind the Key Sheet. These sheets are created using the FDOT CADD Software.

Follow the same requirements contained in ***FDM 910*** for the development of Key Sheets and Signature Sheets.

The Toll Facility Plans Master Key Sheet must be prepared in accordance with ***FDM 910*** and include the following:

- Additional drawing number block. See ***Exhibit 301.1-1***.
- Index of Toll Facilities Master Plans
  - Toll Facility Plans Master Key Sheet, numbered TF-001.
  - Signature Sheets must begin numbering at TF-002 and be numbered sequentially.
  - Toll Site Location Map(s) must be numbered sequentially TF-00#, beginning with the next number following the Signature Sheets.
- Toll Facility Plans sub-component plans must be listed above the Index of Toll Facilities Master Plans. The sub-component plans must be included in the following order:
  - Toll Facilities Demolition / Renovation Plans
  - Toll Facilities Site Plans
  - Toll Facilities Building Plans
  - Toll Facilities Gantry Plans

Toll Facilities Plans may require insertion of sheets that were prepared early or prior to the design process (aka early works). See ***FDM 910.2.6.1*** for instructions on including early works sheets.

Exhibit 947-1: Toll Facility Plans Master Key Sheet Layout

947.3.2 Signature Sheet

The Signature Sheet includes signatures for all disciplines in all sub-component plans.

The Signature Sheet must be prepared in accordance with ***FDM 910***.

947.3.3 Toll Site Location Map

The Toll Site Location Map (project layout) must show the horizontal alignment and stationing and include a call-out for each toll site in the project that includes the gantry numbering and types, station and milepost based on the centerline of the gantry(ies) as shown in ***Exhibit 301.3-1***. The Toll Site Location Map must also identify existing toll sites to remain that are located within the project limits, and existing toll sites that are being demolished or renovated.

The Toll Site Location Map must also identify existing site dependencies (i.e. master/slave toll sites), with construction phase criteria for demolition/renovation of sites with dependencies.

Exhibit 947-2: Toll Site Location Map Layout

947.4 Sub-Components of Toll Facility Plans

947.4.1 Sub-Component Plans

Sub-component plan sets must be provided for the following:

- Toll Facility Demolition/Renovation Plans (each site)
- Toll Facility Site Plans (each site)
- Toll Facility Building Plans (each building type)
- Toll Facility Gantry Plans (each gantry type; Non-Accessible Span, Non-Accessible Cantilever; Accessible)

947.4.2 Sub-Component Key Sheets

A separate Key Sheet must be provided for each toll facilities sub-component plan set. Each Key Sheet base must be a copy of the Master Key Sheet except for these changes:

- Identify the sub-component's Registered Professional of Record
- Uniquely identify the sub-component set within the project:
  - e.g., Site 1; Building Type A; Gantry 1
- Identify the Index of Plans for that sub-component set
- See ***Exhibit 302.2-1*** for a sample sub-component Key Sheet

Exhibit 947-3: Toll Facilities Sub-Component Key Sheet

947.4.3 Toll Site Demolition/Renovation Plans

A separate sub-component plan set with a separate sub-component Key Sheet must be provided for each demolition site. Each demolition site must be identified by a consecutive and unique number. See ***Exhibit 302.3-1*** for details regarding the drawing number protocol.

- The demolition site number and description must be identified on the demolition sub-component plan Key Sheet as a sub-title.
- The sub-title must include the milepost and stationing of the demolition site.
- The title block on each sheet of the sub-component plan set must indicate the demolition site number.

The plans must include the following as needed for demolition/renovations:

- Site civil
- Site electrical
- Building architectural
- Building structural
- Building mechanical
- Building electrical

For demolition only sites, all electrical, mechanical, and structural notes may be shown on the site civil demolition sheet, if appropriate.

The plans must identify the limits of work, construction phasing required to maintain existing site operations prior to demolition, and the maintenance of traffic. This sub-component set must be developed for demolition permit applications.

The plans must identify the following:

- Site civil demolition and grading by stage of construction
- Details for structural, mechanical, and electrical demolition/renovation by stage of construction
- Required protection or modification for any existing infrastructure to remain
- Extent of demolition including removal of foundations and infill of below grade structures and/or utilities
- Structures to remain
- Areas where existing structures or utilities must be protected

947.4.3.1 Index of Sheets for Demolition/Renovation Plans (per site)

The drawing numbering for the Demolition/Renovation Plans must be as shown below:

Exhibit 947-4: Demolition/Renovation Plans Drawing Numbering Convention

Assemble the Toll Site Demolition and/or Renovation Plans in the following order and format:

Dwg. No.	Sheet Description
DG-101	KEY SHEET
DG-102	GENERAL NOTES AND LEGEND – SITE 1
DSC-101	ABBREVIATIONS, SYMBOLS, AND DEMOLITION NOTES – SITE 1
DSC-111	OVERALL SITE DEMOLITION/RENOVATION PLAN – SITE 1
DSC-11#	SITE GRADING PLAN(S) – SITE 1
DST-11#	SITE CIVIL DEMOLITION/RENOVATION PLAN(S) PHASE #
DSE-11#	SITE ELECTRICAL DEMOLITION/RENOVATION PLAN(S) PHASE #
DSI-11#	ISLAND/LANE DEMOLITION/RENOVATION PLAN(S) PHASE #
DSM-11#	ISLAND/LANE MECH/PLUMB DEMOLITION/RENOVATION PLAN(S) PHASE #
DSE-11#	ISLAND/LANE ELECTRICAL DEMOLITION/RENOVATION PLAN(S) PHASE #
DST-12#	CANOPY DEMOLITION/RENOVATION ELEVATION(S) PHASE #
DSI-13#	ISLAND/LANE DEMOLITION/RENOVATION SECTION(S)
DSS-15#	CANOPY DEMOLITION/RENOVATION DETAIL(S)
DAU-11#	OVERALL TUNNEL DEMOLITION/RENOVATION PLAN(S) (Structural) (Includes phased demolition of Structural and temporary shoring to support MOT phasing) – SITE 1
DAU-11#	OVERALL TUNNEL DEMOLITION/RENOVATION PLAN(S) (Mechanical/Plumbing) (Includes phased demolition of Mechanical and Plumbing systems to support MOT phasing) – SITE 1
DAU-11#	OVERALL TUNNEL DEMOLITION/RENOVATION PLAN(S) (Electrical) (Includes phased demolition of Electrical systems to support MOT phasing) – SITE 1
DAA-11#	BUILDING ARCHITECTURAL DEMOLITION/RENOVATION FLOOR PLAN(S)
DAS-11#	BUILDING STRUCTURAL DEMOLITION/RENOVATION FLOOR PLAN(S)
DAA-12#	BUILDING ARCHITECTURAL DEMOLITION/RENOVATION ELEVATION(S) – SITE 1
DAA-15#	BUILDING ARCHITECTURAL DEMOLITION/RENOVATION DETAIL(S) – SITE 1
DAM-11#	BUILDING MECHANICAL DEMOLITION/RENOVATION PLAN(S) – SITE 1
DAM-15#	BUILDING MECHANICAL DEMOLITION/RENOVATION DETAIL(S) – SITE 1
DAE-11#	BUILDING ELECTRICAL DEMOLITION/RENOVATION PLAN(S) – SITE 1
DAE-15#	BUILDING ELECTRICAL DEMOLITION/RENOVATION DETAIL(S) – SITE 1
DAE-16#	POWER RISER DIAGRAM(S) – SITE 1
DAE-16#	ELECTRICAL PANEL SCHEDULE(S) – SITE 1

947.4.4 Toll Facility Site Plans

A separate sub-component plan set must be provided for each site. Each site must be identified by a unique number starting at one. Site numbers must increment consecutively. See ***Exhibit 302.4-1*** for details regarding the drawing number protocol.

The following information must be included on the site plans:

- The site number along with the milepost and stationing of the toll site must be identified on the Key Sheet as a sub-title. Toll site stationing is based on the centerline stationing of the primary gantry.
- The title block on each sheet of the sub-component plan set must indicate the site number.
- The site plans for each sub-component set must include the site civil plans and the site electrical plans.

The following items must be included on all site plans:

- Building type and gantry no.(s).
- North arrow and scale.
- Baseline with stationing.
- Toll loop pavement area and toll site envelope limits.
- Existing and proposed roadway, lane striping, lane widths, direction of travel, tolling loop conduit stub-ups, all pull boxes, manholes and hand holes, service driveway(s), maintenance pull-off area(s), drainage systems, drilled shaft(s), column upright(s), ITS, lighting, utilities, and landscape.

Site civil and site electrical plans must be presented at the following scales:

- Overall site plans: 1”=40’ or 1”=50’
- Enlarged site plans: 1”=20’
- Grading plans: 1”=20’
- Details must be at an appropriate scale.

947.4.4.1 Site Civil

Grading, drainage, geometry, parking, pavement, concrete slabs, signing, pull boxes, and sidewalks must be shown on the site civil plans. Site civil plans must be coordinated with all other drawings. Show all interim and ultimate conditions in the plans for reference. Any items that impact the tolling site, associated

buildings, gantries, or site infrastructure must be shown on the site civil plans.
The site civil plans must show the following within the limits of construction:

- Station and offsets for site elements (building corners, sidewalk corners, equipment slab corners, drywell(s), gantry and stair columns, transformer pad, etc.). This information may be shown separately on an additional site layout plan sheet or combined with the grading plan.
- Site geometry including building dimensions, maintenance pull-off geometry, equipment maintenance offsets for generator and fuel tank, transformer, pull box layout, and all other site element layouts.
- Lane striping and call-outs for each shoulder and each lane including the type of lane (TL, GUL, EL). Provide lane numbering at each toll gantry starting with the NB/EB left lane as Lane 1. Provide shoulder numbering at each toll gantry starting with the NB/EB inside shoulder as Shoulder 1. Provide lane, shoulder and buffer widths.
- Identify FEMA FIRM map number and flood elevation as a general note.
- Latitude and longitude callouts:
    - The plans for new gantries must include the latitude and longitude callouts for the SunPass® Antenna System locations to comply with regulations and to receive a permit from the Federal Communications Commission (FCC).
    - This information must be included in the first submittal of the toll site plans.
    - The latitude and longitude of the gantry centerline must be provided in degrees, minutes, and seconds as well as the northing and easting with the datum for verification of each antenna system, centered on each tolling direction.
    - The associated roadway's milepost, to the nearest tenth of a mile, must be included for reference.
    - Separate call-outs are required for each direction of travel.
- The enlarged site plan must show the following:
    - Maintenance pull-off limits and the adjacent roadway shoulder.
    - All site elements to scale including, but not limited to, pull boxes, mechanical equipment, gantry foundations, concrete barriers, strut channel frames, retaining walls, wire troughs, dry wells with underground condensate piping, and bollards.
    - Sidewalk and equipment foundations.
    - Gravel limits.
    - Adjacent drainage ditches and drainage structures.

  - Rigid pavement joint layout.

- Spot elevations along the perimeter of the new construction, finished floor elevations, sidewalk elevations, all locations identified in item (1) above, and other areas pertinent to the drainage of stormwater must be included. Spot elevations must also be shown on both sides of the concrete barrier within the toll site every 10 feet and at all inflection points.
- Cross sections at critical site points showing grading must be provided. At a minimum, cross sections must show grading at the shoulder adjacent to the building/equipment slabs, generator pad, gantry, and maintenance pull-off access. The cross sections must identify the maximum elevation difference between edge of shoulder and concrete sidewalk across the concrete barrier.
- Details must be provided on the site grading plans as follows:
  - Grading for bollards, grading beyond sidewalk limits and grading for ditches, swales, ponds, canals, or other water bodies near the toll site.
  - Spot elevations must be included to demonstrate positive drainage.
  - Grading details must include proposed 1-foot minimum contours that tie to the surrounding ground elevation. Where ground surrounding a toll site is flat, ½-foot contours must be provided. Contours must include the following:
    - A minimum of 20 feet beyond the limits of toll site infrastructure (maintenance pull-off area, sidewalks etc.).
    - Show the tie into existing ground. The contours may continue onto the overall site plan as needed to show the limits required.
- Wall location and wall type as well as any railing/barrier features must be identified.
- A geotechnical engineer's core borings sheet prepared per the ***Soils and Foundations Handbook***.
- Sidewalk expansion and contraction joint layout must be included.
- Site civil details as required. These include, at a minimum:
  - Toll site median concrete barrier pull box layout elevation & section details
  - Sidewalk and concrete pad details and sidewalk joint details
  - Bollard details
  - Loop pull box details
  - Equipment slab details
  - Rigid pavement joint details
  - Fuel tank hold-down details for TEB Sites

- Site layout for the following:
  - Wire troughs (AVI, Data and Power)
  - RTC power distribution frame(s)
  - AVI reader mounting frame(s)
  - RTC and OCC cabinets

947.4.4.2 Site Electrical

The site electrical plans must show electrical infrastructure necessary to support the installation and operation of toll loops, generator, fuel tank, and wiring between gantry toll equipment and the site infrastructure. The site electrical plans must show the following within the limits of construction:

- Primary service routing plan(s) as required including:
  - The primary power extension from the utility point of presence at the limited access (LA) right-of-way (R/W) to each toll site primary transformer including the routing
  - Each provider contact's name and telephone number
  - Detailed UAO scope breakdown used in developing the tolls portion of the cost estimate for pay item Contribution-in-Aid-of-Construction (CIAC)
- Cross sections showing the conduit boring under the roadway must also be included, where applicable.
- Overall site electrical plans, and enlarged site electrical plans must include, at a minimum:
  - Site elements and all associated site conduits and their routing from origin to termination point. For RTC site enlarged electrical plans:
    - See the conduit routing plans in ***GTR 232***
    - Provide separate plan sheets for AVI reader/loops, power, and data conduit routing
  - Site electrical equipment (e.g. pull box, ground well, wire trough, etc.)
  - All transformer connections
  - Mechanical equipment with electrical connections
  - Proposed utilities near the toll site
  - Existing utilities to remain near the toll site

- Site electrical details as required, including:
  - AVI reader ground-mounted frame(s)
  - Power distribution frame(s)
  - Conduit stub-up details for RTC sites
  - Loop pull box details for median
  - Loop pull box details for shoulders
- Loop pull boxes must be labeled in the plans with a unique consecutive number (#) for each toll site beginning with 1. Each pull box label must be formatted with the following prefixes:
  - Loop Pull Boxes – PB#
  - Intermediate Loop Pull Boxes – IPB#
  - Median Loop Pull Boxes – MPB#
  - Gantry Median/Intermediate Power and Data Pull Boxes – No Prefix
- Lightning protection plans showing counterpoise loops, bonding conductors, ground rods, points of bonding to metallic site elements, and related notes.
- Fenced Gate Access Control Schematic and Wiring Diagram
- RTC Power Riser Diagram
- RTC SCADA Riser Diagram
- RTC Panel Schedules
- RTC Light Fixture Schedules

947.4.4.3 Index of Toll Site Plans (each site)

The drawing numbering for the site civil and site electrical plans must be as shown below:

Exhibit 947-5: Toll Facility Site Plans Drawing Numbering Convention

Assemble the toll site plans in the following order and format:

Site Civil Plans

Dwg. No.	Sheet Description	Scale
SG#-001	KEY SHEET AND INDEX OF SHEETS	
SG#-002	CIVIL GENERAL NOTES AND LEGEND	
SC#-101	OVERALL CIVIL SITE PLAN SITE #	1” = 40’ or 1” = 50’
SC#-10#	ENLARGED CIVIL SITE PLAN(S) SITE #	1” = 20’
SC#-10#	GRADING PLAN(S) SITE #	1” = 20’
SC#-301	GRADING SECTIONS SITE #	
SC#-401	REPORT OF CORE BORINGS SITE#	
SC#-50#	CIVIL SITE DETAIL(S) SITE #	

Site Electrical Plans

Dwg. No.	Sheet Description	Scale
SE#-001	ELECTRICAL SYMBOLS, LEGEND, AND ABBREVIATIONS	
SE#-00#	ELECTRICAL GENERAL NOTES	
SE#-101	OVERALL ELECTRICAL SITE PLAN - SITE #	1” = 20’
SE#-10#	ENLARGED ELECTRICAL SITE PLAN(S)1 SITE #	1” = 8’(min.)
SE#-10#	ENLARGED ELECTRICAL PLAN(S) AVI READERS/LOOPS[2] SITE #	1” = 10’(min.)
SE#-10#	ENLARGED ELECTRICAL PLAN(S) POWER[2] SITE #	1” = 10’ (min.)
SE#-10#	ENLARGED ELECTRICAL PLAN(S) DATA[2] SITE #	1” = 10’ (min.)
SE#-10#	LIGHTNING PROTECTION PLAN(S) SITE #	1” = 20’
SE#-10#	PRIMARY SERVICE ROUTING PLAN(S) SITE #	
SE#-301	PRIMARY SERVICE ROUTING SECTION(S) SITE #	
SE#-50#	ELECTRICAL SITE DETAIL(S) SITE #	
SE#-601	POWER RISER DIAGRAM(S) 2	
SE#-60#	SCADA RISER DIAGRAMS2	
SE#-60#	ELECTRICAL SCHEDULES2	

Notes for Superscript:

1 – *TEB Sites*
2 – *RTC Sites*

947.4.5 Toll Facility Building Plans

A separate sub-component plan set must be prepared for each unique toll equipment building. See ***Exhibit 302.5-1*** for details regarding the drawing number protocol.

- Each unique building type must be identified by a unique alphabetic character starting at A.
- The Key Sheet must also identify the toll site and gantry numbers that are supported by this building type.
- The sheet title in the title block on each sheet must indicate the building type alphabetic character.
- Each building sub-component set must include all necessary discipline's plans, architectural, structural, mechanical, and electrical plans, to be a complete standalone plan set.
- The plans, elevations, and details must indicate the scale to which they are drawn.

947.4.5.1 Architectural Plans

The following items must be included on the toll site architectural plans:

- General Notes must include the State of Florida or Miami-Dade Product Approval Notice of Acceptances (NOA) for all exterior door and door frame assemblies, roof system, and parapet copings for the basis of designs shown in the plans.
- Floor, reflected ceiling, and roof plans, exterior elevations, wall sections, details, and finish and hardware schedules as required to obtain a building permit.
- Floor plans must be prepared according to the following requirements:
    - Floor plans, drawn at an architectural scale that allows each entire site to be shown on one sheet, without break lines, and shows project phasing.
    - The floor plans scale must be ¼-inch or larger showing typical spaces or special rooms with dimensions, showing doors, opening layouts, and other relevant features.
    - Cross references must be included explaining the extent of work, wall types, or other components, assembly, or direction regarding the construction.
- Reflected ceiling plans must be prepared according to the following requirements:
    - Reflected ceiling plans scale must be ¼-inch or larger showing typical spaces or special rooms with dimensions and lighting equipment.
    - Ceiling types, materials, heights, and light fixture types must be shown.

- Roof plans must be prepared according to the following requirements:
  - Roof plans scale must be ¼-inch or larger showing dimensioned penetrations, equipment, and other relevant features.
  - All roof penetrations, including drains, lightning protection, and any other equipment on the roof, must be shown.
  - The direction of roof slopes with elevations at the high and low points, type of roofing system to be used, typical parapet, and flashing details must be shown.
  - Dimensions that locate all penetrations and cross-reference details
- Exterior building elevations plans must be prepared according to the following requirements:
  - The scale, finish, size, and detail of the site must be shown. The details must include all exterior mounted equipment, doors, conduit, CCTV, or reveals as applicable to the building.
- Wall sections plans must be prepared according to the following requirements:
  - Dimensions, proposed construction material, fastener type, length, and spacing must be included.
  - A comparison of finished floor to finished grades at the entrance must be included.
- Details and appropriate schedules referencing manufacturer's numbers or catalogs, room finishes, hardware, and other construction characteristics must be prepared. Door jamb, head, and sill conditions must be included.
- Any other specialized items may be included that are necessary to clearly show the intent of the project design.
- Architectural must be coordinated with civil, structural, mechanical, and electrical disciplines.

947.4.5.2 Structural Plans and Calculations

Structural building plans and details must include the following:

- Structural plans and elevations scale must be ¼-inch or larger showing dimensioned penetrations, and other relevant features. Details must be at a sufficiently large scale to clearly delineate the relevant information to be conveyed.
- General Notes for design loads, design codes, material related notes, abbreviations, legend and details

- Structural foundation plans showing the associated roof wind pressure diagrams, foundation block outs, schedules, notes, details, and sections
- Roof plans, elevations, sections, and details showing all penetrations
- Equipment support frames' details as described in ***GTR 241.7***
- Fuel tank tie-down details

Structural calculations for toll facility buildings must include the following:

- Structural calculations for all design criteria, dead load, and wind pressures for the pre-engineered precast concrete building, foundation system, and equipment support frames as applicable
- The associated wind load diagrams and sections for all calculations, as applicable
- Fastener calculations to mount all ceiling, and wall-mounted equipment described in ***GTR 241***, including fastener type, size, and minimum embedment depth

947.4.5.3 Mechanical Plans

Equipment schedules, floor plan, generator plan, fuel tank, and piping details as required to obtain a building permit must be included on the toll sites mechanical plans included the following:

- Mechanical plans and elevations scale must be ¼-inch or larger. Details must be at a sufficiently large scale to clearly delineate the relevant information to be conveyed. Plans include General Notes, floor plans, air conditioning (AC) equipment layout(s), and sections.
- Fuel oil plans to include fuel tank and piping plans, fuel tank sections, details, monitoring system details, and notes
- Mechanical equipment details including fuel pipe cover plate details and fuel tank details
- Condensate drywell and AC condensate piping details
- AC equipment details and schedule

947.4.5.4 Electrical Plans

Power distribution, lighting, lightning protection, SCADA, access control, CCTV, tolling equipment raceway plans, interior wall elevations, communication system, details, riser diagrams, and panel schedules must be included on the toll facility electrical plans. The electrical plans must include the following:

- Electrical symbol legend, abbreviations, and fixture schedule sheet for each separate plan set. Show the electrical symbols used in the plan set with corresponding definitions for each symbol. Include fixture type, description, manufacturer model number, voltage, mounting orientation, and remarks required for design or installation in the (basis of design) fixture schedule.
- Show the following on power distribution system plans:
  - Physical location and approximate size of the electrical distribution system equipment
  - Power outlets
  - Feeders and raceways
  - Mechanical and plumbing equipment that require electrical service
  - The physical location of the driven ground rods serving the distribution system
- Show the interior reflected ceiling of the building with scaled light fixture symbols shown at each location where a light fixture is installed on the lighting plans. Show equipment specified by other disciplines that may interfere with the light fixture's location such that coordination of physical locations occurs. Show the following on the lighting plans:
  - Any exterior light fixtures
  - The light fixture schedule
  - Required mounting heights
  - Light switches
  - Lighting controls
  - Branch circuit designations for the circuits that serve the lighting system
  - Reference notes to indicate the calculated average lighting levels in each interior and exterior area
  - A separate detail plan sheet for fixture mounting details, elevation details, and control wiring details as required
- Show the following on the lightning protection plan:
  - Building and outdoor equipment connected to the lightning protection system
  - Size of the lightning protection system conductors
  - Location of all air terminals, ground loops, bonding conductors, down conductors, and ground rods

  - Additional sheets for specific details of the lightning protection system components and interconnection between the site infrastructure, gantry, and toll equipment building

- Prepare a separate set of SCADA, security, and access control system plans for each building or site and show the following:
  - SCADA system notes and block diagrams
  - Security, and access control system, wiring and riser diagrams, showing each sensor, meter, door hardware, components in the building, and on the toll site that are to be monitored
  - The size, quantity, and routing of the raceways required for each device
  - All electrical, SCADA, security and access control system plans coordinated with the interior wall elevations of the toll equipment building
- Include the following on the tolling equipment raceway plans:
  - Size, type, and locations of the raceways that are used by a toll equipment contractor to install the tolling equipment
  - Raceways that require exact locations or stub up locations, dimensions from the walls, or other structural components
  - The exact location and size of the toll communication cabinet mounting frame
- Prepare a scaled interior elevation electrical drawing for each wall in the toll equipment buildings and show the following:
  - Actual physical dimensions required for the installation to assure proper integration of the equipment with other building systems while maintaining NEC required clearances
  - Locations of conduit, racking, junction boxes, panelboards, safety switches, UPS units, bypass switches, and wall mounted equipment
  - Show the fiber optic communications conduits stubbed up under the toll's communications cabinet
- Toll equipment working space stub-up details
- Toll equipment cabinet isometric detail must show the required receptacles in the overhead cable tray for TEC equipment and the tolling communications cabinet
- Miscellaneous electrical details including emergency power shutoff details and diagrams, grounding riser, grounding bus and inspection well details, access control wiring and raceway details, lightning protection down conductor details, wall-mounted device conduit and box details

- Include all devices from the power sources (utility transformer and generator) to the main and distribution panelboards on the power riser diagram including the following:
  - Surge protection devices
  - Short circuit analysis
  - Feeder conduit and conductors' type and size
  - Emergency power off
  - Meter
  - Automatic transfer switch
  - Bypass switches
  - Disconnect switches
  - Uninterruptible power supply
  - Any distribution equipment in the system up to the last distribution panelboards with the branch circuits
- UPS/BPS one-line diagrams
- Panel schedules for all electrical panelboards within the toll equipment building and rooms where the limits of work are defined, must include the following:
  - Surge protective devices, electric service configuration (voltage, phase, ground, and phase wires) including the minimum interrupt rating must be provided for all electrical panels
  - Each panel's schedule including breaker size, load, and load description
  - Load calculations for service and feeder conductors

947.4.5.5 Index of Toll Facility Building Plans (per building type)

The drawing numbering for the toll facility building plans must be as follows:

Exhibit 947-6: Toll Facility Building Plans Drawing Numbering Convention

Assemble the toll facility building plans in the following order and format:

ARCHITECTURAL PLANS (BUILDING)

Dwg. No.	Sheet Description	Scale
AAα-001	GENERAL NOTES, ABBREVIATIONS, SYMBOLS, AND LEGEND	
AAα-10#	FLOOR PLAN AND LIFE SAFETY INFORMATION	¼" = 1'
AAα-10#	REFLECTED CEILING PLAN AND ROOF PLAN	¼" = 1'
AAα-20#	EXTERIOR ELEVATIONS	¼" = 1'
AAα-30#	WALL SECTIONS	1½" = 1'
AAα-50#	DOOR DETAILS	
AAα-60#	BUILDING FINISH AND DOOR SCHEDULES	

STRUCTURAL PLANS (BUILDING)

ASα–001	GENERAL NOTES, ABBREVIATIONS, SYMBOLS, AND LEGEND	
ASα-00#	GENERAL NOTES (CONT.)	
ASα-10#	FLOOR SLAB PLAN AND FOUNDATION SECTIONS	¼" = 1'
ASα-10#	ROOF PLAN	¼" = 1'
ASα-20#	EXTERIOR ELEVATIONS	¼" = 1'
ASα-30#	SECTIONS AND DETAILS	
ASα-50#	STRUCTURAL DETAILS FOR EQUIPMENT FRAMES	½" = 1'

MECHANICAL PLANS (BUILDING)

AMα-00#	GENERAL NOTES, ABBREVIATIONS, SYMBOLS, LEGEND, AND DATA CODE	
AMα-101	MECHANICAL FLOOR PLAN	¼" = 1'
AMα-10#	MECHANICAL FUEL OIL PLAN	¼" = 1'
AMα-50#	MECHANICAL FUEL OIL DETAILS	
AMα-50#	MECHANICAL CONDENSATE DETAILS	
AMα-60#	AC EQUIPMENT SCHEDULE	

ELECTRICAL PLANS (BUILDING)

AEα-00#	ELECTRICAL SYMBOLS, LEGEND, AND ABBREVIATIONS	

AEα-00#	ELECTRICAL GENERAL NOTES	
AEα-101	POWER PLAN	¼" = 1'
AEα-10#	LIGHTING PLAN	¼" = 1'
AEα-10#	LIGHTNING PROTECTION PLAN	¼" = 1'
AEα-10#	SCADA AND SECURITY SYSTEM PLANS	¼" = 1'
AEα-10#	TOLLING EQUIPMENT RACEWAY PLAN	¼" = 1'
AEα-20#	INTERIOR ELEVATIONS	3⁄8"=1'
AEα-501	WALL MOUNTED WIRING DETAILS	¾" = 1'
AEα-50#	CABLE TRAY MOUNTED RECEPTACLES DETAILS	
AEα-50#	ELECTRICAL DETAILS	
AEα-601	POWER RISER DIAGRAMS	
AEα-60#	UPS / BPS ONE-LINE DIAGRAM	
AEα-60#	PANEL SCHEDULES AND ELECTRICAL LOAD SUMMARY	
AEα-701	SCADA SYSTEM BLOCK DIAGRAM NOTES	
AEα-702	SCADA SYSTEM BLOCK DIAGRAMS	

947.4.6 Non-Accessible Gantry Plans

The sub-component plan set for span gantries must be prepared separately from the sub-component plan set for cantilever gantries. See ***Exhibit 302.6-1*** for details regarding the drawing number protocol.

- The gantry structure number(s) must be included above the title block.
- Gantry number must be assigned for each toll gantry and must match the site number. When there are multiple gantries at a single site, at least one gantry number, (the mainline gantry if it is part of the multiple gantries), must match the site number.
- The structural and electrical plans and elevations must also identify the mile post and stationing of each gantry.

947.4.6.1 Non-Accessible Gantry Structural Plans

The following items must be included in the non-accessible gantry structural plans:

- Structural Notes
- Gantry plan for all interim and ultimate roadway configurations for each TEC
  - Roadway elements
  - Structural framing
  - Location of chord splices
  - Gantry framing plans showing W-section member layout in addition to panel layout. Clearly label W-section and panel spacings.
  - Toll equipment layout showing the j-arm positions
- Gantry elevations showing the roadway cross section at the gantry showing the roadway cross slope and critical roadway elevation reference line for equipment
  - Elevation of the centerline of the truss as described in ***Standard Plans, Index 700-040*** and ***700-041***
  - Pavement elevations at each breakpoint along the roadway cross slope for all interim and ultimate roadway configurations
  - The APE as identified in ***GTR 250.2.2***
  - Elevations must be recorded in feet to three decimal places
- Typical cross section of the gantry and truss
- Truss, upright, and foundation details
- Gantry upright details
- J-arm and attachment hardware details
- AVI readers mounting details (where applicable)

947.4.6.2 Non-Accessible Gantry Electrical Plans

The following items must be included in the non-accessible gantry electrical plans:

- Electrical gantry plans, sections, and elevations that support the worst-case TEC equipment configuration also accounting for all interim and ultimate roadway configurations, utilizing the appropriate structural gantry plan for the background
- Details including the following:

- Gantry section showing longitudinal cable tray in section and equipment cable tray limits also include section of the equipment cable tray with associated supports
- Gantry strut channel mounting details
- Upright raceway mounting details with wire trough detail
- Details for AVI readers and CCTV mounting

- Lightning protection at the upright base

947.4.6.3 Index of Non-Accessible Gantry Plans (each gantry)

The drawing numbering for the toll facility non-accessible gantry plans must be as follows:

Exhibit 947-7: Non-Accessible Gantry Drawing Numbering Convention

Assemble the non-accessible gantry plans in the following order and format:

NON-ACCESSIBLE GANTRY STRUCTURAL PLANS

Dwg. No.	Sheet Description	Scale
*GG#-001	KEY SHEET AND INDEX OF SHEETS	
*GS#-001	GENERAL NOTES, SYMBOLS, LEGEND AND ABBREVIATIONS	
GS#-101	GANTRY PLAN NB (OR EB) INTERIM (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN NB (OR EB) INTERIM (TEC 2)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) INTERIM (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) INTERIM (TEC 2)	1⁄8” = 1’
GS#-10#	GANTRY PLAN NB (OR EB) ULTIMATE (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN NB (OR EB) ULTIMATE (TEC 2)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) ULTIMATE (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) ULTIMATE (TEC 2)	1⁄8” = 1’
GS#-201	GANTRY ELEVATION NB (OR EB) INTERIM	1⁄8” = 1’
GS#-20#	GANTRY ELEVATION SB (OR WB) INTERIM	1⁄8” = 1’
GS#-20#	GANTRY ELEVATION NB (OR EB) ULTIMATE	1⁄8” = 1’
GS#-20#	GANTRY ELEVATION SB (OR WB) ULTIMATE	1⁄8 ” = 1’
GS#-301	FOUNDATION LAYOUT PLAN	
GS#-30#	FOUNDATION NOTES AND DETAILS	
GS#-30#	REPORT OF CORE BORINGS	
GS#-401	TYPICAL SECTION	½” = 1’
GS#-40#	ENLARGED TYPICAL SECTION	1” = 1’
*GS#-40#	TABLE OF VARIABLES	
*GS#-501	RACEWAY MOUNTING PLANS	1⁄8” = 1’
*GS#-50#	VERTICAL RACEWAY SUPPORT DETAILS	
*GS#-50#	MISCELLANEOUS DETAIL(S)	
*GS#-801	EQUIPMENT SUPPORT ARM NOTES	
*GS#-80#	EQUIPMENT SUPPORT ARM DETAIL(S)	

*Sheets can be typical for multiple gantries within a sub-component set (e.g. Non-Accessible Span; Non-Accessible Cantilever).

*GG# & *GS# = lowest gantry number within each sub-component set for # character.

NON-ACCESSIBLE GANTRY ELECTRICAL PLANS

*GE#-001	ELECTRICAL SYMBOLS, LEGEND, AND ABBREVIATIONS	
*GE#-002	ELECTRICAL GENERAL NOTES	
GE#-101	GANTRY ELECTRICAL PLAN(S)	1/8” = 1’
*GE#-501	GANTRY RACEWAY MOUNTING DETAIL(S)	½” = 1’
*GE#-50#	UPRIGHT RACEWAY DETAIL(S)	¼” = 1’
*GE#-50#	WIRE TROUGH LAYOUT AND DETAIL(S)	¾” = 1’
*GE#-50#	AVI READER MOUNTING DETAIL(S)	½” = 1’
*GE#-50#	MISCELLANEOUS GANTRY ELECTRICAL DETAIL(S)	
*GE#-50#	GANTRY LIGHTNING PROTECTION DETAIL(S)	

*Sheets can be typical for multiple gantries within a sub-component set (e.g. Non-Accessible Span; Non-Accessible Cantilever).

*GE# = lowest gantry number within each sub-component set for # character.

947.4.7 Accessible Gantry Plans

See ***Exhibit 302.7-1*** for details regarding the drawing number protocol.

- The gantry structure number(s) must be included above the title block.
- A gantry number must be assigned for each toll gantry and must match the site number. When there are multiple gantries at a single site, at least one gantry number, (the mainline gantry if it is part of the multiple gantries), must match the site number.
- The structural and electrical plans and elevations must also identify the milepost and stationing of each gantry.

947.4.7.1 Accessible Gantry Structural Plans

The following items must be included on the accessible gantry structural plans:

- Structural Notes
- Gantry plans must be provided for all interim and ultimate roadway configurations, showing roadway elements, truss chord splice connections. Gantry plans must also include all toll equipment layouts and the j-arm positions for each TEC.
- Gantry elevations showing the roadway cross section at the gantry, the roadway cross slope and critical roadway elevation reference line for equipment.
    - Elevation of the centerline of the bottom chord
    - Pavement elevations at each breakpoint along the roadway cross slope for all interim and ultimate roadway configurations
    - The APE as identified in ***GTR 250.2.2***
    - Elevations must be recorded in feet to three decimal places
- Truss framing plans, and elevations
- Grating plans for upper and lower grating
- Post layout plans
- Truss cross section
- Chord splice details
- Truss details
- Foundation details
- Gantry upright details
- J-arm and attachment hardware details
- Equipment retraction assembly inclusive of gate posts, gear box layouts, toll equipment maintenance and operational clearances, etc.
- Details for the gantry columns, gear boxes, latches, grating, stairs, screening, and fall restraints
- AVI readers mounting details
- Typical cross section of the gantry and truss
- Identify left and right gear box orientations

947.4.7.2 Accessible Gantry Electrical Plans

The following items must be included in the accessible gantry electrical plans:

- Electrical gantry plans and sections that support the TEC equipment configurations for the worst-case condition for all interim and ultimate roadway configurations, utilizing the appropriate structural gantry plan for the background
- Wireway to cable tray transitions and shrouds
- Longitudinal cable tray and transverse cable tray details
- Stair and rope lighting details
- Upright wireway mounting details with wire trough detail
- Upright strut channel mounting details
- Lightning protection at the upright base

947.4.7.3 Index of Accessible Gantry Plans (each gantry)

The drawing numbering for the toll facility accessible gantry plans must be as follows:

Exhibit 947-8: Accessible Gantry Drawing Numbering Convention

Assemble the accessible gantry plans in the following order and format:

ACCESSIBLE GANTRY STRUCTURAL PLANS

Dwg. No.	Sheet Description	Scale
*GG#-001	KEY SHEET AND INDEX OF SHEETS	
*GS#-001	GENERAL NOTES, SYMBOLS, LEGEND, AND ABBREV	(1 of #)
*GS#-00#	GENERAL NOTES, SYMBOLS, LEGEND, AND ABBREV	(# of #)
GS#-101	GANTRY PLAN NB (OR EB) INTERIM (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN NB (OR EB) INTERIM (TEC 2)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) INTERIM (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) INTERIM (TEC 2)	1⁄8” = 1’
GS#-10#	GANTRY PLAN NB (OR EB) ULTIMATE (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN NB (OR EB) ULTIMATE (TEC 2)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) ULTIMATE (TEC 1)	1⁄8” = 1’
GS#-10#	GANTRY PLAN SB (OR WB) ULTIMATE (TEC 2)	1⁄8” = 1’
GS#-201	GANTRY ELEVATION NB (or EB) INTERIM	1⁄8” = 1’
GS#-20#	GANTRY ELEVATION SB (OR WB) INTERIM	1⁄8” = 1’
GS#-20#	GANTRY ELEVATION NB (OR EB) ULTIMATE	1⁄8” = 1’
GS#-20#	GANTRY ELEVATION SB (OR WB) ULTIMATE	1⁄8” = 1’
GS#-301	FOUNDATION LAYOUT PLAN(S)	
GS#-30#	FOUNDATION NOTES AND DETAILS	
GS#-30#	REPORT OF CORE BORINGS	
GS#-311	COLUMN A, B, AND C BASE CONNECTION DETAILS	
GS#-31#	COLUMN D BASE CONNECTION DETAILS	
GS#-31#	PEDESTAL DETAILS	3⁄8” = 1’

*Sheets can be typical for multiple gantries within the accessible sub-component set.

*GG# & *GS# = lowest gantry number within each sub-component set for # character.

GS#-401	COLUMN ELEVATIONS	
GS#-40#	COLUMN A AND C LOWER CHORD CONNECTION	
GS#-40#	COLUMN A AND C UPPER CHORD CONNECTION	
GS#-40#	COLUMN B LOWER CHORD CONNECTION	

GS#-40#	COLUMN B UPPER CHORD CONNECTION	
GS#-40#	COLUMN D CHORD CONNECTIONS	
*GS#-411	TYPICAL SECTION	
*GS#-41#	CAMBER AND SPLICE DETAILS	
GS#-42#	TRUSS FRAMING (1 thru 2 of 2)	
GS#-42#	TRUSS CONNECTION DETAILS (1 thru 2 of 2)	
*GS#-43#	PLATFORM DETAILS (1 thru 4 of 4)	
*GS#-50#	UPPER GRATING PLAN(S) (BY SPAN LENGTH)	1⁄8” = 1’
*GS#-50#	LOWER GRATING PLAN(S) (BY SPAN LENGTH)	1⁄8” = 1’
*GS#-50#	UPPER GRATING DETAILS	
*GS#-50#	LOWER GRATING DETAILS (1 thru 2 of 2)	
*GS#-51#	UPPER PLATFORM MAIN POST LAYOUT(S) – INTERIM(S)	1⁄8” = 1’
*GS#-51#	UPPER PLATFORM MAIN POST LAYOUT(S) – ULTIMATE	1⁄8” = 1’
*GS#-531	SCREEN PANEL DETAILS (1 thru 5 of 5)	
*GS#-53#	UPPER PLATFORM END FENCING DETAILS (1 thru 2 of 2)	
*GS#-53#	FALL RESTRAINT DETAILS	
GS#-801	J-ARM AND GEAR BOX GENERAL NOTES	
*GS#-80#	J-ARM DETAIL	
*GS#-80#	J-ARM ATTACHMENT HARDWARE	
*GS#-80#	EQUIPMENT RETRACTION ASSEMBLY ROTATION (1 thru 4 of 4)	
*GS#-8##	EQUIPMENT RETRACTION ASSEMBLY SUPPORT ARM (1 thru 2 of 2)	
*GS#-8##	EQUIPMENT RETRACTION ASSEMBLY DETAILS (1 thru 2 of 2)	
*GS#-8##	PARTIAL GANTRY PLAN / SECTION AT SUPPORT ARM (1 thru 3 of 3)	
*GS#-8##	LATCH BAR ASSEMBLY	
*GS#-8##	STOP PLATE TYPES AND DETAILS	
*GS#-8##	GEAR BOX DETAILS (1 thru 3 of 3)	

*Sheets can be typical for multiple gantries within the accessible sub-component set.

*GS# = lowest gantry number within each sub-component set for the # character.

ACCESSIBLE GANTRY ELECTRICAL PLANS

*GE#-001	ELECTRICAL SYMBOL LEGEND AND ABBREVIATIONS	
*GE#-002	ELECTRICAL GENERAL NOTES	
GE#-101	GANTRY ELECTRICAL PLAN(S)	1⁄8” = 1’
GE#-10#	ENLARGED GANTRY ELECTRICAL PLAN(S)	½” = 1’
GE#-501	AVI READER MOUNTING DETAIL(S)	
GE#-50#	CABLE TRAY INSTALLATION DETAIL(S)	
GE#-50#	WIREWAY INSTALLATION DETAIL(S)	
GE#-50#	STAIR AND ROPE LIGHT DETAIL(S)	
GE#-50#	GANTRY UPRIGHT WIREWAY SUPPORT	¼” = 1’
GE#-50#	GANTRY UPRIGHT WIREWAY	¼” = 1’
GE#-50#	WIRE TROUGH LAYOUT AND DETAIL(S)	
GE#-50#	GANTRY LIGHTNING PROTECTION DETAIL(S)	

*Sheets can be typical for multiple gantries within the accessible sub-component set.

*GE# = lowest gantry number within each sub-component set.

947.5 Design Analysis Reports

947.5.1 General

The toll site construction plans must be accompanied by a design analysis report for the mechanical systems, electrical systems, toll site equipment slabs, TEB foundation, TEB, and gantry structures. Structural and geotechnical calculations must be in accordance with the ***Structures Manual*** and ***Soils and Foundations Handbook***.

947.5.2 Mechanical Design

The design of all toll site mechanical systems must comply with Florida Administrative Code (FAC) 61G15-34, Responsibility Rules of Professional Engineers Concerning the Design of Mechanical Systems, along with all applicable building codes. This applies to new projects and any major modifications or renovations.

- Building load analysis and equipment selection:
  - An itemized AC computation design values summary sheet must be provided separate from what is provided in the load calculations. This summary sheet must include building “U” values, design conditions per American Society of Heating and Air-conditioning Engineers (ASHAE), internal building heat loads, and proposed equipment cut sheets including accessories. A standalone itemized list of these project design values per equipment/heat source must be provided as part of the AC calculations submittal package.
  - Itemized heat gain calculations must be provided to determine required cooling load and air movement requirements to effectively control the temperature and humidity in the TEB. Site-specific heat gain calculations must be provided to justify the cooling capacities of equipment selected. These calculations must be submitted prior to final design.
  - Preliminary calculations must account for heat generated by tolling equipment and tolling communications located in their respective cabinets. The heat output rate for OCC cabinets is provided in ***GTR 260.2***. The heat output rate for the TEB tolling communication cabinet and tolling equipment is provided in ***GTR 244.2***.
- Fuel oil piping:
  - The EOR must ensure the head loss within the fuel piping to and from the generator and fuel tank does not exceed the capacity of the generator fuel pump. The calculation must include consideration for changes in elevation and all fittings including but not limited to strainers, anti-siphon devices and valves.
  - For existing installations, new calculations are required if the generator pump is modified or changes in location or elevation occur as required by the project scope.

947.5.3 Electrical Design

The power design analysis report must be provided and must comply with the following requirements:

- Coordinate with the power service providers (PSP) during the design of the site. Each provider's contact's name and telephone number must be placed in the electrical design analysis report.
- The design of electrical power distribution and lighting systems must comply with Florida Administrative Code (FAC) 61G15-33, Responsibility Rules of Professional Engineers Concerning the Design of Electrical Systems. This applies to new projects, modifications, or renovations. Design drawings and design analysis reports must be prepared, reviewed, and signed and sealed by a professional engineer licensed in the State of Florida. The professional engineer must be competent in electrical engineering through training and experience.
- The plans and reports must be submitted with the Phase III (90%) submittal. The design of the associated plans beyond Phase III (90%) must not proceed until all review comments have been resolved. The reports must include all formulas, calculations, variables, mathematical substitutions, and data used to obtain the results. Reports must include, at a minimum, the calculations listed below:
    - Voltage drop calculations must be submitted for all branch circuits, feeders, and service entrance conductors beginning at the utility transformer secondary terminals. The voltage drop must be limited to the percentages outlined in the FBC.
    - Calculations to determine the load, in volt-amps and amps, using the design loads for each feeder, branch circuit, panelboard, and at the service entrance point must be submitted. Demand factors must be applied in accordance with Article 220 of the NEC. The results are used to size conductors, circuit breakers, and in voltage drop calculations.
        - The calculated load at the service entrance point must be shown on the power distribution system riser diagram in the electrical plans. Load calculations for power distribution system modifications or renovations must consist of the highest existing measured load (prior to modification), the load being removed, the load being added, and the new total calculated load.
        - Existing loads must be field verified by metering or utility information as outlined in Article 220.87 of the NEC. New service points and distribution equipment must be designed with at least 20% spare capacity in amperes.
    - Short circuit calculations must be submitted that show the available RMS fault currents, line to line, and line to ground at ½ cycle after the fault occurs. These calculations must be performed in accordance with the recommendations in the

most recent edition of IEEE Standard 141, Electrical Power Distribution Systems for Industrial Plants.

- The calculations for faults must be performed at each panelboard, automatic transfer switch, and protective device including UPS and UPS maintenance bypass.
- These calculated values must be shown on the power distribution system riser diagram in the electrical plans and used to select the interrupting capacity of each protective device, panelboard(s), and ATS to withstand ratings.
- Documentation received from the utility provider must be provided showing the maximum available fault current at the utility transformer secondary terminals. This value must be used in the short circuit analysis. The short circuit analysis must be updated if a major modification or renovation takes place.

- Electrical distribution equipment must be designed as fully rated, sufficiently, and selectively coordinated systems.
  - Time/current curves must be submitted showing selective coordination of the overcurrent devices.
  - A preliminary coordination study must be performed using a recognized software program to confirm that the specified protective devices safely interrupt electrical faults and overloads and isolate them from the smallest portion of the electrical system to minimize outages. Only the closest protective device to the fault must operate to isolate the fault without affecting other parts of the system.
  - A fault current and coordination study must be prepared for any project that proposes a new or replacement panelboard.
- Generator sizing calculations and computer simulation printouts must be submitted that show the selected engine generator at each site meets the environmental and electrical requirements described in GTR Part 2, Appendix 1, TSP Section for Engine Generators. Catalog cut sheets or specification sheets must be included that show the selected engine generator's following information:
  - Complete model number
  - Accessories
  - EPA exhaust tier level
  - Noise data at 7 meters
  - Weather protective enclosure information
  - Dimensional data

- Fuel consumption rates

- Generator size and adequacy must be recalculated and confirmed if any alterations are made to existing emergency power systems.
- Photometric calculations for interior lighting must be provided to meet the requirements of ***GTR 242.2***.

947.6 General Notes

General Notes sheets convey site-specific requirements not covered by the ***Standard Plans*** or ***Standard Specifications***. See ***FDM 914*** for additional information concerning General Notes.

947.7 Pay Items

Place pay item notes on a General Notes sheet.

Information on how quantities are determined is contained in the Estimated Quantities (EQ) Report and should not be repeated in the plans as a pay item note.

Pay item notes are used to provide unique project information not covered by the basis of payment information contained in the Standard Specifications, such as:

- Clarify how incidental work is to be paid for.
- Clarify the purpose, uses, or requirements.

Pay items associated with Toll facilities (TEB and RTC) must be included in the EQ Report. See ***FDM 902*** for additional information.

Modification for Non-Conventional Projects:
Delete the sentence above and replace with the following: “Submit a separate Schedule of Values for each toll facility within the project.” Delete ***GTR 306.1*** and ***306.2***.

947.7.1 Pay Items Common to TEB and RTC Sites

Pay items that are required for TEB and RTC Toll Facilities include:

- Toll Gantries (Non-Accessible/Accessible). Each gantry pay item includes the following:
  - Support Structure and Hardware
  - Foundation
  - Toll Equipment Mounting Hardware and Attachments
  - Cable Trays for Toll Gantries
  - Conduit
  - Surface Raceways and Wire Troughs at Toll Gantries
  - Lightning Protection
  - Electrical Equipment Strut Channel Supports
  - AVI Ground Mounted Frames
  - Accessible Gantry Gear Boxes
  - General Requirements for Toll Facilities Electrical Infrastructure associated with all work related to the toll gantry.
- Fiber Reinforced Concrete for Toll Loop Pavement (where applicable).
- Toll Site Foundations and Equipment Slabs include:
  - All toll site equipment slabs
  - TEB toll site emergency generator and fuel tank slab
  - TEB foundations
- Conduit (Open Trench/Directional Bore) excluding conduits associated with the TEB and the gantry as identified in (a) and (b) below:
  - Conduit on the gantry and conduits between the gantry and the wire troughs/AVI ground-mounted frames will be included in the gantry pay item as identified in GTR 306.1 item (1).
  - Conduit in, under, and around the TEB will be included in the Toll Plaza pay item as identified in GTR 306.2 item (1)(q).
- Bollards (Permanent/Removable)
- Electrical Power Service, Toll Site Electrical Metering and Utility Service Entrance
- Emergency Generator, Permanent includes:

  - TEB Sites: Above ground fuel tank, associated piping and accessories, and monitoring equipment. Also included are the General Requirements for Toll Facilities Electrical Infrastructure associated with all work related to the TEB generator.
  - RTC Sites: Integrated base fuel tank, associated piping and accessories, monitoring equipment, and associated accessories. Also included are the General Requirements for Toll Facilities Electrical Infrastructure associated with all work related to the RTC generator.
- Toll Site Pull Boxes (12”x12”, 24”x36”, 30”x48”)
- Fence Gate
- Toll Site Perimeter Fencing
- Concrete Bumper Guard for Parking Lot
- Bollards (Permanent/Removable)
- Bullet Rail, Single Rail
- Pedestrian/Bicycle Railing
- Pipe Handrail, Guiderail
- There are items associated with toll site construction that must be paid under the various roadway pay items in the Basis of Estimates. All quantities for these pay items must be coordinated with the roadway EOR including, but not limited to the following:
  - Earthwork (including grading for the entire toll site)
  - Roadway pavement (including the toll loop pavement area)
  - Roadway pavement (maintenance pull-off area)
  - Curb and gutter (toll header curb), where applicable
  - Limited access right-of-way fencing
  - Traffic control
  - Retaining walls (any type)
  - CIAC for primary power
  - Guardrail transition connection to rigid barrier
  - Guardrail
  - Concrete sidewalk, 6” thick
  - Shoulder concrete barrier

- Median concrete barrier
- Performance turf (sodding at each toll site)

947.7.2 TEB Sites

Pay items that will be required in addition to those identified in ***GTR 306.1*** for Toll Facilities with ***TEB*** include:

- Toll Plaza Pay Item (New Construction TEBs) includes the following:
  - Precast concrete structure
  - Foundation
  - Lightning protection including bonding to the gantry counterpoise, the generator, and the fuel tank
  - Data communications service, pathways, and wiring cable trays
  - Toll communications cabinet and raised aluminum support frame
  - Air conditioning system
  - Fuse cabinet
  - Panelboards
  - Critical power panelboards
  - Automatic transfer switch
  - Uninterruptible power supply with bypass switch
  - Grounding including at the power wire trough
  - Security system infrastructure
  - Supervisory control and data acquisition system
  - Lighting fixtures and controls
  - Surge protection
  - Conduit and wiring in, under, and around the TEB except as identified below.
    - Conduit and cabling for home runs to median pull boxes, outside shoulder pull boxes and the electrical power service are not included here and are included in ***GTR 306.1*** item (4).
  - Fire extinguishers and accessories.
- Toll Plaza (Modify Existing) - Modifying existing or phased demolition
- Toll plaza island - toll plaza island/lane work

- Concrete Class II, bulkhead
- Flowable fill
- Delivery of salvageable material
- Removal of concrete pavement, sidewalks, slabs, etc.
- Clearing and grubbing for total toll site demolition
- The lump sum pay items for modifying existing toll sites and for total site demolition must include the following:
  - Detailed notes identifying items that are included in the lump sum
  - Detailed notes identifying items that are paid under roadway pay items in the Basis of Estimates

947.7.3 RTC Sites

Pay items that will be required in addition to those identified in ***GTR 306.1*** for ***RTC*** Toll Facilities are:

- Outdoor communication cabinet pay item includes the following:
  - Dry well and accessories
  - SCADA system
  - Uninterruptible power supply (UPS) – 2 per cabinet
  - Grounding and bonding for OCC cabinet and RTC cabinets
  - Surge protection devices associated with all work related to the OCC cabinet pay item
  - General requirements for toll facilities electrical infrastructure associated with all work related to the OCC and RTC cabinets
  - Lightning protection for the OCC Cabinet pay item
  - Identification for electrical systems associated with all work related to the OCC and RTC cabinets
  - Acceptance Procedures for Toll Facilities at each RTC Toll Site
- Panelboards pay item includes the following:
  - Panelboards
  - Fire extinguishers and accessories at RTC toll sites
  - Automatic transfer switch

  - Lighting and accessories
  - Power distribution frame strut channel and associated accessories which is included in the hangers and supports for electrical systems specification
  - Grounding and bonding for power distribution frame and all electrical equipment located thereof
  - Wiring devices associated with all work related to the panelboards pay item
  - Surge protection devices associated with all electrical equipment related to the panelboards pay item
  - Lightning protection for the power distribution frame strut channel and all electrical equipment located thereof
  - Identification for electrical systems associated with all work related to the panelboards pay item
  - General requirements for toll facilities electrical infrastructure associated with all work related to the panelboards pay item
- Low voltage electrical cables and power conductors at RTC toll sites
- Electricity metering and utility service entrance at RTC toll sites

947.8 Technical Special Provision (TSP) Updates

947.8.1 General

Submit technical special provisions for ***RTC*** and ***TEB*** toll sites as follows:

- **AIA MASTERSPEC® Format:** The specification in CSI Masterformat® /AIA MASTERSPEC® format for the TEB, in its entirety is a single Technical Special Provision (TSP) with the multiple sections as identified in ***GTR Appendix 2***:
  - Prepare and submit all TSP Sections in Microsoft Word© format.
  - The page numbering of the TSP Sections must be in accordance with the requirements presented in ***Section 4*** of the ***Specifications Handbook***.
  - Track all changes and highlight proposed updates made to the TSP Sections as provided in ***GTR Part 2, Appendix 2.***
  - Contact manufacturers of all items specified in Level 2 and Level 3 TSP sections to determine the availability of items and model numbers.
- AASHTO Format: The specifications in AASHTO format are provided in ***GTR Part 2, Appendix 1 and Appendix 3****.*

- The TSP must be in accordance with the requirements presented in ***Section 4*** of the ***Specifications Handbook***.
- Prepare and submit all TSPs in Microsoft Word© format.
- Track all changes and highlight proposed updates made to the TSPs as provided in ***GTR Part 2, Appendix 1 and Appendix 3.***

- Provide all TSPs at the Phase III submittal and all subsequent submittals.

Modification for Non-Conventional Projects:
Delete the note above regarding the Phase III submittal and replace with the following: Provide all TSPs at the 90% phase submittal and all subsequent submittals.