Once work is scheduled, or the need to replace beacons is noted, the Concessionaire shall inform the Federal Aviation Administration (FAA) as to when and for what duration the work will be performed so that appropriate actions can be taken by the FAA to issue Notice to Airmen (NOTAM).

L.4.4. Navigational Warning Lights

The bridge structure in the future may require Navigational Warning Lights attached to their Superstructure, Substructure members and fender protection systems. These lights guide the safe passage of vessels and warn these vessels of the location of the structure, thus making this system essential to the safety of the Toll Roads and the river vessels. The Concessionaire must inspect the warning lights during the night at the frequency stated in Table L.3.3.2 or more often if persistent problems continue with a particular warning light. Upon discovery or notification of a broken, damaged, or malfunctioning light, the Concessionaire shall repair or replace the beacon within the Performance Time Frames stated in Table L.3.3.1.

Once work is scheduled, or the need to replace the lights is noted, the Concessionaire must inform the Army Corps of Engineers and the United States Coast Guard as to when and for what duration the work will be performed so that appropriate action can be taken as required.

L.4.5. Cables, Conduits and Unit Ducts

The Concessionaire must repair or replace all cable and associated equipment grounding cables or cable-in-duct which becomes damaged, displaced, defective, or broken. The Concessionaire must take immediate action to make temporary repairs when cable deficiencies become suspect.

Temporary cable may be used as a trouble fix until a permanent replacement can be made. When temporary cable is used, it must be installed aerial, so the lowest point is at least twenty-five (25) feet above ground level.

Cable used for permanent repairs must be new and must be installed in accordance with all applicable ordinances and codes, and in compliance with the National Electrical Code (NEC). In addition, all new cable installations must follow current PRHTA Specifications and Design Standards.

Additional cable, conduit and unit duct requirements apply as follows:

- Cable in Duct or Conduit – When the damaged or faulty cable is located in duct or conduit, the cable must be completely removed, the duct or conduit repaired, and new cable installed.
- All new cable installations must include a green colored insulated equipment ground conductor properly sized in accordance with all applicable electric codes.

- Direct bury cable may be repaired, provided the defective area is completely removed and replaced with an additional length of repair at least three (3) feet on either side of the defective area. If the repair is within six (6) feet of a light pole, handhold, or a control cabinet, the entire six (6) foot section must be replaced.

L.4.6. Facility Electrical Systems and Supplies

Electrical System work associated and required for the operation of the Toll Road Facilities must be addressed in the requirements for Volume II, Chapter G, "Facilities Operations Plan".

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M. TOLL BOOTH AND PLAZA MAINTENANCE

M.1 Definitions

AutoExpreso System: The trade name of the current Electronic Toll Collection System employed by PRTHA as of the date of the Toll Road Concession Agreement.

Light Curtain: A device that emits a light field between two poles, that maps the shape of a vehicle as the light pattern is interrupted.

Toll Booths: The physical enclosure, including protective covering, that provides safe refuge for toll collectors; toll-lane payment and processing equipment; and communications and emergency response alarms; etc.

Toll Canopy: The physical structure covering the toll booths and collection lanes that provides shelter to Toll Road users and toll collectors.

Toll Collection System (TCS): The electrical and electronic equipment and computer information management system utilized to record and verify the revenue and vehicle classification.

Toll Plazas: The facilities within which toll payments are collected from vehicles. The toll plaza includes the toll canopies; the toll booths; vehicle lanes; etc.

Treadle: A device embedded into the pavement that registers the number of axles or wheels as a vehicle passes over it.

Uninterruptible Power Supply (UPS): Power supplies that operate in parallel with the electric utility sources and supply their load without interruption when and if the utility source fails. Such power supplies must be utilized to meet the operating needs of the computers and critical elements of the Toll Collection System (TCS).

M.2 References

All stated references must be the most current version, or the document known to have succeeded or replaced the original stated herein:

- "International Building Code", IBC.
- "Manual on Uniform Traffic Control Devices (MUTCD)", FHWA.
- "National Fire Codes", NFPA.
- "National Electrical Code", NFPA.
- "International Mechanical Code", IMC.
- "National Plumbing Code, ANSI.
- "Uniform Plumbing Code", WPOA.
- "Uniform Heating and Cooling Code", WPOA.
- "Chimneys, Fireplaces and Vents Code", NFPA.
- Americans with Disabilities Act", U.S. Department of Justice.
- National Standards, Specifications and Regulations as applicable, from the following organizations:
    - National Electrical Manufactures Association (NEMA).
    - American National Standards Institute (ANSI).
    - American Society for Testing and Materials (ASTM).
    - Federal Communications Commission (FCC).
- Original Equipment Manufacturer's (OEM) specifications, Maintenance Manuals, Handbooks, Procedures Guides, etc. as applicable for all installed equipment, systems and components.
- LEED (Leadership in Energy and Environmental Design) Guidelines.

M.3 Policy for Performing Toll Plaza Maintenance

M.3.1 Objective

The objective of Toll Booth and Plaza maintenance is to ensure that all elements, components, and systems are maintained in such a manner that they remain safe, functional, and continually operational in support of the toll collection activities along the Toll Roads, without posing hazards or undue delays to Toll Road users.

The Toll Booth and Plazas (including crash protection, canopies, lighting, signage, and all appurtenances) require maintenance; repairs due to damage, wear, breakage and age; emergency maintenance; cleaning; retrofittings; and replacement due to age and obsolescence.

M.3.2 Responsibility of Concessionaire

To meet the requirements of this Chapter, the Concessionaire must engage in practices to ensure that all Toll Booth and Plaza components, elements, systems and appurtenances are continually operational, secure, clean, sound, and in all ways safe and suitable for use. This requires that the Concessionaire carry out its obligations in accordance with this Chapter in a manner that maintains and/or improves the condition and functionality of the Toll Booths and Plazas.

As of the date of the Toll Road Concession Agreement, the Toll Road users are able to recharge their balances through the In Lane Replenishment lanes (ILR) installed at the Toll Booths and the toll transaction is assigned when the Toll Road users pass through the ETC channelized toll lanes at the toll plaza. In some toll plazas, an Open Road Tolling system with gantries has already substituted the channelized lanes and, after substantial completion of the ORT Improvement Project, only the ILR lanes will be in use at the toll plaza and the toll transaction will be assigned when the Toll Road users pass through the toll gantry at the Toll Point. Then, the Canopies Demolition Project will be executed in the Toll Roads.

All equipment and resources required in supporting the operation of the Toll Booths and Plazas must be provided without fail by the Concessionaire. All repair and replacement work must be scheduled, staged and preplanned so as not to adversely impact traffic movement or safety or the accuracy and validity of the toll collection procedures, or cause undue exposure of Toll Road employees to traffic.

The Concessionaire must perform Toll Booth and Plaza maintenance, inspection and work activities at a frequency that ensures uniform and consistent compliance with all PRHTA, manufacturer recommendations and the requirements specified within this Chapter.

All materials and construction requirements for Toll Booth and Plaza work performed by the Concessionaire must conform to the appropriate and applicable requirements of the Reference Documents noted in Section M.2 of this Chapter.

Once a particular maintenance repair has been started, the work must continue during consecutive working days as weather permits until a thorough, complete and workmanlike repair has been achieved. The Concessionaire must establish and maintain all required traffic control and protection.

Work on Toll Booth and Plaza elements, components, systems and appurtenances within the Toll Systems that must be performed by the Concessionaire includes the following:

- General:
  - Create and maintain an inventory and history record of all Toll Booth and Plaza equipment, elements, components, systems, and appurtenances.
  - Ensure that only qualified, certified, licensed and/or well-trained personnel perform work to these items, especially to sensitive, proprietary, and complex equipment and systems.
  - The maintenance of the Toll Plaza approach and departure lanes are included with the requirements stated within Volume I, Chapter B, "Roadway Maintenance". The Concessionaire must be aware that these lanes will require additional attention due to the defects that can be induced by the constant pavement stresses from the rapid deceleration and acceleration of vehicles; the increased pavement joint deterioration by numerous weaving and lane-changing vehicles; the likelihood of damages caused by an increase in vehicle collisions; and other similar factors.

- Toll Booth and Plaza Signage:
  - The maintenance of the Toll Booth and Plaza Signage is included with the requirements stated in Volume I, Chapter K, "Signs and Signage Systems Maintenance", with the exception of the following:
    - Ensure that all toll rate signage is current, updated with changes in rate schedules, and well placed to inform Toll Road users of the applicable tolls.
    - Ensure that the Toll Booth toll payment message process signs are well illuminated, functioning properly, clean, legible, and free of all defects.

- Toll Booth Gates:
  - Maintain all vehicle stop/go gates and all AutoExpreso Lanes free of defects, damage and malfunctions that could create or have the potential to create an unsafe condition.
  - Maintain all lane open/closed gates free of damage and defects.

- Toll Booth and Plaza Lighting:
  - The maintenance of the Toll Booth and Plaza Lighting is included with the requirements stated in Volume I, Chapter L, "Lighting and Electrical System Maintenance", with the exception of the following:
    - Ensure that all Toll Plaza and Toll Booth lighting provides the proper illumination; functions as intended; remains free of damage and defects; remains free of burnt-out bulbs; and does not create an unsafe condition for Toll Road employees and users.
    - Ensure that lane status, driver stop/go lights, the canopy, AutoExpreso lane signs, and the lane opened/closed lighting are functioning properly and are free of defects, burnt-out bulbs and damage.

- Toll Booth and Plaza Collection Equipment:
  - Ensure that all toll collection equipment is properly functioning; free of defects and damage; and regularly inspected for continual operational ability. These components, elements, and systems that either comprise or interact with the collection of tolls include, but are not limited to, the following:
    - Treadles
    - Light Curtains
    - Detector Loops
    - Toll Payment Message Process Signs
    - Vehicle Stop/Go Lights
    - AutoExpreso Equipment
    - Cash Drawers
    - TCS Connections & Equipment
    - UPS Connections
    - Intercoms, Phones and Communication Systems
    - Emergency Alarms
    - CCTV System

- Toll Plaza Canopies:
  - Ensure that the canopies are free of defective roofing, deficient drainage, loose or missing bolts, cracked welds, corrosion, loss of paint, deformation, loss of section, eccentricity or rotation about an axis, or other indications of weakened support.

- Ensure that the connection and support of all illuminated rooftop and structure mounted signs indicating lane status, as well as lane open/closed lighting, are secure, and free of loose connections, buckled members, excessive corrosion, and other damage.

- Toll Booth Units:
  - Repair all windows that leak, have a poor wind seal, or are scratched and clouded offering poor visibility.
  - Repair or replace all booth doors that do not close properly, do not seat on the weather-seal, or that have broken locks.
  - Ensure that all communications equipment, including the intercom and the emergency signal device(s) are maintained in continual working order, and if broken or malfunctioning, are repaired.
  - Ensure that all ventilation and air conditioning equipment is properly operating.

- Toll Collection System (TCS) and Uninterruptible Power Supply (UPS):
  - Ensure that the TCS and the UPS remain operational at times, with periods of "down-time" limited only to those necessary for repair or maintenance work.
  - Ensure that all repair and maintenance work is performed by qualified personnel familiar with the system.
  - Perform maintenance and "back-ups" of the TCS.

M.3.3 Performance Time Frames

The following table establishes the maximum duration (measured from the time a deficiency is or reasonably should be detected by or reported to the Concessionaire),within which the Concessionaire must complete the required maintenance, repair or replacement work to Toll Booth and Plaza system, element, component, or appurtenance:

TABLE M.3.3.1

Toll Booth and/or Plaza Component, Element or System	Maximum Time Duration
Toll Booth and Plaza Signage	16 Hours
Toll Booth Gates	24 Hours
Toll Booth and Plaza Lighting	16 Hours
Toll Plaza Collection Equipment	8 Hours
Toll Plaza Canopies	7 Days
Toll Booth Units	2 Days
TCS and UPS	4 Hours

The following table establishes the minimum frequency that a particular maintenance operation is to be performed.

TABLE M.3.3.2

Maintenance to be Performed	Minimum Frequency of Occurrence
Toll Booth Cleaning:	
- Cleaning Booth Signs and Windows	3 Times Per Week
- Emptying of Litter Receptacles	Daily

M.3.4 Acceptance Criteria

Toll Plaza and Toll Booth maintenance work will be considered acceptable when the following criteria are met or exceeded:

- General:
  - The inventory and history record is current and complete.
  - The Toll Booths and the areas surrounding the Toll Plaza present a clean, tidy and neat appearance.

- Toll Booth and Plaza Signage:
  - The toll rate signage is current, updated with changes in rate schedule, and are well placed.

- The Toll Booth toll payment message process signs are well illuminated, functioning properly, clean, legible, and free of all defects.

- Toll Booth Gates:
  - The Automatic Coin Machine and Toll Booth stop/go gates and AutoExpreso lanes are functioning properly, are free of all defects and damage, and do not present an unsafe condition.
  - The Toll Booth Lane open/closed gates are free of damage and defects.

- Toll Booth and Plaza Lighting:
  - Toll Plaza and Toll Booth lighting is providing the proper illumination; functioning as intended; free of damage and defects; free of burnt-out bulbs; and does not create an unsafe condition.
  - The lane status, driver stop/go lights, AutoExpreso signs, and the lane opened/closed lighting are functioning properly, and are free of defects, burnt-out bulbs, and damage.

- Toll Booth and Plaza Collection Equipment:
  - All toll collection equipment, components, elements, and systems are properly functioning and free of defects and damage.

- Toll Plaza Canopies:
  - The canopies are free of defective roofing, deficient drainage, loose or missing bolts, cracked welds, loss of paint and section, deformation, eccentricity or rotation about an axis, and other indications of weakened support.
  - The connection and support of the illuminated guidance signs are secure and free of loose connections, buckled members, excessive corrosion, and other damage.

- Toll Booth Units:
  - All windows are free of leaks, poor wind seals, not scratched or clouded, and provide good visibility.
  - All booth doors close properly, seat on the weather-seal, and have properly functioning locks.
  - All communications equipment, including the intercom and the emergency signal devices are in proper working order, and functioning as intended.
  - All ventilation and air conditioning equipment are properly operating.

- Toll Collection System (TCS) and Uninterruptible Power Supply (UPS):
  - The TCS and the UPS are fully operational.
  - Maintenance and "back-ups" of the TCS are being performed on a regular basis.

- Lane Capacity Ability
  - The three (3) types of lanes within the Toll Roads should have the ability to accommodate the following approximate through put capacities, in vehicles per hour (vph) unless weather or geometrical conditions warrant otherwise:
    - ILR: approximately 350 vph
    - AutoExpreso (channalized- approximately 1,800 vph
    - AutoExpreso (Free Flow- approximately 2,400 vph

M.4 Additional Requirements for Toll Plaza Maintenance

M.4.1 Inventory and History Record

The Concessionaire must develop, maintain, and keep current a complete and detailed inventory and history record of all Toll Plaza and Toll Booth equipment, components, systems, and appurtenances, and must keep an ample supply of replacement parts available on-site. The inventory and history record must include the following at a minimum:

- Type, make, model, age, installation date and location of every toll booth component and element.
- Chronological history of all repairs/replacements including a brief note of what the change was (i.e. replaced treadle, repaired light curtain, etc.).

M.4.2 Toll Booth and Plaza Signage

The requirements for inspecting, cleaning, repairing, relocating and replacing signage within the Toll Roads related to the Toll System are discussed in Volume I, Chapter K, "Signs and Signage Systems Maintenance".

The Concessionaire's maintenance staff must make it a habit to regularly observe sign conditions and illumination while patrolling the Toll Roads, and any damaged, non- functioning lights or impaired visibility must be reported for repair.

Any toll regulatory signs that are placed by the Concessionaire to inform motorists of the penalties for toll evasion must be approved by PRHTA, and must be inspected, cleaned, replaced or modified as necessary, and maintained in the same manner as discussed herein and as specified in Volume I, Chapter K, "Signs and Signage Systems Maintenance".

M.4.3 Toll Plaza Gates

Malfunctioning gates or AutoExpreso Lanes must be reported by the toll attendants since they can pose a safety concern to Toll Road users. Toll gates that continually malfunction or have impacted vehicles must be locked in the open/up position and disconnected/deactivated from operations until repaired.

M.4.4 Toll Booth and Plaza Lighting

The lighting maintenance and replacement requirements, including lamp replacement and requirements for electrical systems, are specified in Volume I, Chapter L, "Lighting and Electrical System Maintenance".

Toll Booths and Plaza lighting must be maintained as discussed above. All lighting fixtures that present unsafe conditions, such as the presence of smoke or excessive heat, that flicker or are dark, or that demonstrate high current draw, must be repaired.

Toll attendants are to visually inspect all lighting within and around the Toll Booths and Plazas including toll payment process lights; driver stop-and-go lights; etc.; during each shift and must report all defects for repair.

M.4.5 Toll Booth and Plaza Collection Equipment

The accuracy, functionality and operation of toll collection equipment including, but not limited to, the treadles, vehicle light curtains, etc., must be verified by the Concessionaire daily, by comparing traffic axle counts with the toll collection reports and vehicle classification device data. Malfunctioning toll collection equipment must be regarded as deficient components that affect productive services, and therefore must be repaired. If proper operation cannot be restored within this time frame, the affected toll plaza lane can remain closed, and traffic diverted to one of the remaining plaza lanes until such time as repairs are complete.

M.4.6 Toll Plaza Canopies

The toll plaza canopies must be inspected annually in the same manner as any component of the Toll Road Facilities, in accordance with Volume II, Chapter L, "Annual State of the Toll Roads and Capital Improvement Program Reports". The integrity of the roofing system and all architectural elements, the security of the cladding system, the functioning of the drainage system and downspouts, and the operation of the electrical and lighting systems must be inspected and repaired when found deficient.

The canopy frame and foundations will require an independent inspection and performance evaluation by the Concessionaire's Puerto Rico Licensed Professional Engineer.

M.4.7 Toll Booth Units

All toll plaza booths must be inspected annually in accordance with Volume II – Operations and Procedures Manual, Chapter L, "Annual State of the Toll Roads and Capital Improvement Program Reports".

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N. FACILITY MAINTENANCE

N.1. Definitions

Electrical Systems: Systems, elements and components that are contained in Facilities, and which supply, distribute and function using electricity. These systems include, but are not limited to substations, meters, wiring, service panels, individual circuits, generators, transformers, lighting, motor control units, back-up generators and systems, emergency lighting, etc.

Facility: The buildings, houses, and garages within the Toll Roads that contain administrative, support and logistical services; and the equipment, components, elements and systems that are housed within in each such location.

Fire Protection Systems: Systems, elements and components that are intended to assist in the prevention and suppression of fire. These systems include, but are not limited to, fire extinguishers, exit signage, fire alarms, sprinkler systems, carbon monoxide detectors, heat sensors, smoke detectors, etc.

Life Safety Systems: Systems, elements and components that are contained in facilities, and which promote health, safety, and life preservation. These systems include, but are not limited to, communication systems; security systems; fire suppression and prevention systems; and medical prevention and attention stations; etc.

Mechanical Systems: Systems, elements and components that are contained in facilities and that supply and distribute ventilation and climate control. These systems include, but are not limited to, HVAC systems and components, thermostats, boilers, combustion dampers, air handling units, fresh air intakes, ductwork, return fans, zone dampers, exhaust fans, chillers/condensers, pumps, etc.

Plumbing Systems: Systems, elements and components that are contained in facilities, and that supply, distribute and provide potable water, or dispose of wastewater. These systems include, but are not limited to, valves, piping, water heaters, water storage tanks, faucets, toilets, sinks, showers, booster pumps, ejector pumps, sanitary piping, hot/cold water piping, etc.

Preventive Maintenance: Services required to maintain a facility and its components, equipment, and systems at the original design standards throughout their intended life span, including periodic and scheduled inspections, adjustment, calibration, cleaning, replacement of parts and minor repairs to restore equipment to normal function.

Security Systems: Systems, elements and components which promote safety and security of the people and facilities from outside parties. These systems include, but are not limited to, alarms, cameras, monitor stations, intercoms and radios, access control, etc.

Uninterruptible Power Supply (UPS): Power supplies that operate in parallel with the electric utility sources and supply their load without interruption when and if the utility source fails. Such power supplies must be utilized to meet the operating needs of the computers and critical elements of the Toll Collection System (TCS) and Open Road Tolling Systems (ORT).

N.2. References

All stated references must be the most current version, or the document known to have succeeded or replaced the original stated herein:

- Design Directives, PRHTA
- Standard Specifications for Road and Bridge Construction, PRHTA
- "International Building Code (IBC 2003)", ICC.
- "National Fire Codes", NFPA.
- "National Electrical Code", NFPA.
- "International Mechanical Code", IMC.
- "National Plumbing Code, ANSI.
- "Uniform Plumbing Code", WPOA.
- "Uniform Heating and Cooling Code", WPOA.
- "Boiler and Unfired Pressure Vessel Code, ASME.
- "Chimneys, Fireplaces and Vents Code", NFPA.
- Americans with Disabilities Act (ADA)", U.S. Department of Justice.
- Occupational Health and Safety Act (OSHA) Guidelines
- OSHA Publications List via Catalog or Website, OSHA (Website: http//:www.osha.gov/pls/publications/pubindex.list).
- Standards, Specifications and Regulations as applicable, from the following organizations:
    - National Electrical Manufactures Association (NEMA).
    - American Waterworks Association (AWWA).
    - American National Standards Institute (ANSI).
    - American Society for Testing and Materials (ASTM).
    - Federal Communications Commission (FCC).
    - Underwriters Laboratory (UL).
- Original Equipment Manufacturer's (OEM) specifications, Maintenance Manuals, Handbooks, Procedures Guides, etc. as applicable for all installed equipment, systems and components.

N.3. Policy for Performing Facility Maintenance Work

N.3.1. Objective

The objective of Facility Maintenance is to ensure that all Facilities within the Toll Roads and the components, elements and systems located within such Facilities are properly maintained in such a manner that they remain safe, habitable, and continually operational in their functions of supporting the Toll Roads.

Presently the Toll Road Facilities consist of Administration Buildings, which have public restrooms and a public service area, and General Maintenance Facilities at each Toll Plaza.

Facilities require maintenance; repairs due to weather damage, wear and breakage, age, and other use-related factors; emergency maintenance; preventative maintenance; retro- fittings; and replacements due to age and obsolescence.

In addition, effective Facility Maintenance requires management of inventory; physical assets; workforce; building systems; equipment operation; inspection and repair by qualified personnel; and protocols for tracking and fulfilling work.

N.3.2. Responsibility of Concessionaire

To meet the requirements of this Chapter, the Concessionaire must engage in practices to ensure that all Facilities as well as their components, elements and systems remain continually operational, secure, clean, sound, and in all ways safe and suitable for use. This requires that the Concessionaire carry out its obligations in accordance with this Chapter in a manner that maintains and/or improves the condition and functionality of the Facilities; and prevents unforeseen breakdowns.

With the Toll Roads being open on a continual basis without interruption, the Concessionaire is responsible for all Facilities to remain in full and constant operation, and all staff, equipment, systems, components, and resources are required to support the Facilities without fail. All repair, replacement and maintenance work must be scheduled, staged, and preplanned so as not to adversely impact or impair the operation of the Facilities, Toll Road users or the Toll Collection System, or to cause undue exposure of Toll Road employees.

To ensure compliance with the objectives and requirements of this Chapter, the Concessionaire must incorporate sound and established Facility Maintenance practices; and must perform preventative maintenance strategies to ensure that the equipment service continues to function reliably.

The Concessionaire must perform Facility Maintenance, inspection and work activities at a frequency that ensures uniform and consistent compliance with all PRHTA, Commonwealth and Federal regulations and the requirements specified within this Chapter.

The Concessionaire must engage qualified, bonded and/or licensed personnel to service, operate, inspect, and repair the systems within the Facilities.

All materials and construction requirements for Facilities Maintenance work performed by the Concessionaire must conform to the appropriate and applicable requirements of the Reference Documents listed in Section N.2 of this Chapter.

Once a particular maintenance repair has been started, the work must continue during consecutive working days as weather permits until a thorough, complete, and workmanlike repair has been achieved.

Work on the Facilities, and the elements, components, systems, and appurtenances housed within each Toll Road Facility that must be performed by the Concessionaire includes, but is not limited to, the following:

- General:
    - Create and maintain an inventory and history record of all Facility equipment, elements, components, systems and appurtenances.
    - Ensure that only qualified, certified, licensed and/or well-trained personnel perform work to these items, especially to sensitive, proprietary and complex equipment and systems.
    - Coordination with all utilities and services including, but not limited to, electric, gas, fuel, telephone, sewer, sanitary and water.
    - Ensure that the work areas are left in a manner that presents a clean and tidy appearance.

- Building Exteriors:

  Generally: Ensure that the Facility exteriors are maintained so to preserve the integrity of the exterior building envelopes; ensure the safety of the Facility and its occupants and visitors; and maintain a positive image of the Toll Roads.

    - Foundations: Ensure that visible components of foundations and supported elements are inspected where settlement conditions are found and repaired as instructed by a Licensed Professional Engineer in the Commonwealth of Puerto Rico. In addition, all visible surfaces should be maintained free of cracks, seepage, scaling, spalling, corrosion, deterioration, or efflorescence.
    - Exterior Walls: Ensure that the walls are free of corrosion, spalls, cracks, misalignment, rust, peeling, blistering and other such defects and deficiencies; and that all bolts, clips, rivets, nails, and other fasteners are properly attached and secure.
    - Exterior Walls: Ensure that the masonry wall facades are free of cracks, broken masonry units, open mortar joints, efflorescence, and deterioration and correct all suspected moisture infiltration.
    - Flagpole: Ensure that the flagpole remains free of rust, corrosion, deterioration, and remains well secured.

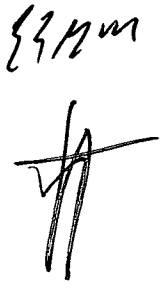
- Roofing: Ensure that roofing is free of all surface's bare spots, blistering, splits, cracks, ridging, loose laps and seams, punctures, missing fasteners, and general deterioration.
- Roofing: Ensure that all flashing, counter flashing, copings, seals, roof penetration points, around roof top HVAC equipment, and parapet wall roofing terminations are free of leaks, cracks, punctures, and deterioration.
- Roofing: Ensure that roofing drains adequately so that it remains free of ponding, staining and debris collection.
- Roofing: Ensure that roof ventilation systems provide continual airflow, prevent condensation, and prevent icing at the eaves and roof edges.
- Gutters: Ensure that all gutters and downspouts are free of leaks, obstructions, rust and corrosion, and function as intended. Ensure that downspouts discharge directly into drains or onto rainwater splash blocks or impervious surfaces to lead water away from face of building, as intended.
- Exterior Doors: Ensure that all doors are free of leaks, drafts and air gaps; all hinges, closers, locksets, and other hardware or components operate as intended; and all door frames and panels are secure and properly set.
- Garage Doors: Ensure that all door panels are free of defects and deficiencies; frames and panels are secure and properly set; and springs, cables, door openers and other hardware operate as intended.
- Windows: Ensure that all windows are free of breaks, leaks, voids and non-operational components.
- Surface Finishes: Ensure that all exterior paints and coatings are free of flaking, blistering, chalking and other deterioration.
- Sealants: Ensure that joint sealants, weather-protection sealants and draft-stopping sealants are intact and functioning as intended.
- Signs: Ensure that all signs and sign components are free of rust, corrosion and deterioration, and are well secured.

- <u>Building Interiors:</u>
  - Interior Floors: Ensure that all floor coverings are clean, free of trip and slip hazards, and replaced or repaired when worn.
  - Walls and Partitions: Ensure that all walls are free of cracks, penetrations, water damage, faded or damaged coverings, and all other damage that might be either aesthetic or structural. Ensure that cracked tiles of tiled surfaces are replaced and that joints which are functionally or visually deteriorated are re-grouted.

- Toilet Partitions: Ensure that partitions are securely mounted, free of damage and corrosion, correctly aligned so that doors operate without binding, and that hardware operates as intended. Ensure that toilet accessories and mirrors are securely mounted, free of damage and operate as intended.
- Interior Doors: Ensure that all doors frames and panels are secure and properly set; and all hinges, closers, locksets, and other hardware or components operate as intended.
- Interior Windows: Ensure that all windows are free of breaks and non-operational components.
- Ceilings: Ensure that the drywall ceilings, suspended ceiling, and other types of ceilings are firmly attached and secure; and remain free of all cracks, water damages, and other deficiencies.
- Built-in Fixtures: Ensure that worktops, vanity tops, cabinets, lockers and other built-in fixtures are free of damage, doors and drawers operate smoothly and cabinet hardware operates as intended.

- Mechanical Systems:
  - HVAC Controls: Ensure that all thermostats, automatic control valves and dampers, diffusers, control units, etc. are inspected, tested, maintained, repaired and replaced as required to maintain space temperature set point and operation of all HVAC systems.
  - HVAC Distribution System: Ensure that all of the HVAC distribution components and systems, including ductwork, grills, registers, volume dampers, supply, return fans, exhaust systems, etc., are inspected and tested; free of rust, corrosion, damage, or defects; and replaced or repaired as required to maintain system operation.
  - HVAC Cooling Units: Ensure that all cooling units provide trouble free operation to maintain space temperature set points. Also ensure that all HVAC equipment such as air handling units, unitary air conditioning units, split system air conditioning units, etc., are inspected and tested. Maintenance of this equipment requires inspection of associated hydronic and refrigerant coils, gas fired furnaces, condenser coils, and supply fans, return fans, exhaust fans, etc. Additionally terminal equipment such as air terminal units, etc., will require inspection and testing. All equipment or equipment component must be free of damage, deterioration and non– functional items replaced. All equipment must conform to all applicable codes and regulations as noted in Section N.2 of this Chapter. Equipment must be kept clean and continually operational at all times.

- Plumbing Fixtures: Ensure that all plumbing fixtures, including sinks, toilets, showers, spigots, drains, faucets, drinking fountains, etc., remain free of leaks, are clean, remain unclogged, and are free of damage and defects that affect their function and operation. Replace any damaged plumbing fixture or associated components that are beyond repair.
- Plumbing Hot Water Heaters: Ensure that all hot water heaters are free of leaks, corrosion, malfunctions and defects that would impair or interrupt the intended service. If mixing valves are installed any temperature sensors are required to be to be checked to meet the applicable Code required at the discharge temperature.
- Plumbing Pumping Systems: Ensure that all ejector pumps, sewage pumps, sump pumps, water pumps, portable-dewatering pumps, submersible pumps and all other pumps within the Facilities function as intended, and are fully capable of operating as intended when required.
- Domestic Water Piping System: Ensure that all supply and pipelines including anti-siphon devices are free of leaks, damage, corrosion and deterioration; and are well secured. Ensure that backflow preventer(s) is/are present and operational on all lines that allow a hose hookup. Ensure the piping insulation and labels are installed and are in good condition, and repair/replace any damaged insulation.
- Sanitary and Vent System: Ensure that the sanitary and vent piping systems are free of any clogs. Repair or replace any damaged piping and ensure that all clean-outs are kept accessible and are sealed.



- Electrical Systems
  - Electrical Supply and Distribution: Ensure that all wiring, raceways, unit substations, panel boards, circuits, receptacles, switches, etc., or other items that distribute or supply electricity to systems or items within the Facilities conform to all applicable codes and regulations; are free of "short", loose connections, defects and damage; are clearly identified and marked; are secured as required to prevent unwarranted entry; and are properly attached and secured at all times.
  - Electrical Lighting: Ensure that all lighting provides the proper illumination for the function intended; is secured in its place; conforms to all applicable codes and regulations; is free of burnt-out or malfunctioning bulbs; is free of broken, damaged or defective reflectors, fixtures, or lenses; and is free of loose and faulty wiring.
  - Electrical Motor Control Units: Ensure that all operations both to and from the Motor Control Units provide the proper volts and amperage; function and supply the equipment in the correct order and manner; are free of defects and deficiencies; and provide full operating capacity when required.

- Facility Services:
  - Grounds Maintenance: Ensure that with respect to the grounds around each Facility within the Toll Roads, landscaping and cleaning is performed in accordance with the requirements stated in Volume I – Maintenance Manual, Chapter E, "Landscape and Roadside Maintenance".
  - Housekeeping: Ensure that all portions, areas and rooms of each Facility are cleaned at least daily to remove trash; sanitize and disinfect bathrooms and locker rooms; and restock bathroom amenities.
  - Pest Control: Ensure that pest control is performed, monitored and maintained if and when required; the remains of the traps properly disposed; and the source of the problem is located and corrected.

- Life Safety:
  - Communication Systems: Ensure that all telephones, intercoms, radios systems, mobile communication base stations, and all other communication systems that are housed or originate in a Facility are maintained, repaired, tested, inspected, and replaced so that they remain in full and continual operation, as applicable.
  - Fire Suppression, Fire Alarm and Precaution Systems: Ensure that all fire alarms, sprinkler systems, heat sensors, smoke detectors, carbon dioxide detectors, fire extinguishers, call buttons, exit signs, emergency lighting, and all other fire suppression and precaution items are fully charged and replaced on a determined schedule; conform to all applicable codes, laws and regulations; are free of defects, deficiencies and malfunctions; and are inspected, tested, maintained, repaired and replaced so that they remain ready for proper operation when required.
  - Medical Prevention and Attention Stations: Ensure that all medical prevention and attention stations are inspected, replenished, updated and clearly located at all times. These items include, but are not limited to, first-aid kits, emergency contact signage, eye wash stations, safety showers, etc.
  - Security Systems: Ensure that all systems that provide for the safety of the Concessionaire's staff, the public, equipment and Facilities are maintained, inspected, tested, repaired and replaced so as to provide full and continual operation. These security systems include, but are not limited to, cameras, monitoring stations, access control, surveillance, alarms, etc.

- Emergency Power Supply System:
    - An Uninterrupted Power Supply (UPS) system located in each Toll Road Facility Toll Plaza Building, and provides power to the Electronic Toll Collection System (ETC) and Open Road Tolling System (ORT) 24 hours a day, 365 days a year. In order to ensure that this service is provided without interruption a back-up power supply should be present at each location. The Concessionaire must inspect, test, maintain, repair and if required replace or supplement the back-up power supply so that if a power interruption does occur, the ETC and ORT will continue to operate and function.

N.3.3. *Performance Time Frames*

The following table establishes the maximum duration (measured from the time a deficiency is or reasonably should be detected by or reported to the Concessionaire), within which the Concessionaire must complete the required maintenance, repair or replacement work to Facility and/or its systems, equipment, elements, components or appurtenances:

TABLE N.3.3.1

Facility Component, Element or System	Maximum Time Duration
Building Exterior:	
-Exterior	1 Day
-Exterior Walls	2 Weeks
-Flag Pole	7 Days
-Foundations	7 Days
-Garage Doors	8 Days
-Gutters	4 Weeks
-Roofing	5 Days
-Signs	1 Week
-Windows	7 Days
Building Interiors:	
- Ceilings	2 Weeks
- Interior Doors	7 Days
- Interior Floors	2 Weeks
- Interior Windows	1 Week
- Walls and Partitions	4 Weeks
Mechanical Systems:	
- HVAC	8 Hours
- Plumbing	12 Hours
Electrical Systems	8 Hours
Life Safety:	
Communication Systems	2 Hours
Fire Suppression and Precaution	2 Hours
Medical Prevention and Attention	4 Hours
Security Systems	1 Hour
Emergency Power Supply System	Immediate (Initial Response)

N.3.4. *Acceptance Criteria*

Facility maintenance work will be considered acceptable when the following criteria are met or exceeded:

- General:
  - The inventory and history record is current and complete.
  - The work areas inside and outside of the Facilities present a clean, tidy and neat appearance.

- Building Exteriors:
  - Exterior Doors: All exterior doors are free of leaks, drafts, voids; all hinges, closers, locksets, and other hardware or components operate as intended; and all door frames and panels are secure and properly set.
  - Exterior Walls: All exterior walls are structurally sound; do not present any safety hazards; are free of corrosion, spalls, cracks, misalignment, rust, peeling, blistering, and other defects and deficiencies; all bolts, clips, rivets, nails, and fasteners are secure; and all masonry wall facades are free of cracks, broken masonry units, open mortar joints, efflorescence, and deterioration.
  - Flag Pole: The flag pole is free of rust, corrosion, deterioration, and is secure.
  - Foundations: The foundations are free of all settlement, deflection, expansion, or contraction conditions; and all cracks, seepage, scaling, spalling, corrosion, deterioration, and efflorescence has been repaired
  - Garage Doors: All door panels are free of defects and deficiencies; frames and panels are secure and properly set; and springs, cables, door openers and other hardware operate as intended.
  - Gutters: All gutters and downspouts are free of leaks, obstructions, rust and corrosion, and function as intended.
  - Roofing: All roofing is free of all bare spots, blistering, splits, cracks, ridging, loose laps and seams, punctures, missing fasteners; all flashing, counter flashing, copings, seals, roof penetration points, and parapet wall roofing terminations are free of leaks, cracks, punctures and deterioration; the roofing drains adequately so that it remains free of ponding, staining and debris collection; and the roof ventilation provides continual airflow, prevents condensation and prevents icing at the eaves and roof edges.
  - Windows: All windows are free of breaks, leaks, voids and non-operational components.
  - Signs: All signs are free of rust, corrosion, deterioration, and are well secured.

- Building Interiors:
  - Ceilings: All ceilings are firmly attached and secure; and remain free of cracks, water damages and other deficiencies.
  - Interior Doors: All doors frames and panels are secure and properly set, and all hinges, closers, locksets, and other hardware or components operate as intended.
  - Interior Floors: All floor coverings are clean, free of trip and slip hazards, and replaced or repaired when worn.
  - Interior Windows: All windows are free of breaks and non-operational components.
  - Walls and Partitions: All walls are free of cracks, penetrations, water damage, faded or damaged coverings, and all other aesthetic and structural damage.
  - Public Restroom: All fixtures, toilets, sinks are clean, sanitized; hand-dryers function properly; all supplies are replaced so as to maintain an ample supply; floors, walls and mirrors are clean; area is properly ventilated; and toilet partitions function properly and are free from graffiti.

- Mechanical System:
  - HVAC Controls: All thermostats, automatic control valves and dampers, diffusers, control units, etc., have been inspected, tested, maintained, repaired and replaced as required to maintain space temperature set point and operation of all HVAC systems.
  - HVAC Distribution System: All HVAC distribution components and systems, including ductwork, grills, registers, volume dampers, supply, return fans, exhaust systems, etc., have been inspected and tested; free of rust, corrosion, damage, or defects; replaced or repaired as required to maintain system operation.
  - HVAC Cooling Units: All heating and cooling units are operating trouble free to maintain space temperature set points. All HVAC equipment such as air handling units, unitary air conditioning units, etc. have been inspected and tested. All associated hydronic and refrigerant coils, gas fired furnaces, condenser coils, supply fans, return fans, exhaust fans, etc., has been inspected. Additionally, terminal equipment such as duct mounted heaters, furnaces; air terminal units, unit heaters, etc., have been inspected and tested. All equipment or equipment components are free of damage, deterioration, and non–functional items have been replaced. All equipment conforms to all applicable codes and regulations. Equipment is clean and continually operational.

- Plumbing Fixtures: All plumbing fixtures, including sinks, toilets, showers, spigots, drains, faucets, drinking fountains, etc., are free of leaks, are clean, remain unclogged, and are free of damage and defects. Damaged plumbing fixture or associated components beyond repair have been replaced in kind.

- Plumbing Hot Water Heaters: All hot water heaters are free of leaks, corrosion, malfunctions and defects. Mixing valves are properly installed and temperature sensors meet the required code discharge temperature.
- Plumbing Pumping Systems: All ejector pumps, sewage pumps, sump pumps, water pumps, portable-dewatering pumps, submersible pumps, and all other pumps are functioning as intended, and are fully capable of operating as intended when required.
- Domestic Water Piping System: All supply and pipelines, including anti-siphon devices, are free of leaks, damage, corrosion and deterioration; and are well secured. Backflow preventer(s) is/are present and operational on all lines that allow a hose hookup. Piping insulation and labels are installed, and in good condition.
- Sanitary and Vent System: All sanitary and vent piping systems are free of any clogs; no damaged piping is present; and all clean-outs are accessible and sealed.

- Electrical Systems:
  - Electrical Supply and Distribution: All electrical supply and distribution items conform to all applicable codes and regulations; are free of "shorts", loose connections, defects and damage; are clearly identified and marked; and are secured to prevent unwarranted entry.
  - Electrical Lighting: All lighting provides the proper illumination; fixtures are secure; conforms to all applicable codes and regulations; is free of burnt-out or malfunctioning bulbs; is free of broken, damaged or defective reflectors, fixtures, or lenses; and is free of loose and faulty wiring.
  - Electrical Motor Control Units: All Motor Control Units provide the proper power supply; conveys the proper function commands to the equipment in the correct order and manner; are free of defects and deficiencies; and provide full operation.

- Facility Services:
  - Grounds Maintenance: All grounds around each facility are neatly landscaped and clean.
  - Housekeeping: All portions, areas and rooms of each facility are cleaned, disinfected and restocked with supplies daily.

- Pest Control: Pest control is being performed, monitored and maintained when required; the remains of the traps are being properly disposed; and the source of the problem has been corrected.

- Life Safety:
  - Communication Systems: All communication systems are being maintained, repaired, tested, inspected, and replaced so that they remain in full and continual operation.
  - Fire Suppression, Fire Alarm and Precaution Systems: All fire suppression and precaution systems are being fully charged and replaced; conform to all applicable codes, laws and regulations; are free of defects, deficiencies and malfunctions; are being inspected, tested, maintained, repaired and replaced so that they remain ready for proper operation when required.
  - Medical Prevention and Attention Stations: All medical prevention and attention stations have been inspected, replenished, updated and are clearly located.
  - Security Systems: All security systems are being maintained, inspected tested, repaired and replaced to provide full and continual operation.

- Emergency Power Supply System:
  - All back-up generators have been inspected, tested, maintained and repaired or replaced that if a power interruption does occur, the ETC will continue to operate and function.

N.4. Additional Requirements

N.4.1. Inventory and History Record

The Concessionaire must obtain and store all Operations and Maintenance Manuals, OEM guidelines, and manufacturer's specifications in a log and file for all equipment contained within the Facility so that they can be referred to for specific maintenance requirements.

Blueprints and line schematics must be preserved, or developed if missing or incomplete, for each MEP system, showing all outlets, appliances, motors, panels, etc. for easier maintenance and repairs.

The Concessionaire must develop, maintain, and keep current a complete and detailed inventory and history record of all Facility equipment, components, systems, and appurtenances, and must keep an ample supply of replacement parts available on-site. The inventory and history record must include the following at a minimum:

- Type, make, model, age, installation date and location of each and every toll booth component and element.
- Chronological history of all repairs/replacements including a brief note of what the change was (i.e. replaced furnace, repaired boiler curtain, replaced alarm system, etc.).

N.4.2. Building Exteriors

Any improvement or maintenance required must meet all applicable Federal and Commonwealth Codes, Ordinances and Laws, and all work must be undertaken in accordance with all applicable permit requirements as necessary. All improvements must be made to current requirements at the time of the improvement.

N.4.3. Building Interiors

Any improvement or maintenance required must meet all applicable Federal and Commonwealth Codes, Ordinances and Laws, and all work must be undertaken in accordance with all applicable permit requirements as necessary. All improvements must be made to current requirements at the time of the improvement.

All lighting and interior electric repairs or replacements must be made in accordance with current Federal and Commonwealth codes, ordinances, and Laws in effect at the time of the repair.

N.4.4. Mechanical Systems

Any improvement or maintenance required must meet all applicable Federal and Commonwealth Codes, Ordinances and Rules, and all work must be undertaken in accordance with all applicable permit requirements as necessary. All improvements must be made to current requirements at the time of the improvement.

N.4.5. Electrical Systems

Any improvement or maintenance required must meet all applicable Federal and Commonwealth Codes, Ordinances and Laws, and all work must be undertaken in accordance with all applicable permit requirements as necessary. All improvements must be made to current requirements at the time of the improvement.

N.4.6. *Services*

Special attention should be provided to the aesthetic and cleanliness values of the ground and services within the Toll Roads.

All Pest control services must be performed in accordance with all current Federal and Commonwealth codes, ordinances and Laws in effect at the time of the service.

N.4.7. Life Safety & Security

Any improvement or maintenance required must meet all applicable Federal and Commonwealth Codes, Ordinances and Laws, and all work must be undertaken in accordance with all applicable permit requirements as necessary. The Concessionaire must remain well-informed of the latest life safety and security requirements and maintain current life safety and security features along the Toll Roads.

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O. OPEN ROAD TOLLING SYSTEMS MAINTENANCE

O.1 Definitions

AutoExpreso System: The trade name of the current Electronic Toll Collection System employed by PRTHA as of the date of the Toll Road Concession Agreement.

Commercial Back Office (CBO): The commercial system that processes the information received from the Transactional Back-Office (TBO) and generates and transmits the reports to the banking system.

Document Management System (DMS): A tool to store and maintain all information related to maintenance and operation of the highway.

Management of Operation and Maintenance System (MOMS): The management system for all operations and maintenance actions carried out on the road.

Reporting System (RES): RES is the system for building and presenting reporting of operations and activities.

Roadside System (RSS): It identifies and includes the set of all electronic toll systems installed on the highway, controlling the traffic, identifying the vehicle, and reading the tag.

Tag: See Transponder.

Transponder: It is an element on board vehicles to pay toll fees on an Open Road Toll.

Transactional Back-Office (TBO): TBO is a central system that gathers all transactions received from the Toll Points, processes all information received, sends acknowledge and configuration tables, and supervises the correct run of the system at every Toll Point.

Toll Point (TP): It means the physical gantry and the RSS with all its elements to get the needed information to achieve the toll transaction.

Toll Zone (TZ): The Toll Zone is the section of the highway to be tolled and it could be composed by one or more Toll Points and all the technical infrastructure needed to communicate with the TBO.

Open Road Tolling Systems (ORT): It is composed the by the Toll Zones of the Toll Roads and the TBO.

Uninterruptible Power Supply (UPS): Power supplies operate in parallel with the electric utility sources and supply their load without interruption when and if the utility source fails. Such power supplies must be utilized to meet the operating needs of the computers and critical elements of the Toll Zone.

O.2 References

All stated references must be the most current version, or the document known to have succeeded or replaced the original stated herein:

- "International Building Code", IBC.
- "Manual on Uniform Traffic Control Devices (MUTCD)", FHWA.
- "National Fire Codes", NFPA.
- "National Electrical Code", NFPA.
- "International Mechanical Code", IMC.
- "National Plumbing Code, ANSI.
- "Uniform Plumbing Code", WPOA.
- "Uniform Heating and Cooling Code", WPOA.
- "Chimneys, Fireplaces and Vents Code", NFPA.
- Americans with Disabilities Act", U.S. Department of Justice.
- National Standards, Specifications and Regulations as applicable, from the following organizations:
    - National Electrical Manufactures Association (NEMA).
    - American National Standards Institute (ANSI).
    - American Society for Testing and Materials (ASTM).
    - Federal Communications Commission (FCC).
- Original Equipment Manufacturer's (OEM) specifications, Maintenance Manuals, Handbooks, Procedures Guides, etc. as applicable for all installed equipment, systems, and components.
- LEED (Leadership in Energy and Environmental Design) Guidelines.

O.3 Policy for Maintenance of Open Road Tolling Systems

O.3.1 *Objective*

The objective of Open Road Tolling Systems Maintenance is to ensure that all elements, components, and systems are maintained in such a manner that they remain safe, functional, and continually operational in support of the toll collection activities along the Toll Roads, without posing hazards or undue delays to Toll Road users.

The Toll Zone and all its elements (including road pavement, safety elements, crash protection, gantries, lighting, loops, cameras, antennas, UPS, communication equipment, computers, lasers, and all appurtenances) require maintenance; repairs due to damage, wear, breakage and age; emergency maintenance; cleaning; retro-fittings; and replacement due to age and obsolescence.

O.3.2 *Responsibility of Concessionaire*

After substantial completion of the ORT Improvement Project and the Concessionaire Bidirectional Project

- PR-52 will include nine Toll Points: Montehiedra (1 TP), Caguas Norte (2 TP), Caguas Sur (2 TP), Salinas (2 TP), Rampa Salinas (1 TP), Juana Díaz Este (1 TP), Juana Diaz Oeste (1 TP) and Ponce (1 TP).
- PR-53 will include eight Toll Points: Ceiba (2 TP), Humacao Norte (2 TP), Humacao Sur (2 TP), Guayama (2 TP) and Hucar (2 TP).
- PR-66 will include six Toll Points: Plaza Carolina (2 TP), Carolina Norte (1 TP), Carolina Sur (1 TP) and Rio Grande (2 TP).
- PR-20 will include two Toll Points: Guaynabo Sur (2 TP).

In order to meet the requirements of this Chapter, the Concessionaire must engage in practices to ensure that all Toll Zone components, elements, systems and appurtenances are continually operational, secure, clean, sound, and in all ways safe and suitable for use. This requires that the Concessionaire carry out its obligations in accordance with this Chapter in a manner that maintains and/or improves the condition and functionality of the Toll Zones.

All the equipment and resources required in supporting the operation of the Toll Zones must be provided without fail by the Concessionaire. All repair and replacement work must be scheduled, staged and preplanned so as not to adversely impact traffic movement or safety or the accuracy and validity of the toll collection procedures, or cause undue exposure of Toll Road employees to traffic.

The Concessionaire must perform Open Road Tolling Systems maintenance, inspection and work activities at a frequency that ensures uniform and consistent compliance with all PRHTA, manufacturer recommendations and the requirements specified within this Chapter.

All materials and construction requirements for Toll Zones work performed by the Concessionaire must conform to the appropriate and applicable requirements of the Reference Documents noted in Section O.2 of this Chapter.

Once a particular maintenance repair has been started, the work must continue during consecutive working days as weather permits until a thorough, complete and workmanlike repair has been achieved. The Concessionaire must establish and maintain all required traffic control and protection.

Work on Toll Zone elements, components, systems, and appurtenances within the Open Toll Road Systems that must be performed by the Concessionaire includes the following:

- General:
  - Create and maintain an inventory and history record of all Toll Zones equipment, elements, components, systems, and appurtenances.
  - Ensure that only qualified, certified, licensed and/or well-trained personnel perform work to these items, especially to sensitive, proprietary, and complex equipment and systems.
  - The maintenance of the Toll Points lanes is included with the requirements stated within Volume I, Chapter B, "Roadway Maintenance". The Concessionaire must be aware that these lanes will require additional attention because the defects that could be induced in pavement could affect the performance of the Open Road Tolling system.

- Toll Point and Toll Zone:
  - Check that the gantries are, itself and its foundations, in the correct and safe state.
  - Check that the Toll Point and Toll Zone have all its elements in the correct state of operation and adjustment. Includes lights, cameras, strobes, antennas, lasers, surface condition, and anything below, supported, or on the gantry, including associated cabinets.

- Toll Point and Toll Zone Lighting:
  - The maintenance of the Toll Points and Toll Zone lighting is considered to be included with the requirements stated in Volume I, Chapter L, "Lighting and Electrical System Maintenance", with the exception of the following:

- Ensure that all Toll Points and Toll Zone lighting provides the proper illumination; functions as intended; remains free of damage and defects; remains free of burnt-out bulbs; and does not create an unsafe condition for Toll Road employees and users.

- Toll Point and Toll Zone Equipment:
  - Ensure that all toll collection equipment is properly functioning; free of defects and damage; and regularly inspected for continual operational ability. These components, elements, and systems that either comprise or interact with the collection of tolls include, but are not limited to, the following:
    - Loops, detectors and readers.
    - Cameras
    - Lasers
    - Flashes & Strobe lights
    - UPS and all elements of power involved (transformers, switches, cables, etc.)
    - Distribution Panel
    - Communication Systems, data, and voice if any.
    - Emergency Alarms
    - Cabinets
    - CCTV System
    - Computers in general

- Transactional Back-Office (TBO):
  - Ensure that the TBO remain operational at times, with periods of "down-time" limited only to those necessary for repair or maintenance work.
  - Ensure that all repair and maintenance work is performed by qualified personnel familiar with these particular systems.
  - Perform maintenance and "back-ups" of the TBO.

- Uninterruptible Power Supply (UPS):
  - Ensure that the UPS remain operational at times, with periods of "down-time" limited only to those necessary for repair or maintenance work.
  - Ensure that all repair and maintenance work is performed by qualified personnel familiar with these particular systems.

O.3.3 *Performance Time Frames*

The following table establishes the maximum duration (measured from the time a deficiency is or reasonably should be detected by or reported to the Concessionaire), within which the Concessionaire must complete the required maintenance, repair or replacement work to Toll Point, Toll Zone and TBO, system, element, component, or appurtenance:

TABLE M.3.3.1

ORT Component, Element or System	Maximum Time Duration
Priority One: Any failure that will result in loss of ability to accurately collect revenue or audit the system.	3 hours
Priority Two: Any failure of a system component or software that will result in a degradation of system performance or result in the loss of redundancy in a key component but does not qualify as a Priority One event.	6 hours
Priority Three: Minor failure of the equipment, network, or software or an indication that would result in a malfunction or degradation of the system.	24 hours
TBO (including interface with CBO) in Disaster Event (*)	3 days

(*) TBO (3 days) make the reference to the maximum time allowed for the transactions to reach the TBO. Note that PRHTA requires that no data/transactions is lost.

Toll Zone and Toll Gantry maintenance work will be considered acceptable when the following criteria are met or exceeded:

- General:
  - The inventory and history record are current and complete.
  - The Toll Zones presents a clean, tidy, and neat appearance.

- Toll Points and Toll Zone:
  - All the Toll Points and Toll Zone equipment, components, elements, and systems are properly functioning and free of defects and damage.
  - Gantries are free of defective foundations and fixtures, poor drainage, loose or missing bolts, cracked welds, rust, loss of paint and section, deformation, tilt, warpage, eccentricity, or rotation about an axis, and other indications of weakened support.

- Toll Point and Toll Zone Lighting:
  - Toll Point and Toll Zone lighting provides the proper illumination; functioning as intended; free of damage and defects; free of burnt-out bulbs; and does not create an unsafe condition.

- Transactional Back-Office:
  - All the TBO equipment, components, elements, and systems are properly functioning and free of defects and damage.

- Uninterruptible Power Supply (UPS):
  - The UPS, distribution panel, connectors, cable, and all elements needed to give power to ORT system, are fully operational.
  - The Concessionaire must ensure that the backup is working properly.

- Lane Capacity Ability:
  - Each lane of the Toll Points should have the ability to accommodate a minimum through put of 2,400 vehicles per hour.

O.4 Additional Requirements for Open Road Tolling Systems Maintenance

O.4.1 Inventory and History Record

The Concessionaire must develop, maintain, and keep current a complete and detailed inventory and history record of all Open Road Tolling equipment, components, systems, and appurtenances, and must keep an ample supply of replacement parts available on-site. The inventory and history record must include the following at a minimum:

- Type, make, model, age, installation date and location of every Toll Point, Toll Zone and TBO component and element.
- Chronological history of all repairs/replacements including a brief note of what the change was (i.e. replaced antenna, repaired camera, etc.).

O.4.2 Open Road Tolling Maintenance

The Concessionaire must maintain the entire Open Road Tolling System covering, among others, the following tasks:

- Toll Point and Toll Zone maintenance assuring the capture of all the vehicles, its correct classification, LPN and Tags passing through the Toll Points.
- TBO (primary and secondary sites) maintenance assuring data validation and automated transaction record administration, processing, and packaging.
- Interfaces maintenance to the CBO for transactions data exchange (including images), list management, and toll rate management.
- Facilities maintenance of the gantries and technical shelters (cabinets).
- Electrical and mechanical maintenance at the gantries.
- Maintenance of access control systems, fire detection and suppression systems at the TBO Primary and Secondary site.
- Ventilation and cooling (HVAC) system maintenance at the TBO Primary and Secondary site.
- Ensure the continuity of the electrical supply in the Toll Zones, their gantries, and at the TBO sites.
- Ensure the good state of gantries and cabinets, and their foundations and fixings.
- Network communications maintenance
- Power wiring and cable ducting maintenance.

O.4.3 Toll Point and Toll Zone Lighting

The lighting maintenance and replacement requirements, including lamp replacement and requirements for electrical systems, are specified in Volume I, Chapter L, "Lighting and Electrical System Maintenance".

All lighting fixtures that present unsafe conditions, such as the presence of smoke or excessive heat, that flicker or are dark, or that demonstrate high current draw, must be repaired or replaced.

Toll attendants are to visually inspect all lighting within and around the Toll Zones including toll collection process lights, lights inside cabinets, etc. during each shift, and must report all defects for repair.

O.4.4 Open Road Tolling Equipment

The accuracy, functionality and operation of open road tolling equipment including, but not limited to, cameras, lasers, strobe, antennas, computers, etc., must be verified by the Concessionaire on a daily basis. Malfunctioning Open Road Tolling equipment must be regarded as deficient components that affect productive services, and therefore must be repaired.

O.4.5 Transactions Records

Once the transaction is generated at the Toll Point, it must comply with the following requirements:

- Create a unique transaction ID for each and every vehicle passing through a Toll Point.
- Send the transaction data in a format that is compatible with the requirements set forth in the existing ICD or another format defined by the CBOS operator.
- Capture images for every single vehicle passage.
- Assign images (LPN & overview) to their associated toll transactions.
- Prevent or filter duplicate transactions.
- Prevent transactions from being assigned with a higher or lower vehicle classification.
- Prevent transactions from being generated incorrectly.
- Prevent transactions from being assigned to the wrong AutoExpreso user.
- Prevent tag read from being assigned to the wrong transaction.
- Prevent vehicle images from being assigned to the wrong transaction.
- Automatically sent to the TBO for final validation and formatting.

The TBO processes the transactions, which must be classified as:

- "Tag-LPN" transaction.
- "Tag" transaction
- "LPN" transaction

- "Technical Loss" (neither tag nor vehicle identified). Note that these transactions must not be sent to the CBO.

O.4.6 Open Road Tolling Key Performance Indicators

The Concessionaire, among others, must meet or exceed the following monthly Key Performance Indicators (KPI):

- Toll Points Availability >=99.4%
  - The extent to which all Tolling Points are fully available to generate and process Transaction Records and send them to the TBO in a day, for each Toll Point.
- Toll Points Performance >=99.5%
  - The number of vehicles passing a Tolling Point that generates a Transaction Record in a day, for each Tolling Point based on a PRHTA-selection sample, in a month.
- TBO Availability >=99.5%
  - The percentage of time that the TBO is fully available for exchanging data with CBO.
- ANPR Capture Rate >92,5%
  - Passages with ANPR Reading through the total number of vehicles based on a PRHTA-selection sample.
- ANPR Correct Read Rate >90%
  - Total number of ANPR correct read divided by the total number of transactions during the month.
- Capture Rate >97%
  - The proportion of vehicles equipped with a tag that result in a transaction record, per Tolling Point, in a month.
- Vehicle Framing Accuracy >=97%
  - The proportion of vehicles passages where the number plate captured by the Tolling Point for a specific vehicle was correctly matched with the Tag for such vehicle, per Tolling Point, in a month.

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P. ITS AND DTL SYSTEM MAINTENANCE

P.1. Definitions

Conduit or Duct: An enclosed tubular way for protecting wires and cables.

Closed-Circuit Television (CCTV): The video camera system used to provide surveillance of the roadway system.

Dynamic Message Signs (DMS): Signs that use electronics or mechanics to vary a visual word, number or symbolic display as traffic conditions warrant. Also known as Variable Message Signs (VMS) and Changeable Message Signs (CMS).

Dynamic Toll Lane (DTL): Ensures traffic flow using a dynamic toll adjusting rates according to traffic conditions, using video technology to identify crashes and communicates with drivers through electronic signs.

Electrical Systems: Systems, elements and components that are contained in facilities, and which supply, distribute and function by the use of electricity. These systems include, but are not limited to: substations, meters, wiring, service panels, individual circuits, generators, transformers, lighting, motor control units, back-up generators and systems, and emergency lighting.

ITS: Intelligent Transportation System necessary for monitoring the Toll Road's traffic flow and performance, detecting traffic and traffic operational conditions throughout the Toll Roads and clearly communicate relevant and useful travel information to user drivers.

Permanent Repair Time: Amount of time from initial discovery or report to the Concessionaire until the time permanent repairs are made.

Service Response Time: Amount of time from initial discovery or report to the Concessionaire until personnel are present at the required location.

Service Restoration Time: Amount of time from initial discovery or report to the Concessionaire until the time the system is fully operational again.

Traffic Management Center (TMC): Monitors and controls traffic and the road network. It communicates with ITS equipment and, in the future, Connected Vehicle Roadside Equipment (RSE) to monitor and manage traffic flow and monitor the condition of the roadway, surrounding environmental conditions, and field equipment status. It manages traffic and transportation resources in responding to, and recovering from, incidents ranging from minor traffic incidents through major disasters.

Uninterruptible Power Supplies (UPS): Power supplies that operate in parallel with the electric utility sources and supply their load without interruption when and if the utility source fails. Used to meet the operating needs of the computers and critical elements of the ITS.

P.2. References

All stated references must be the most current version, or the document known to have succeeded or replaced the original stated herein:

- Design Directives, PRHTA
- Highway Design Manual, PRHTA
- Standard Drawings, PRHTA
- Standard Specifications for Road and Bridge Construction, PRHTA
- "An Informational Guide to Roadway Lighting", AASHTO.
- "Roadside Design Guide", AASHTO.
- "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals", AASHTO.
- "ANSI Catalog of American National Standards", ANSI.
- "Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems", IEEE.
- "National Electrical Code", NFPA.
- "Title 33 Code of Federal Regulations – Part 118", U.S. Government Printing Office.
- "Real Time System Management Information Program", 23 CFR Part 511
- "Intelligent Transportation Systems Architecture and Standards", 23 CFR Part 940
- Regulations mandated by US Federal Government Agencies related to Transportation Systems Management and Operations (TSM&O), Intelligent Transportation Systems (ITS), Traffic Incident Management (TIM), Performance Measurement and/or any other regulations related to the management and operations of the transportation network.
- San Juan Metropolitan Area Intelligent Transportation Systems Regional Architecture

P.3. Policy for Maintenance of ITS and DTL Systems

P.3.1 Objective

The objective of ITS and DTL maintenance is to ensure that all elements and components of ITS and DTL systems including, but not limited to, cameras, traffic sensors, variable message signs, computers, algorithms, etc.; as well as all highway systems including power, communication, signaling wiring, etc., are properly maintained and serviced so as to continuously function at superior reliability, and to reduce potential hazards to the safe and orderly movement of traffic.

The ITS and DTL and all elements thereof (including safety elements, crash protection, poles, lighting, loops, cameras, variable message signs, UPS, communication equipment, computers, and all appurtenances) require maintenance; repairs due to damage, wear, breakage and age; emergency maintenance; cleaning; retro-fittings; and replacement due to age and obsolescence.

P.3.2 Responsibility of Concessionaire

To meet the requirements of this Chapter, the Concessionaire must engage in practices to ensure that all ITS and DTL components, elements, systems and appurtenances are continually operational, secure, clean, and in all ways safe and suitable for use. This requires that the Concessionaire carry out its obligations in accordance with this Chapter in a manner that maintains and/or improves the condition and functionality of the ITS and DTL systems.

All the equipment and resources required in supporting the operation of the ITS and DTL systems must be provided without fail by the Concessionaire. All repair and replacement work must be scheduled, staged and preplanned so as not to adversely impact traffic movement or safety or the accuracy and validity of the traffic management procedures, or cause undue exposure of Toll Road employees to traffic.

The Concessionaire must perform ITS and DTL maintenance, inspection and work activities at a frequency that ensures uniform and consistent compliance with all PRHTA, manufacturer recommendations and the requirements specified within this Chapter.

All materials and construction requirements for Toll Road work performed by the Concessionaire must conform to the appropriate and applicable requirements of the Reference Documents noted in Section P.2 of this Chapter.

Once a particular maintenance repair has been started, the work must continue during consecutive working days as weather permits until a thorough, complete, and workmanlike repair has been achieved. The Concessionaire must establish and maintain all required traffic control and protection.

Work on toll road elements, components, systems, and appurtenances within the ITS and DTL systems that must be performed by the Concessionaire includes the following:

- General:
  - Create and maintain an inventory and history record of all ITS and DTL equipment, elements, components, systems, and appurtenances.
  - Ensure that only qualified, certified, licensed and/or well-trained personnel perform work to these items, especially to sensitive, proprietary, and complex equipment and systems.
  - The maintenance of the road lanes that could affect ITS or DTL systems performance is included with the requirements stated within Volume I, Chapter B, "Roadway Maintenance". The Concessionaire must be aware that these lanes will require additional attention because the defects that could be induced in pavement could affect the performance of the ITS or DTL systems.

- ITS and DTL equipped areas:
  - Check that the structures, poles or other supports are, itself and its foundations, in the correct and safe state.
  - Check that the ITS and DTL equipped areas have all its elements in the correct state of operation and adjustment. Includes lights, cameras, variable message signs, sensors, surface condition, and anything below, supported, or on the structures, including associated cabinets.

- ITS and DTL Lighting:
  - The maintenance of the ITS and DTL lighting is included with the requirements stated in Volume I, Chapter L, "Lighting and Electrical System Maintenance", with the exception of the following:
    - Ensure that all ITS and DTL equipped areas are provided with the proper illumination; functions as intended; remains free of damage and defects; remains free of burnt-out bulbs; and does not create an unsafe condition for Toll Road employees and users.

- ITS and DTL Equipment:
  - Ensure that all ITS and DTL equipment is properly functioning; free of defects and damage; and regularly inspected for continual operational ability. These components, elements, and systems that either comprise or interact with the traffic management and dynamic toll assignment include, but are not limited to, the following:

- Loops.
- Variable Message Signs
- UPS and all elements of power involved (transformers, switches, cables, etc.)
- Distribution Panel
- Communication Systems, data, and voice if any.
- Emergency Alarms
- Cabinets
- CCTV System
- Computers in general

TMC Central Systems:

- Ensure that the ITS central system and the DTL central system remain operational at times, with periods of "down-time" limited only to those necessary for repair or maintenance work.
- Ensure that all repair and maintenance work is performed by qualified personnel familiar with these particular systems.
- Perform maintenance and "back-ups" of all TMC Central Systems.
- Ensure that all TMC Central Systems are inspected on a monthly basis and the maximum time to repair or replace all noted damage or deficiencies will be within the Performance Time Frames stated in Table P3.3.1 of this Chapter.

- Uninterruptible Power Supply (UPS):
  - Ensure that the UPS remain operational at times, with periods of "down-time" limited only to those necessary for repair or maintenance work.
  - Ensure that all repair and maintenance work is performed by qualified personnel familiar with these particular systems.

- Closed Circuit Television (CCTV) and ITS Systems:
  - Ensure that all components are inspected monthly and the maximum time to repair or replace all noted damage or deficiencies will be within the Performance Time Frames stated in Table P3.3.1 of this Chapter.
  - Replace the CCTV cameras and other ITS equipment with new cameras and new ITS devices every eight (8) years, or as required.

P.3.3 Performance Time Frames

The following table establishes the maximum duration (measured from the time a deficiency is or reasonably should be detected by or reported to the Concessionaire), within which the Concessionaire must complete the completed the required maintenance, replacement or repair work to restore the functionality or operation of deficient ITS or DTL systems or components thereof (unless weather conditions limit material application):

TABLE P.3.3.1

ITS and DTL System	Maximum Time Duration
LPriority One: Any failure that will result in loss of ability to accurately perform the traffic management of the Toll Road.	3 hours
- Priority Two: Any failure of a system component or software that will result in a degradation of system performance or result in the loss of redundancy in a key component but does not qualify as a Priority One event.	6 hours
- Priority Three: Minor failure of the equipment, network, or software or an indication that would result in a malfunction or degradation of the system.	24 hours

The following table establishes the minimum frequency that a particular operation is to be performed:

TABLE P.3.3.2

Operation to be Performed	Minimum Frequency of Occurrence
Inventory of ITS and DTL Systems	Yearly
CCTV Camera or another ITS equipment Replacement	Once every eight (8) Years

P.3.4. Acceptance Criteria

ITS and DTL maintenance work will be considered acceptable when the following criteria are met or exceeded:

- General:
  - The inventory and history record are current and complete.
  - The ITS and DTL areas presents a clean, tidy, and neat appearance.

- ITS and DTL areas:
  - All the ITS and DTL equipment, components, elements, and systems are properly functioning and free of defects and damage.
  - Structures and poles are free of defective foundations and fixtures, poor drainage, loose or missing bolts, cracked welds, rust, loss of paint and section, deformation, tilt, warpage, eccentricity, or rotation about an axis, and other indications of weakened support.

- ITS and DTL Lighting:
  - ITS and DTL areas lighting is provided by the proper illumination; functioning as intended; free of damage and defects; free of burnt-out bulbs; and does not create an unsafe condition.

- TMC Central Systems:
  - All the TMC systems, including ITS and DTL systems, equipment, components, elements, and systems are properly functioning and free of defects and damage.

- Uninterruptible Power Supply (UPS):
  - The UPS, distribution panel, connectors, cable, and all elements needed to give power to ITS and DTL systems, are fully operational.
  - The Concessionaire must ensure that the backup is working properly.

P.4 Additional Requirements for ITS and DTL Systems Maintenance

P.4.1 Inventory and History Record

The Concessionaire must develop, maintain, and keep current a complete and detailed inventory and history record of all ITS and DTL equipment, components, systems, and appurtenances, and must keep an ample supply of replacement parts available on-site. The inventory and history record must include the following at a minimum:

- Type, make, model, age, installation date and location of each and every ITS and DTL component and element.
- Chronological history of all repairs/replacements including a brief note of what the change was (i.e. replaced antenna, repaired camera, etc.).

P.4.2 ITS and DTL Maintenance

The Concessionaire must maintain the entire ITS and DTL systems covering, among others, the following tasks:

- ITS and DTL field equipment maintenance assuring the performance and functionality of all them.
- ITS Central System maintenance assuring all its performance and functionalities needed for the traffic management and operational tasks at the TMC through all the Toll Roads.
- DTL Central System maintenance assuring all its performance and functionalities needed for the operational tasks at the TMC through the DTL section, including among others, the opening/closing of the DTL access gates, the dynamic toll rate assignment, the posting of the toll rate at the tariff message sign, and others.
- Interfaces maintenance with other systems like PRHTA TMC, TCS or others.
- Facilities maintenance of the structures and technical shelters (cabinets).
- Electrical and mechanical maintenance at the road.
- Maintenance of access control systems, fire detection and suppression systems at the TMC site.
- Ventilation and cooling (HVAC) system maintenance at the TMC site.
- Ensure the continuity of the electrical supply in the field and at the TMC.
- Ensure the good state of structures, poles and cabinets, and their foundations and fixings.
- Network communications maintenance
- Power wiring and cable ducting maintenance.

P.4.3 ITS and DTL Area Lighting

The lighting maintenance and replacement requirements, including lamp replacement and requirements for electrical systems, are specified in Volume I, Chapter L, "Lighting and Electrical System Maintenance".

All lighting fixtures that present unsafe conditions, such as the presence of smoke or excessive heat, that flicker or are dark, or that demonstrate high current draw, must be repaired or replaced.

P.4.4 ITS and DTL Equipment

The accuracy, functionality and operation of ITS and DTL equipment including, but not limited to, CCTV cameras, variable message signs, vehicle detection system, Bluetooth travel time systems, wireless communication systems, fiber optic communications systems, UPS, and other related equipment, must be verified by the Concessionaire on a daily basis. Malfunctioning ITS and DTL equipment must be regarded as deficient components that affect productive services, and therefore must be repaired.

P.4.5 ITS and DTL Key Performance Indicators

The Concessionaire, among others, must meet or exceed the following monthly Key Performance Indicators (KPI):

- ITS and DTL Equipment Availability >=99.5%
  - The extent to which all ITS and DTL equipment in the field are fully available to perform its functionalities.
- ITS and DTL Systems Availability >=99.5%
  - The extent to which all ITS and DTL systems are fully available to perform its functionalities.

P.4.6 Additional ITS and DTL on PR-18 and PR-22 outside the Toll Road Limits

The Concessionaire must maintain ITS and DTL Equipment on PR-18 and PR-22 that fall outside of the limits of the Toll Roads and needed for the Dynamic Toll Lane (DTL) operation. These assets include CCTV cameras, vehicle detectors, dynamic message signs, and fiber optic communications infrastructure (cables, conduits, pull boxes, etc.). These assets are in PR-18 from kilometer 0.0 up to the limits of the Toll Roads, in the northbound ramp from PR-18 towards PR-22, and in PR-22 km 2.4.

The Concessionaire must maintain the DTL access gates and auxiliary components (controllers, communication devices, etc.) located at PR-1, and PR-21 that fall outside of the limits of the Toll Roads and needed for the Dynamic Toll Lane operation. These assets are at the PR-1 and PR-21 DTL entrance/exit ramps.