

REQUEST FOR PROPOSALS

Traffic Signals Systems (TSS) Repairs in the San Juan Metropolitan Area

1 Project's General Description

The Department of Transportation and Public Works (DTPW) is issuing this Request for Proposals (“RFP”) and all Exhibits hereto (collectively, the “Proposal Documents”) to solicit Proposals from a firm or team of firms, which specializes in providing Traffic Signals Systems design, construction installation and repairs. The services to be provided will be for the civil design and construction/installation of traffic signal systems components with the purpose of repairing existing traffic signal systems installed in several locations in the San Juan Metropolitan area, as illustrated in Figure 1, 2 and 3. The DTPW intends to issue a Contract to the Proposer that presents the most comprehensive technical proposal for the design and construction/installation of traffic signal systems, where price will not be the sole determining factor.

The purpose of the repairs is to address specific deficiencies or enhance the resiliency as identified for each of the traffic signals systems to be addressed at the intersections to be indicated in the RFP. The repairs will include several types of main activities including: improve the electrical power infrastructure, replacement of traffic signal cabinet, replacement of traffic signal heads, installation of single head supports, installation/repair of pedestrian signal heads and supports and push button, installation of conduits, installation/replacement of video detection systems, and installation of solar power backup systems.

The selected Proposer must perform the design of certain systems and the construction/installation of traffic signals systems structures and components. The selected Proposer will be required to have qualified personnel with the experience in the design and construction of traffic signal systems. The selected Proposer must have the capability of replacing poles, cabinets, traffic signals heads, conduits, solar power backup systems and other components related to the traffic signals. The selected Proposer must have personnel certified and experienced in the design of traffic signal systems.



Figure 1: Intersections to be addressed on PR-3



Figure 2: Intersections to be addressed on PR-25

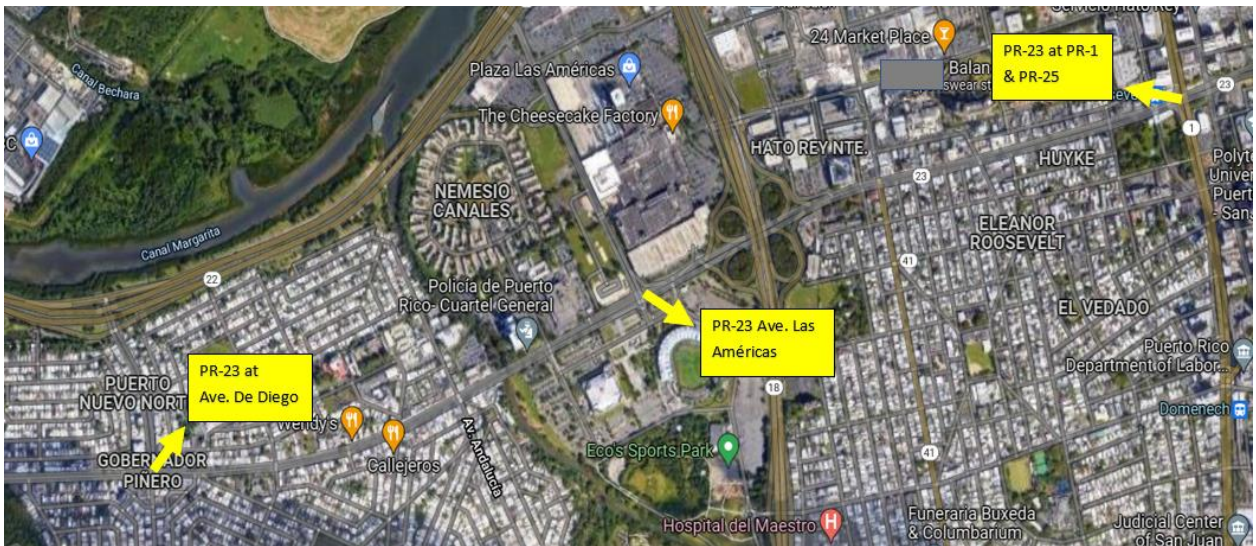


Figure 3: Intersections to be addressed on PR-23

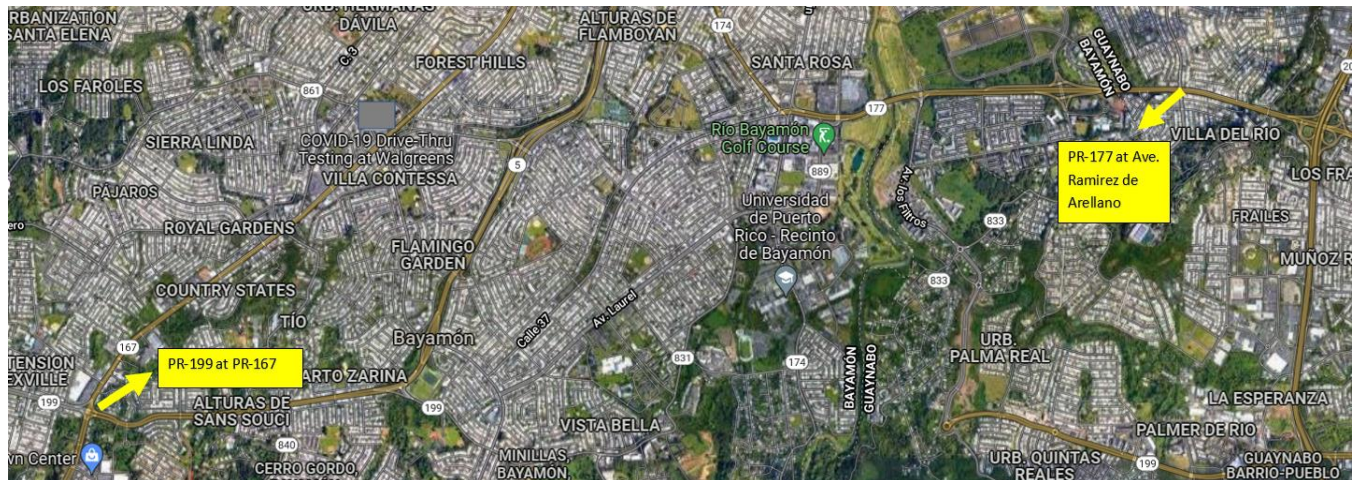


Figure 4: Intersections to be addressed on PR-177 and PR-199

Table 1 presents a list of the intersections to be addressed as part of this RFP and provides a general description of the work to be performed for each of the intersections. Section 2 of the RFP will provide the detailed work to be performed for each of the intersections included in Table 1.

ID	Intersection	Energize Traffic Signal 635	Electric Power meter Column K-7-3-1	Traffic Signal Controller and Cabinet Replacement	Traffic Signal Heads Replacement	Traffic Signal Mast Arm Installation	Pedestrian Signal Head Installation	Pedestrian Signal Head Support (10ft) Installation	Accessible Pedestrian Push Button Installation	Traffic Signal Wiring Replacement	PVC Conduit (4") Installation	PVC Conduit (2") Installation	Video Detection System Installation
1	PR-3 at Barriada Buen Consejo	x	x	x						x	x	x	
2	PR-3 at PR-27	x		x	x					x	x	x	x
3	PR-3 at Calle 3	x	x	x	x					x	x	x	x
4	PR-3 at Calle 13	x	x	x	x					x	x	x	x
5	PR-3 at PR-181	x	x	x						x	x	x	
6	PR-3 at Calle Juan Peña Reyes	x	x	x	x					x	x	x	x
7	PR-3 at PR-47	x	x	x	x					x	x	x	x
8	PR-3 at Calle 11	x	x	x	x					x	x	x	x
9	PR-3 at Ave. Simón Madera	x	x	x	x					x	x	x	x
10	PR-3 at Calle Monte Carlo	x	x	x	x	x				x	x	x	x
11	PR-3 at Calle Yaboa Real	x	x	x	x	x				x	x	x	x
12	PR-3 at Ave. Campo Rico	x	x	x	x					x	x	x	x
13	PR-3 at Plaza Escorial	x								x	x	x	x
14	PR-25 at Ave. De Diego						x		x	x			
15	PR-25 at Calle Del Parque						x	x	x	x			
16	PR-25 at Ave. Fidalgo Díaz						x	x	x	x			
17	PR-25 at Ave. Sagrado Corazón						x	x	x	x			
18	PR-25 at Ave. Haydeé Rexach						x						
19	PR-25 at Calle Segarra						x			x			
20	PR-25 at Calle Maestro Cordero						x	x	x	x			
21	PR-25 at Calle Prudencio Rivera						x	x	x	x			
22	PR-25 at Calle Bolivia						x		x	x			
23	PR-25 at PR-23						x	x	x	x			
24	PR-23 at PR 1						x	x	x	x	x	x	
25	PR-23 at Ave. Las Américas						x	x	x	x	x	x	
26	PR-23 at Ave. José De Diego						x		x	x		x	
27	PR-177 at Ave. Ramirez de Arellano			x									
28	PR-199 at PR-177												
29	PR-2 at PR-6				x	x	x	x	x				

Table 1: List of intersections to be addressed and the expected works.

2 WORK TO BE PERFORMED

Prior to the beginning of construction activities at each location, the Contractor must investigate the exact location of the existing underground utilities and coordinate the works with the directors of Puerto Rico Aqueduct and Sewer Authority (PRASA) regional office, Puerto Rico Electric Power Authority (PREPA) regional office, telephone companies, cable TV companies and gas companies to avoid any damage to the existing utilities. This coordination activities must be considered as a subsidiary obligation under the pay items included in the Proposal.

The Contractor must protect the existing underground utilities from damage to ensure the continuity of the utility service. Any damage to existing utilities, caused by negligence of the Contractor, must be repaired by the Contractor at no expense to the DTPW.

The contractor must request the recommendation of the engineer before proceeding to transfer the operation of the existing traffic controller assemblies to the new ones. The contractor must perform the following works before the request to transfer the operation:

1. All works related to the power surge feeders for the new traffic signal system and field devices shall be fully operational and accepted by the PREPA.
2. The new traffic signal system and field devices must be installed, configured, and programmed, and must be ready to start the operation.
3. The communication system must provide a reliable communication between the TMC and traffic signal systems and field devices.

During the transfers, the Contractor must work on a maximum of three intersections at the same time. Any change to these instructions must be coordinated with the Engineer. The Engineer will take into consideration the capacity of the Contractor, the available materials, and the possible impact to traffic conditions to perform the necessary evaluation for the approval or denial of the proposed changes to the work schedule.

The recommendation to transfer the operation of the existing traffic controller assemblies to the new ones, and the final acceptance of the project will be based on the result of the inspections performed by the Traffic Signal Design and Administration Division from the Puerto Rico Highway and Transportation Authority, and the Traffic Regulation Office from the Department of Transportation and Public Works. The inspection process from these entities will be as follows:

1. The first inspection will be performed at the field to determine if all the work required to transfer the operation of the existing traffic controller assemblies to the new ones was completed, according to the project's contract documents.

2. The second inspection will be performed at the TSSMC to determine if all the work required to transfer the operation of the existing traffic controller assemblies to the new ones was completed, according to the project's contract documents.
3. The third inspection will be at the field to determine if all the work was done in conformance with the project's contract documents and to verify that any deficiencies found at the first inspection were addressed.
4. The final inspection will be at the TSSMC to determine if all works was done in conformance with the contract documents, and to validate that the system implemented meet the project's required functionality. This inspection will consist of a 30-Day operational test and a final meeting after this period for the final demonstration. In case of any fail, the 30-Day test will be repeated. The Warranties and Guarantees time will start after the acceptance of the project, in conformance with specifications 654.

Before requesting any of the inspections described above, the Contractor must be responsible for verifying that all the works were completed according to the project's contract documents.

The Contractor must verify all dimensions and details as shown on the plans and any other pertinent data received from the Engineer, and notify him all errors, omissions, conflicts, and discrepancies found. The Contractor must notify the Engineer of these problems in writing before proceeding with the work.

If during the progress of the project, there are conditions which make it impossible to produce work in accordance with the best general practice or could cause any change in the work as specified, the Contractor must refer the matter to the Engineer before proceeding. If the Contractor fails to make such reference to the Engineer, and decide to continue with the work, the Contractor will proceed on his own risk, and if such work is not satisfactory to the Engineer, the Contractor must remove and replace it at his own cost, to the satisfaction of the Engineer.

The contractor must perform Maintenance and Protection of Traffic activities according to the Plans, the PRHTA's Specification 638 and the Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition.

Once the works are accepted by the DTPW, the Contractor must prepare and submit As-Built plans (.pdf and .dwg) to the DTPW showing the final location, installation details and the configuration parameters of each device installed, and a communication network diagram showing the IP addresses of all the devices installed as part of the project. These activities must be considered as a subsidiary obligation under the pay items included in the Proposal.

This section will describe in detail the works to be performed by the Contractor for each of the intersections identified in Section 1 – Table 1. The Contractor must perform each of the activities stated below for each of the intersections to be addressed as part of this project.

2.1 ID 1 – PR-3 at Barriada Buen Consejo

2.1.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.1.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word “SEMAFOROS” at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.1.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.1.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- c. All equipment installed must be of the same trademark, model, and manufacturer.
- d. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- e. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- f. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor

- must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- g. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
 - h. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
 - i. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
 - j. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
 - k. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
 - l. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.1.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the

Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.1.6 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.1.7 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.2 ID 2 – PR-3 at PR-27

2.2.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.

- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.2.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.2.3 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button

- f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the

Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.2.4 Traffic Signal Head Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.2.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.2.6 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.2.7 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.2.8 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.3 ID 3 – PR-3 at Calle 3**2.3.1 Maintenance and Protection of Traffic**

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access

driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.3.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.3.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.3.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA*

Interface/NTCIP Fully Actuated. In addition, the contractor shall rebuild the affected areas to their original condition.

- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated.*
- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.3.5 Traffic Signal Head Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the

pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.3.6 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.3.7 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.3.8 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.3.9 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS®

monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.4 ID 4 – PR-3 at Calle 13

2.4.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.4.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems

as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word “SEMAFOROS” at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.4.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.4.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.

- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.4.5 Traffic Signal Head Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.4.6 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.4.7 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.4.8 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.4.9 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.5 ID 5 – PR-3 at PR-181

2.5.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.

- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.5.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.5.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.5.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface

- b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
- a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.

- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.5.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.5.6 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.5.7 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.6 ID 6 – PR-3 at Calle Juan Peña Reyes

2.6.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic

and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.6.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.6.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority

(PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.6.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the

selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.

- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.6.5 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.

- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.6.6 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.6.7 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.6.8 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.6.9 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a

subsidiary obligation under the pay item for video detection cameras.

- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.7 ID 7 – PR-3 at PR-47

2.7.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.7.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word “SEMAFOROS” at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.7.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.7.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor

- must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
 - f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
 - g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
 - h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
 - i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
 - j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.7.5 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.7.6 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.7.7 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.7.8 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.7.9 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance with PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.8 ID 8 – PR-3 at Calle 11

2.8.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails,

concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.

- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.8.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.8.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.8.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground

rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.

- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.8.5 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.8.6 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the

Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.8.7 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.8.8 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.8.9 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.9 ID 9 – PR-3 at Ave. Simón Madera

2.9.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.9.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be

resistant the different environmental conditions. The letters must be color yellow over a black background.

- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.9.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.9.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.

- a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
- b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
- c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.9.5 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723,

as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.

- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.9.6 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.9.7 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.9.8 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.9.9 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.10 ID 10 – PR-3 at Calle Monte Carlo

2.10.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.

- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.10.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.10.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.10.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:

- a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
- a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.

- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.10.5 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.10.6 Traffic Signal Mast Arm Installation

The Contractor must furnish and install the new traffic signal supports as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal support foundation installation attempts,

as a subsidiary obligation under the pay items for traffic signal supports. In addition, the Contractor must rebuild the affected areas to their original condition.

- b. The resistance to ground shall not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than one ground rod is needed, the Contractor must install one ground rod. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- c. The contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- d. These works will be a subsidiary obligation under the pay items for traffic signal supports.

2.10.7 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.10.8 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.10.9 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.10.10 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.11 ID 11 – PR-3 at Yaboa Real

2.11.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.

- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.11.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.11.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.11.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface

- b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button
 - f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
- a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.

- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.11.5 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.11.6 Traffic Signal Mast Arm Installation

The Contractor must furnish and install the new traffic signal supports as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal support foundation installation attempts,

as a subsidiary obligation under the pay items for traffic signal supports. In addition, the Contractor must rebuild the affected areas to their original condition.

- b. The resistance to ground shall not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than one ground rod is needed, the Contractor must install one ground rod. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- c. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- d. These works will be a subsidiary obligation under the pay items for traffic signal supports.

2.11.7 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.11.8 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.11.9 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.11.10 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.12 ID 12 – PR-3 at Ave. Campo Rico

2.12.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation

requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.

- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.12.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.12.3 Electric Power Meter Column K-7-3-1

The Contractor must furnish and install the PREPA meter box column for energizing the traffic signal systems, as indicated by the Engineer and in conformance with the Puerto Rico Electric Power Authority (PREPA) distribution standard K-7-3-1 (modified), plans, and PRHTA's specifications 635.

- a. The PREPA distribution standards K-7-3-1 was modified for this project. See page TSS-9 of the plans for details.

2.12.4 Traffic Signal Controller and Cabinet Replacement

The Contractor must furnish and install the advanced traffic signal controller (ATC) assembly (NEMA TS-2 Type 2) as indicated by the Engineer and in conformance with plans and PRHTA Specifications 654.

- a. All equipment installed must be of the same trademark, model, and manufacturer.
- b. The location for the new traffic control cabinet must be next to the existing cabinet and will be connected to the same point of connection.
- c. The ATC must have the following features:
 - a. Windows based remote user interface
 - b. USB data module
 - c. Ethernet support for 10/100 base t networks
 - d. Protocol support for NTCIP 1201 level 1 & NTCIP 1202 level 2 compliant applications
 - e. LCD display with adjustable contrast button

- f. All necessary ports to allow interfacing to the following communications infrastructures: FSK, high speed serial RS232, fiber optics modems and LAN/WAN applications. Compatibility with laptop computer and PDA for easy field programming works.
- d. The top surface of the proposed foundation must be smooth, even, and level to ensure a sealed and tight fit between the foundation and the traffic signal control cabinet. All foundations work, including the finish, must be performed prior to the installation of the traffic signal control cabinet. The Contractor must not affect or damage the gasket or sealant compound used between the control cabinet and the foundation.
- e. The contractor must build a Portland Cement Concrete access sidewalk for traffic signal control cabinet in conformance with PRHTA standard specification 608 and as directed by the Engineer.
 - a. The sidewalk must be built from the proposed "traffic control cabinet" to a nearly existing or proposed sidewalk. If there are no sidewalks, the proposed access sidewalk must match the finished grade against the existing roadway's shoulder.
 - b. The Portland cement concrete sidewalk must have a width of 5 feet and a depth of a 4 inch with an embedded 6"x 6" #6-gauge wire mesh and control joint every 5 feet.
 - c. The contractor must build a 3 feet width Portland cement concrete sidewalk around the ATC cabinet foundation.
- f. If during the installation activities of the traffic signal controller foundation it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal controller foundation installation attempts, as a subsidiary obligation under the pay item *Advanced Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*. In addition, the contractor shall rebuild the affected areas to their original condition.
- g. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than two ground rods are needed, the Contractor must install two ground rods. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirement.
- h. These works will be a subsidiary obligation under the pay item *Advances Traffic Signal Controller Assembly, NEMA Interface/NTCIP Fully Actuated*.
- i. The ATC must be integrated in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.
- j. The Contractor must configure the existing programmed data into the new traffic signal controllers before the first inspection at each intersection. Once these works are approved by the

Engineer, the Contractor must activate the new traffic signal controllers with the existing programmed data (modification of the existing programmed data may be required to adjust to the new project conditions).

2.12.5 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.
- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.12.6 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.12.7 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.12.8 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.12.9 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.13 ID 13 – PR-3 at Ave. Plaza Escorial**2.13.1 Maintenance and Protection of Traffic**

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and

streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.13.2 Energize Traffic Signal

The Contractor must furnish and install the electrical conductor for energizing the traffic signal systems, as indicated by the Engineer and in conformance with PREPA standards, plans, and specifications 635.

The Contractor must furnish and install the galvanized riser at the existing PREPA concrete poles for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA distribution standard URD-4, plans, and PRHTA Specifications 635.

- a. Risers for the traffic signal system be identified with the word "SEMAFOROS" at a height of ten feet. The paint must be resistant the different environmental conditions. The letters must be color yellow over a black background.
- b. The portion of the concrete base projecting above the sidewalk or ground level must be painted with an approved federal yellow polyurethane paint.

2.13.3 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.13.4 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.13.5 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.13.6 Video Detection System Installation

The Contractor must furnish and install the video image detection system as indicated by the Engineer and in conformance PRHTA's Standards Drawings TRSI, and Specifications 654.

- a. As part of it, the Contractor must install, program, and configure all the virtual sensors required for an effective operation of the traffic signal systems. This includes virtual sensors for counting vehicles and speed measures for all lanes on the intersections. The system must provide a count study summarized by 15-minute periods. This work will be a subsidiary obligation under the pay item for video image processors.
- b. The Contractor must maintain the lens clean and the images free of obstructions, until the acceptance of the project, as a subsidiary obligation under the pay item for video detection cameras.
- c. The video image detection system must be integrated (vehicle detections, data collection, video, etc.) in CENTRACS® monitoring software, as a subsidiary obligation under the pay item for the monitoring system software.

2.14 ID 14 – PR-25 at Ave. De Diego

2.14.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract

book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.14.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.14.3 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- a. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- b. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be

aligned parallel to the direction of travel on the associated crosswalk.

- c. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- d. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- e. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.15 ID 15 – PR-25 at Calle Del Parque

2.15.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.15.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.15.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.
- b. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- c. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- d. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.15.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- a. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- b. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- c. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- d. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.

- e. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.15.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.16 ID 16 – PR-25 at Ave. Fidalgo Díaz

2.16.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.

- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.16.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.16.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.
- b. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- c. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- d. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.16.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- a. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.

- b. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- c. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- d. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- e. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.16.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.17 ID 17 – PR-25 at Ave. Sagrado Corazón

2.17.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway

lighting and other traffic control devices as may be required for the maintenance and protection of traffic.

- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.17.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.17.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.
- b. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- c. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- d. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.17.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- a. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- b. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- c. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- d. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- e. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.17.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.18 ID 18– PR-25 at Ave. Haydeé Rexach

2.18.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access

driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.18.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.19 ID 19 – PR-25 at Calle Segarra

2.19.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.19.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.20 ID 20 – PR-25 at Calle Maestro Cordero

2.20.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails,

concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.

- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.20.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.20.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.
- b. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- c. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.

- d. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.20.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- a. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- b. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- c. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- d. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- e. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.20.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.21 ID 21 – PR-25 at Prudencio Rivera

2.21.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract.

The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- f. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- g. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- h. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- i. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- j. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.21.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- c. All pedestrian signal head shall be flat black.
- d. The lens shall be LED type.

2.21.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- e. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.

- f. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- g. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- h. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.21.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- f. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- g. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- h. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- i. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- j. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.21.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- b. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.22 ID 22 – PR-25 at Calle Bolivia

2.22.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- k. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- l. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- m. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- n. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- o. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.22.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- e. All pedestrian signal head shall be flat black.
- f. The lens shall be LED type.

2.22.3 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- k. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- l. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- m. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- n. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- o. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.22.4 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- c. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.23 ID 23 – PR-25 at PR-23

2.23.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access

driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.23.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.23.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.
- b. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a

ground test, and provide a certification indicating that the installation meets with the requirements.

- c. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- d. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.23.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- a. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- b. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- c. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- d. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- e. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.23.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- a. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.24 ID 24 – PR-23 at PR-1

2.24.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract

book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.24.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- c. All pedestrian signal head shall be flat black.
- d. The lens shall be LED type.

2.24.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- e. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations

that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.

- f. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- g. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- h. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.24.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- f. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- g. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- h. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- i. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- j. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.24.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- b. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.24.6 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.24.7 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.25 ID 25 – PR-23 at Ave. Plaza Las Américas

2.25.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- f. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- g. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- h. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- i. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.

- j. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.25.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- c. All pedestrian signal head shall be flat black.
- d. The lens shall be LED type.

2.25.3 Pedestrian Signal Head Support (10') Installation

The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.

- e. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.
- f. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- g. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- h. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.25.4 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- f. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- g. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.

- h. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- i. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- j. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.25.5 Signal Wiring Replacement

The Contractor must furnish and install the new electrical conductors for all traffic signal devices thru the conduits as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- b. Before proceeding with the installation, the Contractor must verify if there are no obstructions in the existing conduit, if existing conduits are in conditions to be used. If the Contractor finds obstructions in the conduits, or there are no conduits, the Contractor must install new conduits sections as indicated by Engineer. This work will be a subsidiary obligation under the pay item P.V.C. conduit 2" or 4" diameter sched. 40.

2.25.6 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.25.7 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.26 ID 26 – PR-23 at Ave. De Diego

2.26.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract.

The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- f. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- g. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- h. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- i. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- j. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.26.2 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- c. All pedestrian signal head shall be flat black.
- d. The lens shall be LED type.

2.26.3 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- f. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- g. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- h. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.

- i. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.
- j. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

2.26.4 PVC Conduit (4") Installation

The Contractor must furnish and install 4" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.26.5 PVC Conduit (2") Installation

The Contractor must furnish and install 2" PVC conduit (schedule 40) for energizing the traffic signal systems as indicated by the Engineer and in conformance with PREPA standards, plans, and Specifications 205 and 635.

2.27 ID 27 – PR-177 at Ave. Ramírez de Arellano

2.27.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.

- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.27.2 Photovoltaic Power Backup System Installation

2.28 ID 28 – PR-99 at PR-167

2.28.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation

requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.

- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.29 ID 29 – PR-2 at PR-6

2.29.1 Maintenance and Protection of Traffic

The Maintenance and Protection of Traffic must be in accordance to the Puerto Rico Highway and Transportation Authority's (PRHTA) Standard Drawings, MOT Standard Drawings included in the contract book, Specification 638 – Maintenance and Protection of Traffic and current edition of the MUTCD. The Contractor must furnish and install temporary traffic protection devices as indicated below at the locations indicated by the Engineer. The work must consist of maintaining traffic and protecting the public from damage to persons and property throughout the project construction area for the duration of the contract. The Contractor must maintain and protect through and local traffic within the limits of the project, including traffic on all existing roads and streets which intersect the project within the project limits, and access driveways, except as otherwise provided by the Engineer. The Contractor must also comply with the following requirements:

- a. The work includes, but is not limited to: furnishing, installing, moving, removing, and maintaining temporary construction signs, barricades, cones, drums, pavement marking, guard rails, concrete barriers, impact attenuators, traffic signals, highway lighting and other traffic control devices as may be required for the maintenance and protection of traffic.
- b. All traffic control devices and traffic control operations must be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD- FHWA) - Edition 2009.
- c. The Contractor must provide the necessary traffic control devices and taking other appropriate measures for the protection of the public and his personnel.
- d. All traffic control devices must conform to the design, dimensions, materials, color, fabrication and installation requirements specified on PRHTA's Specification 638 and TSRI's standard drawings.
- e. Used traffic control devices may be incorporated to the project if they are, in good working conditions and shall be subject to the approval by the Engineer.

2.29.2 Traffic Signal Heads Replacement

The Contractor must furnish and install the traffic signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All traffic signal head must be flat black.

- b. All lenses must be 12 inches outside diameter.
- c. The backplates must include the fluorescent yellow retroreflective tape in conformance Specifications 654 and 723, as a subsidiary obligation under the pay items for traffic signal heads. The backplates must extend 5 inches on each side of the signal face and 5 inches on the top and bottom. The 3 inches closest to the signal face shall be louvered and the remaining 2 inches must have the fluorescent yellow retroreflective tape.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables in the existing traffic signal support and apply an anticorrosive treatment and seal the remaining holes with grip filler for galvanized steel, as a subsidiary obligation under the pay items for traffic signal heads.
- e. For traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR, a supplementary sign must be provided in conformance with the Specification 613 and the standard drawings TRSI 1 of 40. The sign shall be located immediately to the right of the traffic signal heads. This sign will be a subsidiary obligation under the pay item for traffic signal heads 5-SL-C-PE, 5-SL-C-PR, and 5-SR-C-PR.

2.29.3 Traffic Signal Mast Arm Installation

The Contractor must furnish and install the new traffic signal supports as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the Contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for traffic signal supports. In addition, the Contractor must rebuild the affected areas to their original condition.
- b. The resistance to ground shall not exceed 10 Ω . The Contractor must install the necessary 1/2" x 8' copper ground rods to comply with the maximum resistance. In case that less than one ground rod is needed, the Contractor must install one ground rod. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- c. The contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- d. These works will be a subsidiary obligation under the pay items for traffic signal supports.

2.29.4 Pedestrian Signal Head Installation

The Contractor must furnish and install the pedestrian signal heads as indicated by the Engineer and in conformance with plans, Standards Drawings TRSI, and Specifications 654.

- a. All pedestrian signal head shall be flat black.
- b. The lens shall be LED type.

2.29.5 Pedestrian Signal Head Support (10') Installation

- a. The Contractor must furnish and install a new traffic signal support post for pedestrian heads per PRHTA's specification 654 or as directed by the Engineer. The removal of existing any existing pedestrian signal head support to be replaced must be performed by the Contractor, if applicable.
- b. If during the installation of the traffic signal support foundations it is found that there are field conditions at the selected locations that impede this installation, the contractor must perform at least three traffic signal support foundation installation attempts, as a subsidiary obligation under the pay items for pedestrian signal supports. In addition, the Contractor must rebuild and reestablish the affected areas to their original condition.
- c. The resistance to ground must not exceed 10 Ω . The Contractor must install the necessary ground rod to comply with the maximum resistance. In addition, the Contractor must perform a ground test, and provide a certification indicating that the installation meets with the requirements.
- d. The Contractor must apply an anticorrosive treatment and install a grommet in the holes for the electrical conductors and communication cables.
- e. These works will be a subsidiary obligation under the pay items for the pedestrian signal supports for pedestrian signal heads.

2.29.6 Accessible Pedestrian Push Button Installation

The Contractor must furnish and install the accessible pedestrian signal pushbutton station as indicated by the Engineer and in conformance with plans, and PRHTA's Specifications 654.

- a. The pushbutton must be installed at a mounting height of 3.5 feet above the sidewalk.
- b. Tactile arrows must be located on the pushbutton, have high visual contrast (light on dark or dark on light), and shall be aligned parallel to the direction of travel on the associated crosswalk.
- c. The audible walk indications must be in Spanish and will be provided by the Authority. The contractor must install and set it in the pushbutton stations.
- d. The volume of audible walk indications and pushbutton locator tones must be set to be a maximum of 5 dBA louder than ambient sound.

- e. The accessible pedestrian signal pushbutton stations must comply with *The Manual on Uniform Traffic Control Devices (MUTCD)* standards requirements.

i. Other Works

- a. The Contractor must remove the existing traffic signal pole support and pole located at the traffic channelizing island at the northwestern quadrant of the intersection as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- b. The Contractor must build a new support for a new 40" galvanized pole at the traffic channelizing island at the northwestern quadrant of the intersection as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- c. The Contractor must furnish and install a new 40' galvanized traffic signal pole with a 45" mast arm located at the traffic channelizing island at the northwestern quadrant of the as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- d. The Contractor must perform the power connection from the new self-support to the existing pull box as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- e. The Contractor must remove two (2) new traffic signal heads (3-S-V) as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- f. The Contractor must remove of one (1) new traffic signal head (3-L-V) as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- g. The Contractor must furnish and install two (2) new traffic signal heads (3-S-V) and perform the connection with the traffic signal cabinet as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- h. The contractor must furnish and install one (1) new traffic signal head (3-L-V) and perform the connection with the traffic signal cabinet as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.

- i. The Contractor must remove the existing pedestrian signal head, poles and push button located at the traffic channelizing island at the northwestern quadrant of the intersection and at the PR-2 central island at the west of the intersection as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- j. The Contractor must furnish and install the pedestrian signal heads, poles, and Accessible Pedestrian Signal at the traffic channelizing island at the northwestern quadrant of the intersection and at the PR-2 central island at the west of the intersection as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 654.
- k. The Contractor must remove the existing traffic signs on the traffic channelizing island located at the northwestern quadrant of the intersection as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 638.
- l. The Contractor must furnish and install new traffic signs on the traffic channelizing island located at the northwestern quadrant of the intersection as indicated by the Engineer and in conformance with plans, PRHTA Standards Drawings TRSI, and PRHTA Specifications 638.
- m. The Contractor must demolish and reconstruct the existing traffic channelizing island located at the northwestern quadrant of the intersection as indicated by the Engineer and in conformance with the plans, the PRHTA Design Manual, PRHTA Design Directives, PRHTA Standard Drawings, PRHTA Standard Specifications for Road and Bridge Construction, and other applicable design regulations.