

SPECIFICATIONS

FOR

2013 – 2014 TASK ORDER CONTRACT FOR
TRAFFIC SIGNAL SYSTEMS

CITY OF SAN ANTONIO

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NOVEMBER 2012

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TABLE OF CONTENTS

Project Description

Governing Specifications

Special Provisions

PROJECT DESCRIPTION

Project Duration and Amount

This is a task order contract and shall be terminated 730 calendar days after the notice to proceed. The construction time for each individual site shall be 45 calendar days. Liquidated damages will be assessed on per site basis should the Contractor fail to complete the construction in the specified time. The City may authorize the Contractor to work on up to five sites at the same time.

Project Scope

This project construction includes but is not limited to the installation of traffic signal equipment, school flasher equipment, signs, pavement markings, curb ramps, vehicle detection and any other work required to complete the traffic signal system.

Project Location

All locations shall be assigned by the City Traffic Signal Engineer within the contract time limits and shall be located throughout the city. This Task Order Contract will give the City the ability to have the construction capacity available to construct new installations as they are identified and as funds are made available.

Important Notes

1. All work shall follow the 2008 Edition of the "Standard Specifications for Construction" published by the City of San Antonio, the Texas Department of Transportation (TxDOT) Traffic Standards, and the Special Provisions for this contract.
2. All costs associated with the following items shall be included with other applicable items:
 - Item 100 - Mobilization
 - Item 101 - Preparing Right-of-Way
 - Item 530 - Barricades, Signs and Traffic Handling
 - Item 540 - Temporary Erosion, Sedimentation, and Water Pollution Prevention and Control.
3. Unit prices established shall remain valid throughout the duration of the contract.
4. **The quantities shown are estimated quantities used for budgetary purposes only. Awarding this contract does not guarantee the Contractor the entire amount of work shown in the proposal.**
5. The projects will be assigned as they become available and will vary in size. There will not be any additional compensation for projects based on the estimated cost or size.
6. Some materials, which have been identified in the special provisions and the bid proposal estimate, will be provided by the City of San Antonio. The Contractor shall be responsible for providing all other material required and the installation of all equipment and material.
7. On Form 060 SUPPLEMENTAL CONDITIONS as it pertains to Liquidated Damages the definition of Substantial Completion is at time of traffic signal turn-on.

**CITY OF SAN ANTONIO, TEXAS
GOVERNING SPECIFICATIONS**

All City of San Antonio Standard Specifications for Construction, 2008 edition, and Special Specifications applicable to this project are identified as follows:

ITEM DESCRIPTION

100	MOBILIZATION
101	PREPARING RIGHT-OF-WAY
103	REMOVE CONCRETE
104	STREET EXCAVATION
200	FLEXIBLE BASE
203	TACK COAT
205	HOT MIX ASPHALTIC CONCRETE PAVEMENT
206	ASPHALT TREATED BASE
208	SALVAGING, HAULING & STOCKPILING RECLAIMABLE ASPHALTIC PAVEMENT
308	DRILLED SHAFTS AND UNDER-REAMED FOUNDATIONS
500	CONCRETE CURB, GUTTER, AND CONCRETE CURB AND GUTTER
502	CONCRETE SIDEWALKS
505	CONCRETE RIPRAP
506	CONCRETE RETAINING WALL – COMBINATION TYPE
512	ADJUSTING EXISTING MANHOLES AND VALVE BOXES
530	BARRICADES, SIGNS & TRAFFIC HANDLING
531	SIGNS
533	CLEANING AND REMOVAL OF PAVEMENT MARKINGS AND MARKERS
535	HOT APPLIED THERMOPLASTIC PAVEMENT MARKINGS
537	RAISED PAVEMENT MARKINGS
540	TEMPORARY EROSION, SEDIMENTATION, AND WATER POLLUTION PREVENTION AND CONTROL
552	REMOVING AND RELOCATING IRRIGATION SYSTEMS
556	CAST IN PLACE DETECTABLE WARNING SURFACE TILES
600	TRAFFIC SIGNAL GENERAL CONDITIONS
615	TRAFFIC SIGNAL CONTROLLER CABINET
618	CONDUIT
620	ELECTRICAL CONDUCTORS
624	GROUND BOXES
628	ELECTRICAL SERVICES
633	BATTERY BACKUP SYSTEM FOR TRAFFIC SIGNAL
655	CONTROLLER FOUNDATION AND PEDESTAL POSTS
656	FOUNDATIONS FOR TRAFFIC CONTROL DEVICES
680	INSTALLATION OF HIGHWAY TRAFFIC SIGNALS
681	TEMPORARY TRAFFIC SIGNALS

- 682 VEHICLE AND PEDESTRIAN SIGNAL HEADS
- 683 LED COUNTDOWN PEDESTRIAN SIGNAL MODULE
- 684 TRAFFIC SIGNAL CABLES
- 685 FLASHING BEACON ASSEMBLIES
- 686 TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)
- 687 PEDESTAL POLE ASSEMBLIES
- 688 PEDESTRIAN DETECTORS AND VEHICLE LOOP DETECTORS
- 693 INTERNALLY LIGHTED STREET NAME SIGN ASSEMBLIES
- 694 VIDEO IMAGING VEHICLE DETECTION SYSTEM
- 695 EMERGENCY VEHICLE TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM
- 696 RADAR VEHICLE DETECTION DEVICES (RVDD)
- 802 TREE PRUNING
- 1000 WEB PORTAL

SPECIAL SPECIFICATIONS

- 6007 REMOVING TRAFFIC SIGNALS

ITEM 696

RADAR VEHICLE DETECTION DEVICES (RVDD)

696.1. DESCRIPTION: *Furnish and install Radar Vehicle Detection Devices (RVDD), including: Radar Advance Detection Devices (RADD) and/or Radar Presence Detection Devices (RPDD) to detect vehicles on a roadway via processing of radar electromagnetic waves and provides detector outputs to a traffic signal controller or similar device.*

696.2. DEFINITIONS

- A. RADAR:** Radio detection and ranging. High frequency electromagnetic energy waves used to detect, identify, and determine the range, direction, and/or speed of an object such as a motor vehicle.
- B. Radar Vehicle Detection Device (RVDD):** Device that emits electromagnetic waves and senses return waves from passing and/or approaching vehicles. The RVDD shall be spatially monostatic; the transmitter and receiver shall be located on the same sensor device.
- C. Radar Advance Detection Device (RADD):** Device that accurately and continuously detects, tracks, and identifies speed of approaching vehicles simultaneously to an intersection in the selected direction of travel. The RADD is capable of detection as described in section 696.3.A. The RADD shall maintain detection of a vehicle moving within 100 ft. to 500 ft. from the device as programmed by the user.
- D. Radar Presence Detection Device (RPDD):** Device that accurately and continuously detects and tracks approaching vehicles simultaneously to an intersection in the selected direction of travel. The RPDD is capable of true presence detection as described in section 696.3.B. The RPDD shall maintain detection of a vehicle moving or stopped within a programmed detection zone set up by the user.
- E. Interface Module:** Device that interfaces with the cabinet detector rack allowing for contact closure to occur on a selected detector channel.
- F. Communications Link:** The communications connection between the RVDD processor unit and a local area network (LAN) or laptop computer.
- G. Detection Accuracy:** The measure of the basic operation of a detection system (shows detection when a vehicle is in the detection zone and shows no detection when there is not a vehicle in the detection zone).
- H. Passage Detection:** The ability of a vehicle detector to detect the passage of a vehicle moving through the zone of detection and to ignore the presence of a vehicle stopped within the zone of detection.
- I. Presence Detection:** The ability of a vehicle detector to sense that a vehicle, whether moving or stopped, has appeared in its zone of detection.
- J. Delay Timing:** When selected, applies delayed contact closure to the associated detector channel input. When a vehicle is detected by the RVDS, the delay timing must time out before contact closure is removed from the associated detector channel.

- K. Extension Timing:** When selected, applies additional contact closure to the associated detector channel input. When a vehicle is no longer detected within a detection zone, extension timing must time out before contact closure is removed from the associated detector channel.

696.3. FUNCTIONAL CAPABILITIES

A. Radar Advance Detection Device (RADD) Capabilities and Requirements

1. The RADD shall provide passage detection and contact closure to the interface module for vehicles approaching the intersection (the unit).
2. The RADD shall provide vehicle detection, tracking, and speed of moving vehicles approaching an intersection at a range of 100 feet to 500 feet from the radar sensor.
3. The RADD system software shall be capable of creating multiple detection zones within the detection range and applying conditional logic to the detection zones, allowing contact closure to occur only when logic conditions are achieved by the RADD. The user shall be able to apply logic gating such as: “and”, “or” to a detection zone from the software GUI provided with the system. Conditional logic programming will allow the user to control when contact closure occurs to the detector rack interface module.
4. The RADD system software shall be capable of minimum and maximum speed settings to create a desired speed range for contact closure to the detector channel. Vehicles detected within the minimum and maximum speed settings will apply contact closure to the assigned detector channel input.
5. Detection accuracy will be determined by the detection of any moving vehicle or cluster of vehicles within a defined detection zone and within the minimum and maximum speed parameters programmed for the detection zone. With four (4) detection zones programmed, each zone 100 feet in length, a minimum of 95% detection accuracy shall be required for each zone. Detection zones will be set up between 100 feet and 500 feet. Conditional logic for each zone shall be set up in the “or” gate position allowing for contact closure to occur when vehicle speed conditions are met in the detection zone.
6. The RADD shall be capable of delay timing as defined in 696.2.J of this specification. As a minimum the user shall be able to program and select extension timing from 0-25 seconds in one/tenth (0.1) second increments from the GUI provided with the RVDS system.
7. The RADD shall be capable of extension timing as defined in 696.2.K of this specification. As a minimum the user shall be able to program and select extension timing from 0-25 seconds in one/tenth (0.1) second increments from the GUI provided with the RADD system.
8. The RADD shall be capable of adjusting the extension time automatically based on speed of a moving vehicle.

B. Radar Presence Detection Device (RPDD) Functional Capabilities and Requirements

1. The RPDD shall provide presence detection and contact closure to the interface module for vehicles approaching an intersection. Presence detection shall operate as defined in 696.2.I of this specification.
2. The RPDD shall, as a minimum detect vehicles within a 100 feet, 90 degree cone of detection from the sensor. Stop bar radar units shall be able to detect vehicles in 10 lanes of detection. The number of lanes used and detection zones shall be set up and selected from the GUI.
3. The RPDD shall be able to assign up to 4 detector outputs per unit and capable of using 2 or 4 channel interface modules to the detector rack.
4. The RPDD shall be able to distinguish and omit wrong way traffic from activating an assigned detector output.
5. The RPDD shall as a minimum, maintain a detection accuracy of 95% for each detection zone set-up on the GUI.

696.4. MATERIALS: Provide components necessary for RVDD installation. A RVDD shall consist of the following components: Radar sensor (1), detector rack interface module (1), power and surge protection panel or module (1), and all associated equipment required to set up and operate in a field environment including software, serial and Ethernet communications ports, cabling, electrical connectors, and mounting hardware.

A. RVDD Interface Module

1. The RVDD interface module must comply and operate with NEMA TS-2 Type 1 detector rack or Type 170/2070 input file.
2. The RADD shall be capable of 16 contact closure inputs to the detector rack. The user shall be able to assign each contact closure to an associated detector channel. The contact closure shall occur through the interface modules or controller module plugged into the rack.
3. All components of the RVDD housed in the controller cabinet shall be rated to operate in a temperature range from -34°C to +74°C (-30°F to +165°F) at 0 percent to 95 percent relative humidity, non-condensing.
4. The RVDD shall provide a “fail safe” operation that triggers when communication between the radar vehicle sensor and the interface module is broken. Contact closure will occur on all programmed detector channels associated with the interface module when the fail safe is triggered and will remain in this state until communication is reestablished between the interface module and the radar vehicle sensor.
5. The RVDD shall be capable of either “pulse mode” or “presence mode” operation. In the pulse mode, when a vehicle is detected and conditional logic is satisfied, contact closure will occur for approximately 125 ms. In the presence mode, contact closure will occur for as long as a vehicle is detected and conditional logic programming is satisfied.

B. RVDD Sensor

1. The RVDD shall be able to operate in all types of weather conditions including: rain, snow, sleet, ice, fog, and wind blown dust. The RVDD shall be able to operate normally and with no degraded performance when the radar vehicle sensor is encased in a 1/2 inch ice.
2. The RVDD shall be rated to operate in a temperature range from -34°C to 60°C (-30°F to 140°F) at 0 percent to 95 percent relative humidity.
3. The RVDD shall comply with all applicable Federal Communications Commission (FCC) requirements. The manufacturer will provide documentation of compliance with FCC specifications. Each RVDD will be FCC certified under CFR 47, Part 15, Section 15.245 as a field disturbance sensor or Section 15.249 as an intentional radiator. This certification will be displayed on an external label on each device according to the rules set forth by the FCC.
4. The RVDD shall maintain frequency stability without the use of manual tuning elements by the user.

C. Power and Surge Protection

1. Lightning and surge protection will be provided for power connections and communications links to the RVDD meeting or exceeding EN 61000-4-5 class specifications.

D. Software and Communication Requirements

1. The RVDD system software shall utilize a GUI that runs in a Microsoft Windows Mobile and Microsoft Windows XP environment or newer Microsoft operating system. The GUI shall graphically illustrate vehicle movement and directionality when detection is achieved by the RVDD. The software shall be capable of auto configuration upon set up of the RVDD.
2. Programmed parameters from the GUI to the sensor shall be stored in non-volatile memory devices such as Flash RAM or EEPROM within the sensor. The RVDD shall not rely on batter backup or the use of a super capacitor to retain memory.
3. The RVDD shall provide a RS232 serial communications link allowing the user to interface with a laptop computer and operate the GUI. The RS232 serial port shall be full duplex and will support true RTS/CTS hardware handshaking for interfacing to various communications devices.
4. The RVDD shall provide an Ethernet communications link allowing the user to interface the system and operate the GUI via a LAN and using TCP/IP protocol.
5. The RVDD firmware shall be upgradeable by external, local, or remote download via serial or Ethernet ports.
6. The serial and Ethernet communications ports as a minimum will support the following baud rates: 9600, 19200, 38400, 57600, and 115200. The user shall be able to select the desired baud rate from the GUI.

7. The operator shall be able to save configurations settings to a file or reload the configurations settings to the RVDD from a saved file using the GUI.
8. The RPDD software shall allow for a virtual connection option so that the software can be used without connecting to an actual sensor.

E. Cabling: The cable end connector shall meet the MIL-C-26482 specification and shall be designed to interface with the appropriate MIL-C-26482 connector. The connector back shell shall be an environmentally sealed shell that offers excellent immersion capability. All conductors that interface with the connector shall be encased in a single jacket and the outer diameter of this jacket shall be within the back shell's cable O.D. range to ensure proper weather sealing. The back shell shall have a strain relief with enough strength to support the cable slack under extreme weather conditions. The cable shall conform to the following specifications:

1. Radar Advance Detection Device (RADD) Cabling

- a. Shielded, twisted pairs with a drain wire
- b. Nominal Capacitance Conductor to Conductor @ 1 KHz \leq 26 pF/Ft
- c. Nominal Conductor DC resistance at 20°C (68°F) \leq 15 ohms/1000 Ft
- d. Single continuous run with no splices allowed.
 - If communication is conducted over the RS-485 bus, the communication cable can be terminated only at the two farthest ends of the cable and the operational baud rate and cable lengths shall not exceed the following limits:

Baud Rate*	Cable Length
115.2 Kbps	300 ft
57.6 Kbps	600 ft
38.4 Kbps	800 ft
19.2 Kbps	1000 ft
9.6 Kbps	2000 ft

**Note: These represent Maximum data rates. The data rate used should be the minimum data rate required for operation.*

- e. RVDS supplied shall use 24 VDC, the power cable shall meet the following specifications:
 - Two shielded, twisted pairs with two drain wires connected in parallel
 - Nominal capacitance conductor to conductor @ 1 KHz \leq 26 pF/Ft
 - Nominal conductor DC resistance @ 20°C (68°F) \leq 15 ohms/1000

- The cable length shall not exceed 600 ft.
- f. If a cable length of 600 ft to 2,000 ft is required, the power cable shall meet the following specifications:
 - 10 AWG conductor size/gauge
 - Two conductor count
 - Stranded Cable Type
 - Bare Copper Material
 - 600 Volt Range
 - 90°C Temperature Rating
 - PVC/Nylon insulation material
 - PVC jacketing material
 - 40 Amps per conductor
- g. Both communication and power conductors may be bundled together in the same cable as long as the above-mentioned conditions are met.

2. Radar Presence Detection Device (RPDD) Cabling

- a. The RS-485 conductors shall be a twisted pair.
- b. The RS-485 conductors shall have nominal capacitance conductor to conductor of less than 71 pF/Ft at 1 KHz.
- c. The RS-485 conductors shall have nominal conductor DC resistance of less than 16.5 ohms/ (304.8 m) at 20°C (68°F).
- d. The power conductors shall be one twisted pair with nominal conductor DC resistance of less than 11.5 ohms/ (304.8 m) at 20°C (68°F).
- e. Each wire bundle or the entire cable shall be shielded with an aluminum/Mylar shield with a drain wire.
- f. The cable O.D. shall not exceed 0.4 inches.
- g. The cable length shall not exceed 2,000 ft (609.6 m) for the operational baud rate of RS-485 communications (9.6 Kbps).
- h. The RVDS shall use 24 VDC and the cable length shall not exceed 500 ft (182.9 m).
- i. Both communication and power conductors can be bundled together in the same cable as long as the above-mentioned conditions are met.

696.5. EQUIPMENT: Provide the machinery, tools, and equipment necessary for proper prosecution of the work. All machinery, tools, and equipment used shall be maintained in a satisfactory and workmanlike manner.

696.6. CONSTRUCTION: Install RVDD in accordance with the details shown on the plans and the requirements of this item

A. Manufacturing and Testing

1. The internal electronics of the RVDD shall utilize automation for the surface mount assembly. The RPDD shall comply with the requirements set forth in IPC-A-610C Class 2 and the RADD with the requirements in IPC-A-610C Class 3, Acceptability of Electronic Assemblies.
2. The RVDD shall undergo a rigorous sequence of operational testing to ensure product functionality and reliability. Testing shall include the following:
 - a. Functionality testing of all internal sub-assemblies
 - b. Unit level burn-in testing of duration 48 hours or greater
 - c. Final unit functionality testing prior to shipment.

B. Installation and Training

1. When requested by COSA personnel or purchasing agency, the supplier of the RVDD shall supervise the installation and testing of the radar equipment.
2. If requested by COSA personnel or purchasing agency, up to two days of training shall be provided to personnel of COSA in the operation, setup, and maintenance of the RVDD. Instruction and materials shall be provided for a maximum of 20 persons and shall be conducted at a location selected by COSA. COSA or purchasing agency shall be responsible for the cost of training.
3. Instruction personnel are required to be certified by the equipment manufacturer. The User's Guide is not an adequate substitute for practical, classroom training and formal certification by an approved agency.
4. Formal levels of factory authorized training are required for installers, contractors, and system operators. All training must be certified by the manufacturer.

C. Warranty, Maintenance, and Support

1. The RVDD shall be warranted to be free of defects in material and workmanship for a period of 5 years from date of shipment from the supplier's facility. During the warranty period, the supplier shall repair with new or refurbished materials, or replace at no charge, any product containing a warranty defect or fails to operate properly after installation provided the product is returned FOB to the supplier's factory or authorized repair site. Product repair or replaced under warranty by the supplier will be returned with transportation prepaid. This warranty does not apply to products damaged by accident, improper operation, abuse, serviced by unauthorized personnel or unauthorized modification.

2. If a RVDD fails with no visible or physical damage to any electronic/electrical component of the system or its wiring, then the unit is considered to have failed under normal operating conditions. A blown fuse or surge protection device failure shall be considered to have failed under normal operating conditions. Acts-of-God will not be accepted as excusable unit failures of the RVDD system.
3. Repair or full replacement will be required if a RVDD fails to operate as specified under normal operating conditions. Repaired or replaced components of the RVDD will be provided at no cost to COSA. The replaced or repaired units will inherit the remainder of the failed unit's warranty.
4. During the warranty period, technical support shall be available from the supplier via telephone within 4 hours of the time a call is made by a user, and this support shall be available from factory certified personnel or factory certified installers.
5. Ongoing software support by the supplier shall include firmware updates for the RVDD processor unit and external software needed to set up and operate the RVDD system. These updates shall be provided free of charge during the warranty period. The update of the RVDD software shall be tested and approved by COSA before installation.
6. The supplier shall maintain a program for technical support and software updates following expiration of the warranty period. This program shall be made available to COSA in the form of a separate agreement for continuing support.
7. The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the radar system.

696.7. MEASUREMENT: This item will be measured as each RADD or RPDD installed, tested, and made operational including the radar sensor, detector rack interface module, processor units, power and surge protection panel or module, software, serial and Ethernet communication ports, electrical connectors and mounting hardware.

The RVDD communication and power cable(s) will be measured by the linear foot of the cable type furnished (RADD or RPDD)

696.8. PAYMENT: The work performed and materials furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid for each item listed in Section 696.9, "Bid Items". These prices are full compensation for furnishing, placing, and testing all materials and equipment, and for all tools, labor, equipment, hardware, operational software packages, supplies, support, personnel training, shop drawings, documentation, and incidentals. A power cable meeting the specifications outlined in Section 696.4 "Materials" shall be included with communication cable and is considered subsidiary to the price of the communication cables.

These prices also include any and all interfaces required for the field and remote communications links along with any associated peripheral equipment, including cables; all associated mounting hardware and associated field equipment; required for a complete and fully functional RVDD system.

696.9. BID ITEMS:

Item 696.01 - Radar Advance Detection Device (RADD) – per each

Item 696.02 - Radar Presence Detection Device (RPDD) – per each

Item 696.03 - Radar Advance Detection Device (RADD) Communication and Power Cable – per linear foot

Item 696.04 - Radar Presence Detection Device (RPDD) Communication and Power Cable – per linear foot

Item 696.12 - Install Radar Detection Device – per each

Item 696.14 - Install Radar Communications Cable – per linear foot

SPECIAL SPECIFICATION 6007

REMOVING TRAFFIC SIGNALS

6007.1 DESCRIPTION:

This item governs the removal, storage, and salvage of traffic signals.

6007.2 CONSTRUCTION:

Traffic signals must remain in operation during construction until their removal as directed. The Contractor will not be responsible for maintenance of the signals during this period of operation.

Remove existing electrical services, pedestal poles, strain poles, mast arm pole assemblies, luminaires, signal heads, controllers, cables, and other accessories. Remove materials so that damage does not occur. Remove and store items designated for reuse or salvage at locations shown on the plans or as directed.

Remove abandoned concrete foundations to a point 2 ft. below final grade. Backfill hole with material equal in composition and density to the surrounding area. Replace surfacing material with similar material to an equivalent condition.

Accept ownership of unsalvageable materials and dispose of in accordance with federal, state, and local regulations.

6007.3 MEASUREMENT:

This Item will be measured as each signalized intersection removed. A signalized intersection is a group of signals operated by a single controller.

6007.4 PAYMENT:

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Removing Traffic Signals." This price is full compensation for removing the various traffic signal components; removing the foundations; disposal of unsalvageable material; hauling; and equipment, labor, tools, and incidentals.

6007.5 BID ITEM:

Item 6007.01 – Removing Traffic Signals – per each

SPECIAL PROVISIONS

All work shall conform to the 2008 Edition of the “Standard Specifications for Construction” published by the City of San Antonio and these Special Provisions.

ITEM 101. PREPARING RIGHT-OF-WAY

The Contractor shall be responsible for obtaining all permits required to complete the task order.

ITEM 308. DRILLED SHAFTS AND UNDER-REAMED FOUNDATIONS

Anchor bolts for poles shall be provided by the City of San Antonio and installed by the Contractor.

An additional 2” schedule 40 PVC stub out shall be installed at each pole foundation. Stub outs shall be one-foot in length and appropriately capped below grade for future use. This shall be subsidiary to item 308.1 “Drilled Shafts”.

ITEM 530. BARRICADES, SIGNS & TRAFFIC HANDLING

The Contractor shall be responsible for setting and removing all barricades and temporary traffic control devices.

ITEM 531. SIGNS

Small roadside signs shall be provided by the City of San Antonio. The Contractor shall provide the supports and all the necessary hardware for mounting.

ITEM 533. CLEANING AND REMOVAL OF PAVEMENT MARKINGS AND MARKERS

Removal of existing pavement markings will be measured by the linear foot of lane line including any conflicting markers or by each symbol or word removed. Payment shall be according to the quantities measured for each bid item.

ITEM 600. TRAFFIC SIGNAL GENERAL CONDITIONS

All work shall comply with the City of San Antonio Right of Way Ordinance and the Utility Excavation Criteria Manual.

Trenches for the electrical service conduit left overnight for the purpose of inspection by the utility company shall be adequately covered or platted and barricaded with reflective standard barricades equipped with warning flashers or as directed by the Engineer. Any reusable backfill material shall be removed and stored off-site until the utility company approves the conduit installation. Payment for this work will be made under “Conduit (Open Trench)”.

Any other trenches left overnight as well as any foundations that do not have poles sitting on them or any other such hazard to the public shall be adequately covered and barricaded with reflective standard barricades equipped with warning flashers or as directed by the Engineer. This work will not be paid directly and is considered subsidiary to applicable items specified for the project.

ITEM 618. CONDUIT

Proposed conduit shown under existing street pavement and driveways shall be installed by horizontal, directional bore. No trenching or conventional jacking or drilling shall be permitted except as allowed by the Engineer.

Conduits installed under roadways, driveways, or any other areas where it is possible for vehicles to drive presently or with future development shall be placed at a minimum depth of 30 inches.

The Contractor shall place warning tape in all trenches where new conduit is placed. All warning tape shall be placed at a depth of 6 to 8 inches below final grade. Conduit warning tape shall be a 4 mil inert plastic film specially formulated for prolonged use underground. All tape shall be highly resistant to alkalis, acids, and other destructive agents found in soils. Tape shall have a continuous printed message warning of the location of underground conduits. The message shall be in permanent ink specifically formulated for prolonged underground use and shall bear the words “caution – electric line buried below”, or other such approved phrase, in black letters on a yellow or red background.

Conduit installed from the electrical service source to the meter pedestal or cabinet shall be paid under item 618.03, “Conduit (Open Trench)”, per linear foot of the type and size required by the utility company. The bid price shall be full compensation for the electrical wiring, covering and barricading the trench, off-site storing of backfill material and any other incidentals required for a safe environment while the conduit is being inspected by the utility company.

ITEM 624. GROUND BOXES

The Contractor shall furnish and install the ground box for the battery backup system and shall be subsidiary to item 633.01, Battery Backup System.

All other ground boxes and covers shall be provided by the City of San Antonio and installed by the Contractor.

The installation of the traffic signal ground box in new controller cabinet foundation shall be subsidiary to item 655.01, Type 332 Controller Foundation.

ITEM 628. ELECTRICAL SERVICES

Upon receipt of the electrical permit for each intersection, the Contractor shall email a scanned copy to Marc Jacobson at marc.jacobson@sanantonio.gov.

The Contractor shall supply and install the address in permanent numbers and letters to the street side of the service enclosure. Said address shall also be recorded and given to the City Inspector for the City’s records.

The Contractor shall be responsible for paying all fees and obtaining the permits required to install the electrical service. Trenches for the electrical service conduit left overnight for the purpose of inspection by the utility company will be paid under item 618.03, “Conduit (Open Trench)”.

ITEM 633. BATTERY BACKUP SYSTEM FOR TRAFFIC SIGNAL

The Contractor shall furnish and install the ground box for the battery backup system and shall be subsidiary to item 633.01, Battery Backup System.

ITEM 655. CONTROLLER FOUNDATION AND PEDESTAL POSTS

The foundation for new traffic signal controller cabinet assembly shall be “City Type” in accordance with Standard TM-BBS-08, Battery Backup System Layout.

ITEM 680. INSTALLATION OF HIGHWAY TRAFFIC SIGNALS

The project shall consist of furnishing some materials and installing all materials and equipment required for a complete traffic signal installation. Upon project completion, fully operational traffic signal systems will be required. Items required but not shown on the plans are the responsibility of the Contractor and shall be subsidiary to the applicable bid item.

Permanent traffic signs will be provided by the City of San Antonio. Contractor shall install all permanent signs mounted on signal equipment, as shown on the plans. The Contractor shall provide all necessary hardware for mounting. In accordance with item 680, the cost of installing these signs shall be subsidiary to this same item.

The controller cabinet, traffic signal controller, and anchor bolts shall be provided by the City of San Antonio and installed by the Contractor.

The Contractor shall demonstrate to the Engineer's satisfaction that the field wiring is properly installed and labeled. Only then, the Contractor shall install the controller assembly on the completed foundation. City forces will connect the field wiring to the controller, set up, and turn on the controller.

Until the project is completed and accepted, the Contractor will be responsible for the maintenance of the traffic signals. The Contractor shall ensure that all elements of the traffic signals remain in operation at his expense. The Contractor shall complete any repairs to the traffic signals within four hours after notification. The City of San Antonio shall retain the responsibility of the operation of the traffic signals.

The locations shown on the plans for signal pole foundations, controller foundations, conduit and other items may be varied to meet local conditions, subject to prior approval by the Engineer. The Contractor shall be responsible for adjustments in project construction, which may be necessary because of conflict with utilities.

Final adjustment of heads, as required by the Engineer, shall be done by the Contractor and shall be subsidiary to the various bid items.

All traffic signal equipment, including span wire, installed shall maintain a minimum clearance of 3' radius from neutral overhead electrical lines and 10' radius from primary overhead electrical lines. Additional clearance requirements shall be as directed by the electrical utility company.

ITEM 681. TEMPORARY TRAFFIC SIGNALS

Additional vehicular signal heads, mounting assemblies, and back plates required shall be provided by the City of San Antonio and installed by the Contractor. Reconfiguration of vehicle signal heads shall be as directed by the City.

ITEM 682. VEHICLE AND PEDESTRIAN SIGNAL HEADS

Vehicular and pedestrian signal heads and mounting assemblies and back plates shall be provided by the City of San Antonio and installed by the Contractor.

ITEM 684. TRAFFIC SIGNAL CABLES

All proposed signal cable shall be #14 a.w.g. solid copper.

ITEM 685. FLASHING BEACON ASSEMBLIES

The City of San Antonio shall provide the Solar Powered School Zone Flasher Assemblies, pedestal pole for roadside mounted installations, traffic signal pole assemblies for mast arm installations, signs and signal heads.

For mast arm installations, the contractor will be paid for installation of the traffic signal pole assembly and for the pole's foundation under the appropriate bid items.

Upon project completion, fully operational flashing beacon system will be required. Items required but not shown on the plans are the responsibility of the Contractor and shall be subsidiary to the applicable bid item.

ITEM 686. TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL)

Traffic signal poles and mast arms shall be provided by the City of San Antonio and installed by the Contractor.

ITEM 687. PEDESTAL POLE ASSEMBLIES

Pedestal pole, pedestal pole base, and anchor bolts shall be provided by the City of San Antonio and installed by the Contractor. The Contractor shall be responsible for drilling and pouring the foundation.

ITEM 688. PEDESTRIAN DETECTORS AND VEHICLE LOOP DETECTORS

Pedestrian push button and signs shall be provided by the City of San Antonio and installed by the Contractor.

ITEM 693. INTERNALLY LIGHTED STREET NAME SIGN ASSEMBLIES

Internally lighted street name signs shall be provided by the City of San Antonio and installed by the Contractor as directed by the Engineer.

ITEM 694. VIDEO IMAGING VEHICLE DETECTION SYSTEM

VIVDS cameras and any mounting hardware needed shall be provided by the City of San Antonio for installation by the Contractor. Contractor shall focus and zoom the cameras as directed by the Engineer. Provide a fully operational VIVDS. The camera assemblies shall be mounted above the roadway on the mast arms and/or luminaire arms, as shown on the plans. Camera assembly height shall be a minimum of 25 feet above the roadway or in accordance with manufacturer recommendation to obtain optimum detection, as determined by the Engineer.

ITEM 695. EMERGENCY VEHICLE TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM

Emergency vehicle preemption detectors, mounting hardware, and cable shall be provided by the City of San Antonio and installed by the Contractor as directed by the Engineer.

ITEM 696. RADAR VEHICLE DETECTION DEVICES (RVDD)

The Contractor shall furnish and install all radar vehicle detectors, mounting hardware, and cable unless noted in the task order that the equipment is to be provided by the City of San Antonio and installed by the Contractor as directed by the Engineer.

ITEM 802. TREE PRUNING

Tree pruning shall be done in accordance with the Branch Pruning and Branch Clearance Details of the City of San Antonio Tree Protection Details.