
CITY OF BOCA RATON

Special Requirements for Traffic Control Signal Devices and ITS Devices



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Traffic Management Center
City of Boca Raton
Municipal Services Department
2500 Northwest 1st Avenue
Boca Raton, Florida 33431

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Special Requirements for Traffic Control Signal Devices and ITS Devices
Municipal Services Department/ Traffic Division
City of Boca Raton

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Primary References	Manual on Uniform Traffic Control Devices	FHWA 2009 http://mutcd.fhwa.dot.gov/kno_2009.htm
	Minimum Specification for Traffic Control Signal Devices	FDOT 2010 http://www.dot.state.fl.us/trafficoperations/Traf_Sys/terl/apl4.shtm
	Standard Specification for Road and Bridge Construction	FDOT 2010 http://www.dot.state.fl.us/specificationsoffice/Implemented/SpecBooks/2010BK.shtm

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CBR-100 GENERAL REQUIREMENTS

The Contractor shall adhere to items outlined in this: *Special Requirements for Traffic Control Signal Devices and ITS Devices* and *Policies and Procedures for contractors working with Traffic Signals, Communications Infrastructure and ITS devices* as published at www.bocatraffic.org.

All mast arms, strain poles, wood poles, drill shafts and cabinet locations shall be coordinated and pre-approved by the Traffic Operations Engineer and/or the Chief Signal Technician prior to any installation.

All work and materials shall conform to the *Florida Department of Transportation Standard Specifications for Road and Bridge Construction* dated 2010, *FDOT Minimum Specification for Traffic Control Signal Devices* dated 2010, *The Manual of Uniform Traffic Control Devices* dated 2009.

CBR-101 MOBILIZATION

The Contractor shall provide all necessary equipment and manpower during the course of construction.

CBR-102 MAINTENANCE OF TRAFFIC

The Contractor shall maintain traffic signal vehicle detection and signal/ITS communications as part of the maintenance of traffic. The cost for temporary vehicle detection and temporary signal/ITS communications shall be included as part of the lump sum maintenance of traffic pay items.

During the time the Contractor is restoring or repairing any malfunctioning traffic signal equipment, ITS equipment or signal/ITS communications, the Contractor shall provide, at his/her expense, temporary traffic control devices, flagger personnel, and law enforcement personnel as necessary to maintain safe and efficient traffic flow.

Response and Repair times will be as follows:

- Response time for a malfunctioning traffic signal shall be within two (2) hours of notification. The Contractor shall provide the City the emergency phone number for his/her standby technicians for such notification.
- The contractor shall restore or repair all malfunctioning traffic signal equipment to original level of operation prior to the malfunction within twenty-four (24) hours of notification.
- The contractor shall restore all malfunctioning detection, including signal inductive loops, video detection and pedestrian detection by means of temporary or permanent detection as decided by the Contractor. Vehicle Detection shall work to its original level of operation prior to the malfunction within twenty-four (24) hours of notification. Pedestrian detection will be evaluated on a case by case basis and shall be restored as soon as practical.
- The contractor shall restore all malfunctioning communications as decided by the contractor. Communications shall work to its original level of operation prior to the malfunction within twenty-four (24) hours of notification. Temporary fiber optic mechanical or fusion splice may be used to restore communications within 24 hours; however a full replacement of the fiber optic run shall be required prior to final acceptance.

The contractor shall inform in writing (electronic mail will be acceptable) the City of Boca Raton Traffic Signal Section of any problem and the corresponding fix and resolution for any traffic signal related problem. If the contractor is unable to provide repair and restoration after the designated response times, the City of Boca Raton may provide restoration at the effort of its own staff and all direct costs shall be billed to the contractor.

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CBR-555 DIRECTIONAL BORE

Directional Bore pay item shall include all materials and installation costs. The directional bore shall be placed at a minimum depth of 36" for pavement and 36" for pedestrian signal below the finished grade. Directional bore shall include no more than 180 degree of total bend, and shall have a bending radius of at least 10 times the direction bore diameter. A City of Boca Raton signal inspector shall be notified and be present on site to check the depth of the directional bore during the installation. The work includes a single directional bore and certain number of conduits as specified on the plan sheets. If plan sheets do not specify the number of conduits, a minimum of two (2) conduits shall be installed when under pavement and/or across any roadway. Unless specified elsewhere in the construction contract, any additional conduits within the same bore shall be paid as specified in CBR-630.

CBR-611 ACCEPTANCE PROCEDURES

The Contractor shall provide two hard copies of the marked-up (as-builts) construction plans and electronic files in Adobe Acrobat (*.PDF). These as-builts shall be submitted seven days prior to final inspections. A communications report (optical time-domain reflectometer-OTDR) shall also be provided seven days prior to final inspections if the construction includes communications or fiber optic work. One hard copy of communications report shall also be furnished along with electronic files in Adobe Acrobat format (*.PDF).

A contractor representative must be present during final inspections. The Contractor shall refer to the inspection and acceptance procedures as specified in "Policies and Procedures for Traffic Signal, Communications Infrastructure and ITS Devices". Field-testing of communications and detection shall be done prior to final inspection.

CBR-630 CONDUIT

Traffic Signal Conduit

A minimum of two conduits with a diameter of 2" each shall be installed across and under the roadway for any new traffic signal mast arm installation, one for signal cable, one for spare. For any new mast arm intersections with video detection, a minimum of three (3) conduits shall be required with one for signal cable, one for video detection and one as a spare. . No conduits shall be populated in excess of forty percent capacity.

A "14 AWG THHN" wire shall be installed within all communication conduits or unused signal conduits and weatherproofed. Splices shall be installed within the pull boxes to provide electrical continuity. Payment for conduit shall be based upon the length of the trench or bore as measured between the center of pull boxes and the total length of conduit supplied is incidental to the project.

Communications Conduit

Payment for conduit shall be based upon the length of the trench or bore as measured between the center of pull boxes and not the total length of conduit supplied. Refer to CBR-783 ITS-Fiber Optic Cable and Interconnect.

CBR-632 SIGNAL AND INTERCONNECT CABLE

Signal Cable

The signal and interconnect cable shall be secured with lashing rods (cable ties or tie wraps will not be allowed). Refer to Appendix B, for additional information on signal cable.

Interconnect Cable

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For the interconnect cable, signal plans shall specify the number of fibers and the number of terminations/splices by each location. Should the signal plans not specify the fiber, a six pair or 12 count single mode fiber shall be installed. The cable color-coding shall be per City of Boca Raton standards. Refer to CBR-783 ITS-Fiber Optic Cable and Interconnect.

CBR-635 PULL AND JUNCTION BOX

Traffic Signal Pull Boxes

Traffic Signal pull boxes shall have "Quazite heavy duty" covers rated for a static load of at least 20,000 pounds over a 10" square area. The minimum size of any traffic signal pull box shall be 17" x 30" x 12". Covers shall be stamped "BOCA RATON TRAFFIC SIGNAL" for all signalization applications. A minimum of three pull boxes shall be installed at the corner where the controller cabinet is located. A minimum of three conduits for the signal cable video cable, and spare shall be installed from the pull boxes adjacent to the cabinet at the corner where the cabinet was installed. All of the cables or wires inside a pull box should be properly labeled as to type (such as loop, signal, video, spare) and destination (such as "EB to cabinet" or "to loop 6I"). The Contractor shall refer to Appendix B for color coding. For drainage, 12" of pea rock shall be required under the pull box similar to typical shown in FDOT index no 17721. For all pull boxes in grassy areas, a concrete reinforced apron shall be required to prevent landscape maintenance damages. The concrete apron shall be 12" wide x 6" deep reinforced and sloped away around pull box similar to typical shown in FDOT index 17500 for street lights. Concrete apron, when required, shall be included under this pay item and design engineer-of-record should have separate pay item numbers for pull boxes in concrete and pull boxes in grass. All pull boxes shall be flushed with final grade.

Communications Pull Boxes

Fiber optic pull boxes shall be utilized for all communications cables. Pull boxes shall be spaced at a distance of 700 feet or as agreed by the engineer. The Fiber optic pull boxes shall be heavy duty and non-metallic with an open bottom and shall be rated for a static design load of at least 20,000 pounds over a 10 inch square area. The cover (lid) shall be extra heavy duty with 2 bolts with 2 lifting slots and shall be flush seated. Pull box dimensions are 24"X 36"X 30". One fiber optic pull box shall be installed at or within 10 feet of the traffic controller cabinet. Fiber optic pull box shall not contain any items other than communications cable or fiber optic (such as no electrical conductors). When pull box is to be placed in a sidewalk, removal, restoration and replacement of sidewalk slab is required. For drainage, 12" of pea rock shall be required under the pull box similar to typical shown in FDOT index no 17721. Pull box covers shall be stamped "BOCA RATON FIBER OPTICS". For all fiber optic pull boxes in grassy areas, a concrete reinforced apron will be required. The concrete apron shall be 12" wide x 6" deep reinforced and sloped away around pull box similar to typical shown in FDOT index 17500 for street lights. Concrete apron when required shall be included under this pay item and Design engineer-of-record should have separate pay item numbers for pull boxes in concrete and pull boxes in grass.. Each pull box shall have 50 feet of spare fiber per run and 50 feet of spare fiber per run at the cabinet pull box. All pull boxes shall be flushed with final grade.

CBR-639 ELECTRICAL POWER SERVICE ASSEMBLY

First preference is to install service on a new 15 foot concrete service pedestal with a pull box for ground line. Second preference is to install service riser and disconnect to existing traffic signal pole. If a new service pedestal cannot be installed a service riser and disconnect on an existing FPL pole a maximum of 75 feet from the controller cabinet may be used. This service disconnect shall have a surge protector installed on the load side (line side of equipment).

The service disconnect box shall be Square D (part number Q024L70RB). The service disconnect shall be properly bonded to the pole ground wire. Load side of disconnect shall be run back underground and on to the controller cabinet. All of this work shall be performed under this

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pay item, and the contractor shall secure an electrical inspection prior to energizing the new electrical service.

CBR-649 SIGNAL POLE

Prior to fabrication and installation, all signal pole locations need to be field verified for utility conflicts. The Contractor shall call for locates for all subsurface utilities. Locations for of utilities shown on the plans are approximate only. The contractor shall determine and obtain approval from the Traffic Operations Engineer or Chief Signal Technician prior to digging or excavating.

The Contractor shall hand dig the first four feet of the pole foundations using caution. The Contractor shall coordinate with Florida Power and Light (FPL) for overhead power line adjustments to meet vertical and horizontal clearance requirements. All additional costs for field locations and field adjustments are incidental and shall be included in the cost of the signal pole (for both strain pole and mast arm installation)

CBR-650 VEHICULAR TRAFFIC SIGNAL ASSEMBLY

Traffic signal heads are to be cast aluminum. Full tunnel visors (not cutouts) shall be required. L.E.D. modules shall be installed on all signal heads. The L.E.D. modules shall be compliant to ITE-VTCSH-LED requirements and shall include a manufacturer's warranty of at least 5 years. Color shall be gloss black (not flat black). Traffic signal heads shall be mounted horizontally where possible. Drainage holes in the bottom of the signals shall be provided. All signal heads shall be properly caulked as to prevent water intrusion.

CBR-653 PEDESTRIAN SIGNAL ASSEMBLY

L.E.D. pedestrian signals are to be countdown one section provided with international side-by-side full hand/full man symbols. The L.E.D. pedestrian signal modules shall be compliant to ITE-VTCSH-LED requirements and shall include a manufacturer's warranty of at least 5 years.

CBR-659 SIGNAL HEAD AUXILIARIES

Back plates are to be provided on all East/West signal heads. Back plates shall be installed such that vent slits open to the rear of the signal head and flush side shall be forward facing.

All pedestals shall include transformer-type bases. The transformer base shall be Pelco Model # st-5326

All disconnects for span wire installation shall be with a 1 ½ " pipe threaded top. The disconnects shall be engineered castings model 1155-18-T. The drop pipe shall be threaded directly into the disconnect with no adapter between.

CBR-660 DETECTORS

Video detection is the preferred means of vehicle detection. Please refer to CBR-786 ITS-Video Detection.

Loop detectors, if installed, will follow FDOT's Standard Specifications for Road and Bridge Construction 2010, section 660.

CBR-665 PEDESTRIAN DETECTOR

The pedestrian detector button shall be Polara bulldog pedestrian button or FDOT approved equivalent. Pedestrian detector shall include a pedestrian signal information sign for countdown

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pedestrian indications. Pedestrian detector shall be jam free and impact resistant with no moving parts. The pedestrian detector button shall be fluorescent yellow green. All pedestrian detector push buttons should be properly caulked between the button and pole to prevent water intrusion.

CBR-670, 676 TRAFFIC CONTROLLER ASSEMBLY / CABINET / TRAFFIC CONTROLLER

Controller assembly shall consist of a Naztec TS-2 type 2 controller with front Ethernet port within a Boca Type VI TS-2 Control Cabinet (68" minimum) or a NEMA type VII TS-2 cabinet with 4 terminal facility BUI (Bit Interface Units). During special instances, a Naztec TS-2 controller in a TS-1 cabinet environment will be required. This shall be done on a case by case basis as decided by the Engineer. Control cabinets shall have a minimum of 16-channel detector rack, 32-loop detector panel, three shelves and ball bearing roller drawer. This controller shall provide a total utility and interoperability with the City of Boca Raton ATMS. The cabinet shall include a minimum of 16 load switch bays and accommodations for the video detection traffic control system.

The cabinet shall have a divided exhaust plenum equipped with two fans and two thermostats. Each fan shall be controlled by a separate thermostat and the third thermostat shall be wired to activate a user-defined alarm signal to the ATMS. Each fan shall be capable of moving 200 CFM of free air and shall be rated for continuous duty and lifetime of at least three years. The cabinet air filter shall be aluminum type with dimensions of 12" x 16" x 1".

The top of the controller assembly pad shall be at least 18" above the highest grade elevation of the corner where the cabinet is installed. The controller cabinet door shall open away from the intersection and/or vehicular traffic. The Contractor shall contact the City of Boca Raton Traffic Signal section prior to installing the cabinet.

CBR-678, 685 CONTROLLER/CABINET ACCESSORIES, SYSTEM AUXILIARY

All system auxiliary items shall conform to the City of Boca Raton requirements.

The Traffic signal cabinet shall be provided with the following:

- (a) Pre-emption/priority System
The pre-emption priority system shall be Opticom GPS system by Global Traffic Technologies using the following: Opticom Model 1010 GPS Radio Unit, Opticom Model 1000 GPS Phase Selector, Opticom Model 1040 GPS Card Rack and Opticom Model 1030 GPS Auxiliary Interface Panel (For intersections equipped with hardwired pre-emption such as bridge, rail-road or fire station)
- (b) Telemetry Transceiver (Ethernet Switch) - Refer to CBR-784 – Network Devices
- (c) System Auxiliary (Video Encoder) - Refer to CBR-782 – Video Equipment
- (d) System Auxiliary (Transfer switch)
Transfer switch shall be minimum of 30 amps from GenTran This device is mounted externally for transferring power source from electric company to inverter and to generator. Transfer switch shall be keyed with No. 2 signal control cabinet key.
- (e) System Auxiliary(Uninterruptible Power Source - UPS)
The UPS shall be APC smart UPS 750V with a 10/100 Base-T Ethernet

CBR-699 INTERNALLY ILLUMINATED SIGNS

Internally Illuminated Street name signs shall consist of L.E.D. light based signs from Engineered Castings (Quantum Lite QSN Series) or Temple Incorporated (formerly Carmanah Model R409A) Mounting of the signs shall be rigid on mast per manufacturer recommendation. The illuminated street name signs shall be single sided when mounted rigidly and shall have prismatic grade backing to provide retroreflectivity in the absence of power. A minimum of 8-INCH letters, highway gothic C font, shall be used. Wiring shall be a 10 amp optical relay mounted on the "D" panel to special function #1 output through separate 10-amp breaker.

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CBR-782 ITS- VIDEO EQUIPMENT

CCTV/Video Monitoring Equipment

- (a) Old Installation, Refurbish, Reinstall or Relocate – Use Vicon Surveyor series SVFT-PRS35 analog cameras equipped with firmware for native Vicon camera control protocol. This firmware shall be compatible with the existing Cameleon ITS software version 4.0 and Vicon driver version 1.1.
- (b) New Installation, -- Use Bosch Autodome VG4 500 Series IP Camera. Control will be web browser based, with Major Version Number 4.1 or higher.

CCTV/Video Monitoring Equipment Cable

- (a) Old Installation, Refurbish or Relocate - Use composite cable to carry the power, video and RS-422/RS-485 control signals. The power portion of the cable shall be sized such that the voltage drop is no greater than four percent when the camera is being operated at the full rated load, including heater. All cables and connectors for the CCTV cameras shall be identical. The composite cable shall be per manufacturer's requirements.
- (b) New Installation – Use composite-hybrid cable to carry the power and IP video (Cat5 Ethernet). The composite cable shall be per manufacturer's requirements.

Video Encoders

Video Encoder serves to send intersection video to the Traffic Management Center (TMC). Video encoders shall depend on the video equipment being encoded.

- (a) New installation - Digital PTZ-CCTV - (i.e. Bosch VG4 series) - Use internal H.264/MPEG4 encoding capabilities with the Bosch VG4 IP camera.
- (b) New installation - Video Detection – Use Iteris Edge-Connect as Video Encoder with H.264/MPEG4 encoding capabilities.
- (c) Refurbish, Reinstall or Relocate - Analog PTZ-CCTV (i.e. Vicon Surveyor series) – Use VBRICK 4200 Encoder series, with MPEG2 encoding and serial connector.

All integration with the existing Control Center software will be performed by the City. The City will provide the Internet Protocol (IP) scheme to the Contractor to configure the IP addresses for the encoder and the Ethernet switch.

CCTV Camera Pole – New Installation

All camera poles shall be concrete square poles. All poles to be installed shall be listed on the Florida Department of Transportation Qualified Products List (QPL). All camera poles shall have a concrete foundation and installed at a distance greater than or equal to the minimum clear zone requirements such as shoulder or FPL power lines. All poles shall be within the right of way. Pole locations shall be field located and pre-approved by the City prior to installation or construction.

The Installer shall ground all poles in accordance with the details for grounding and connections shown in Index No. 17727 of the Design Standards, 2010. All grounding shall be Cad Weld. A #4 braided copper wire from ground to lighting dissipater installed within a 3/4 " PVC schedule 40, 8 foot above ground shall be installed for all pole mounted CCTV installation.

The Installer shall mount the CCTV camera approximately 2 feet from the top of the pole. It shall be possible to remove the camera for maintenance without disturbing the mounting assembly and requiring the removal of only a single multi-conductor connector. Mounting assemblies shall be from manufacturer (Vicon or Bosch). All materials that make up the mounting assembly shall be of stainless steel or aluminum.

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CCTV Pole Mounted Cabinets – New Installation

If no space is available on the existing traffic control cabinet, a pole mounted cabinet may be required for new CCTV installations. Pole mounted cabinets shall be weatherproof aluminum enclosures or other approved metal cabinets that shall meet the requirements of Section 676 of the FDOT Standard Specifications for Road and Bridge Construction, 2010. To ensure personnel safety, all cabinets shall be installed in such a manner as to open away from traffic. The minimum dimensions of the cabinets shall be 36”H x 24”W x 22”D. The cabinets to be installed shall be NEMA Type 3 cabinets and equipped with the following:

- (a) Two 19” EIA racks with tapped 10-32 threaded holes, placed at the left and right side of the cabinet on the front side of the cabinet.
- (b) Power Distribution Assembly containing
 - 15 Amp Square D Main Circuit Breaker
 - GFI Circuit Breaker
 - AC Power Transient Voltage Surge Suppressor (TVSS)
 - Copper Ground Buss
 - Minimum two AC receptacles
 - The input side of the main circuit breaker shall be wired to the main AC input to the cabinet. The output side of the main circuit breaker shall be wired to the input side of the AC power TVSS. The output side of the AC power surge suppressor shall feed the two AC receptacles.
 - The input side of the GFI circuit breaker shall be wired to the main AC input to the cabinet. The output side of the GFI circuit breaker shall feed the two GFI receptacles.
 - The GFI receptacles are not required to be protected by an AC power surge suppressor.
- (c) A minimum of 15W standard fluorescent light fixture that illuminates when the cabinet door is opened and extinguishes when the cabinet door is closed.
- (d) Vents
- (e) A thermostat activated fan
- (f) One din-rail
- (g) Two shelves

The 120 VAC power from the existing signal cabinet shall use an in-line fuse. The Installer shall provide surge suppression on all conductors entering the camera enclosures and cabinets. Surge suppressors shall be located inside the pole mounted cabinet and shall be placed between the camera and the encoder. The Contractor shall provide surge suppressors for Power, Video Signal, Control Signal, Ethernet Copper Communications.

CBR-783 ITS-FIBER FIBER OPTIC CABLE AND INTERCONNECT

Communications Cable

This paragraph applies to conduit installed for all the communications cables, as to provide for a “fiber friendly” installation. The Conduit shall enter communications pull boxes at a 45 degree angle relative to the vertical wall of the pull box. Further, the conduit shall terminate in each communications pull box at diagonally opposed corners. Two 2” conduits shall be installed from the communications pull box most adjacent to the traffic controller cabinet and shall terminate within the cabinet. Communications conduit shall include no more than 180 degrees of total bend, and shall have a bending radius of at least 10 times the conduit diameter. All conduits shall be placed at a minimum level of 36” below the finished grade. A City of Boca Raton traffic signal inspector shall be notified and be present on site to check the depth of the conduit during the installation. A warning tape 4” in width shall be installed 18” below the finished grade. The warning tape shall read “WARNING FIBER, BURIED COMMUNICATIONS CABLE BELOW”.

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A communications report (optical time-domain reflectometer-OTDR) report will be evaluated based on FDOT Standard Specifications for Road and Bridge Construction 2010, Section 783.

Fiber optic connectors, pig tails, jumpers and wall mounts connector center shall be manufactured by CORNING, SIECOR or 3M; or shall meet and exceed optical fiber optic specifications as enumerated in FDOT Standard Specifications for Road and Bridge Construction 2010, Section 783

CBR-784 ITS-NETWORK DEVICES

Ethernet Switch Equipment

The communication switch shall be 10/100 switch with 8 copper (Ethernet) ports and 4 single mode fiber ports (EX73340-A0B) or 10 copper (Ethernet) ports and 2 single mode fiber port (EX73320-A0B) Switch depending on intersection location. The switches shall be Etherwan XPRESSO EX73000 series with DC jack.

CBR-786 ITS-VIDEO DETECTION

Video Processing Unit (VPU)

Video detection is the preferred means of vehicle detection. Video detection system shall use a VPU (Video Processing Unit) with separate Video Detection Cameras. The City of Boca Raton uses Traffic and Special Projects Division uses Iteris Edge 2 video detection modules with EdgeConnect Quad-View Remote Communications Module.

Video Detection Camera

The Video Detection Camera shall be approved by the manufacturer to work with its VPU. VPUs and Cameras shall not be mixed and matched between different manufacturers. The camera bracket shall be included and provide for full 360-degree pan adjustment using simple hand tools. The enclosure shall provide for separate connectors for the power and video signal. Video surge suppression shall be provided for each video input. The cameras shall operate from a 120V-AC source. The camera shall be colored with motorized zoom lens.

A digital IP camera may be used, provided that it is supported and approved by the VPU manufacturer. The camera may utilize POE (Power over Ethernet) IP video technology, in which case a single connector shall suffice. If needed, a separate POE switch or power injector to convert standard 120V-AC source to 12V-DC over CAT5 cable, shall be supplied at no additional cost.

Video Detection Cable

The coax and power cable to the camera shall be an Iteris specified (Belden 8281 coax and a conjoined Siamese durable minimum 16 AWG three conductor cable) or approved cable and shall run directly to camera assembly and shall be in the same jacketed cable .Outdoor Rated Cat5 Ethernet cable with end boots and sealed ends to prevent water intrusion shall be used for all IP and POE cameras.

Video Detection - New Installation (General)

The initial detection zones shall be dimensioned to mimic the loop assembly dimension for a stop bar (6' x 46'). The installer shall be responsible for acquisition of all permits, maintenance of traffic (MOT), demolition, and construction. The installer shall be responsible for all utility locates and coordination and shall coordinate any required relocations.

The installer shall submit for approval a signed and sealed list of materials to for the City's review. The list shall include the materials enumerated here-in together with all other materials to effect a complete and working system. The installer must receive written approval from the City prior to

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any installation of Video Detection Equipment on new or existing Traffic Signal Intersections within the City of Boca Raton.

Video Detection - New Installation (Cameras)

The installer shall field verify the exact and final location of camera mounts with manufacturer representative. For Mast-Arms, The bracket shall be a Pelco Triton bracket with a 4 foot pipe to mount the camera. For strain poles shall be Pelco SP-1062-FL. Cameras shall be mounted on VPU/Camera manufacturer approved brackets and mounts. The bracket shall be tapped/fixed after installation and adjustment to prevent twisting or turning. The Contractor shall provide surge suppression on all conductors entering the traffic signal cabinet including power and video.

Video Detection - New Installation (VPU and Video Detection Rack)

All connectors shall be Iteris specified or approved. Existing traffic signal cabinets may have reached the space capacity with current operational equipments. The Contractor shall coordinate with the City to minimize the effects of removing and reinstalling detection equipments. It may be necessary for the Contractor to relocate shelves and/or wiring panels to accommodate the new detector rack (and/or encoder and switch). The Installer shall provide a detailed plan for the physical location of all equipment in the cabinet prior to undertaking the work. This work shall only be undertaken with the approval of the Traffic Operations Engineer and/or the Chief Signal Technician and shall be included in this pay item.

Installation (Video Encoder)

The Contractor shall furnish and install video encoder for video detection as approved by the City. Refer to CBR-784 for additional information.

Installation (Network Switch)

The Contractor shall furnish and install an Ethernet Switch for video detection for all new construction signalized intersection. For all video detection replacement or upgrades at existing signalized intersections, the contractor may use the existing switch for network connectivity.

Installation (Receptacle)

The Contractor shall install 6-receptacle outlet into signal cabinets duplex receptacle. Sentrex model PR609 or equivalent should be used.

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APPENDIX A GENERAL NOTES for Signal Design Engineers

1. The contractor shall notify all utility companies through Sunshine One Call of Florida Inc. (1-800-432-4770 or 811) forty-eight (48) hours in advance of work commencing.
2. Existing signal equipment removed from the project shall become the property of the City of Boca Raton. The cost of delivery to the city shall be included in the removal of the related signal pay item.
3. The contractor is to use caution when working in or around areas of existing loop wires and lead-in cable, fiber run, overhead transmission lines and underground utilities
4. Vehicle detection shall be maintained throughout the duration of the project. The contractor shall inform the City of Boca Raton forty-eight (48) hours before a planned vehicle detection disconnection. The contractor shall replace inoperative vehicle detection through the use of any temporary detection methods as soon as possible and preferably within twenty-four (24) hours as part of the maintenance of traffic. If vehicle detection is not part of the construction project, the contractor shall restore any damaged vehicle detection equipment to its level of operation prior to any damages as soon as possible. The City of Boca Raton Traffic Signal Section or traffic signal detection subcontractor may begin restoration of the damage vehicle detection after the first 24 hours have expired. The responsible party will be billed for associated work.
5. Traffic signal communication cable / traffic signal interconnect to intersections shall be maintained throughout the duration of the project. It shall be the contractor's responsibility to examine job site conditions prior to submitting bid proposals in accordance with section 2-4 of the FDOT standard specifications. The contractor shall inform the City of Boca Raton within forty-eight (48) hours before a planned communication outage. The contractor shall use temporary communication methods to establish communication of the signal back to the TMC as soon as possible and preferably within twenty four (24) hours as part of the maintenance of traffic. If communications interconnect is not part of the construction project, the contractor shall restore any damaged interconnect to its original level of operation prior to any damages as soon as possible. The City of Boca Raton Traffic Signal Section or fiber optic/communication cable subcontractor may begin restoration of the damage vehicle detection after the first twenty-four 24 hours have expired. The responsible party will be billed for associated work.
6. The locations of existing utilities as shown on these plans are approximate and based on the information furnished to the engineer by the utility owners and are shown as a notice to the contractor that underground utilities exist. The contractor shall notify the utility company owners for location and staking of underground facilities forty-eight (48) hours prior to excavating. The location of all poles, pedestals, mast-arms and other equipments requiring excavation shall be considered approximate and may be adjusted to avoid conflicts and satisfy safety codes.
7. Florida Statute 553.851 (1994) requires that before excavating, notice be given to the utility owner a minimum of two days ahead and a maximum of five days ahead, excluding Saturday, Sunday and legal holidays. Note not all utility companies are members of "call sunshine" 1-800-432-4770 or 811.
8. The contractor shall field verify the location of the utilities prior to construction.
9. Contractor shall coordinate with Florida Power and Light (FPL) to determine the electrical service feed location.
10. Contractor shall be responsible for field checking intersection elevation as they relate to the installation of mast arms.
11. Signal maintaining agency is the City of Boca Raton and the address is as below:
City of Boca Raton Signal Shop
2500 NW 1st Ave
Boca Raton, Florida 33431
(561)416-3364

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12. Prior to any equipment order, the contractor shall submit to the City of Boca Raton for approval, equipment specifications, design or submittal data for all materials proposed for this project. Five copies of shop drawing, specification, design and submittal data shall be submitted to the City of Boca Raton for approval. Allow 30-day turn around for submittal.
13. All signal equipment and auxiliaries shall be compatible with the existing City of Boca Raton signal system.
14. All signs and signal equipment to be removed shall be disposed of by the contractor the way as decided by the City of Boca Raton.
15. The maintaining agency shall be provided with two sets of hardcopy as-builts and a CD of electronic files in Adobe Acrobat or AutoCAD format seven (7) days prior to inspection.
16. The contractor shall furnish all necessary equipment including a bucket truck for testing and inspection of the traffic signals.
17. Signal timing: see plan sheets. Where the need for temporary signal timing is required, contractor shall get the approval of the maintaining agency. Final signal timing is decided by the City of Boca Raton.
18. Position pull boxes, junction boxes, cabinets, poles and other obstructive items shall be clear of curb cut ramps.
19. Pull boxes shall be constructed away from the pedestrian area. All signal pull boxes shall be stamped with "Boca Raton Traffic Signal" or "Boca Raton Fiber Optics".
20. Luminaires shall be 120 Volt, 250 Watt HPS (model M400 POWR/DOOR LUM with PE receptacle MDRL25MOA21RMS31) and shall be wired on a separate breaker in disconnect box.
21. The conduit for electrical services will be galvanized, rigid metal and shall conform to FDOT index 17736. All other conduits installed under ground or under pavement will be schedule 40. Above ground conduit applications shall be schedule 80. Conduits shall be provided with #14 AWG pull wire installed in a continuous length for the entire run of the corresponding conduit for all spares. All conduits shall be 2-inch minimum unless specified in the plans.
22. The traffic signal cabinet shall be oriented with the door opening and away from the street. The traffic cabinet base shall be at least eighteen inches above roadway crown elevation and high enough to ensure that no flooding will occur.
23. A concrete technician's pad shall be constructed adjacent to the traffic cabinet.
24. All signal head bodies shall be gloss black in color and mounted horizontally wherever possible.
25. All green, amber, red ball and arrow indications, pedestrian signal heads shall be L.E.D.
26. Fiber optic cable shall be installed with a #14 AWG stranded black THHN wire for the total length of the fiber installation.
27. All delay detectors, including loop, video or microwave, shall have delay override function which runs normal mode during phase green and delay mode during other interval.
28. Each signal interconnect pull box shall have 50 feet of spare fiber cable and signal interconnect pull box at controller assembly shall have 50 feet spare.
29. All area hardware for signal heads shall be stainless steel under 5/8" diameter.
30. All lock nuts for signal heads shall use stainless steel nylon insert lock nuts.
31. All adjustable disconnect brackets for signal heads shall be threaded.
32. All pedestrian signage mounted on pedestals shall be secured using stainless steel strapping and buckles.

Mast Arm installations

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33. Final locations of mast arms are to be field determined. Contractor will lay out mast arm poles, request utility locates in the mast arm area, contact the project engineer and jointly verify the pole location, mast arm length. Shop drawings shall be submitted to the City of Boca Raton for approval.

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34. Mast arm concrete foundation shall be poured in a single pour. Foundations poured that do not comply with this requirement shall be completely removed and re-poured at the contractor's expense. A Drilled Shaft Installation Plan shall be part of the shop drawings.
35. Mast arm details are based on FDOT District 4 design. Mast arm poles with luminaire attachments shall be provided with shop drawings and calculations.
36. The top of mast arm foundations within the sidewalk shall match finish contour and elevation of sidewalks without joints. Contractor is responsible for the proper bolt projection above finished sidewalk grade.

Applicable standards

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37. The contractor shall be governed by the applicable portions of the *FDOT Roadway and Traffic Design Standards*, *FDOT Standards Specifications for Road and Bridge Construction*, and any supplements or special provisions used to develop this project.
 38. The traffic control plans for this project shall comply with the latest edition of the *FDOT Roadway and Traffic Design Standards*, *Manual of Uniform Traffic Control Devices* and *FDOT Standard Specifications for Road and Bridge Construction*.

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APPENDIX B Signal Cable Chart

Pedestrian Cable Color Code for Span Wire
CONDUCTOR COLORS AND SEQUENCE TABLE

Phase	Conductor No.	Use	Base Color	First Tracer
	1	Don't Walk	Red	
2 Ped.	2	Walk	Green	
	3	Detector	Blue	
	4	Don't Walk	Red	Black
4 Ped.	5	Walk	Green	Black
	6	Detector	Blue	Black
6 Ped.	7	Don't Walk	Red	White
	8	Walk	Green	White
	9	Detector	Blue	White
8 Ped.	10	Don't Walk	Black	Red
	11	Walk	Black	
	12	Detector	Black	White
	13	Ped. Neutral	White	
	14	Detector Neutral	White	Black
	15	Spare	Orange	
	16	Spare	Orange	Black

Cable Color Code for Mast Arms
CONDUCTOR COLORS AND SEQUENCE TABLE

Phase	Conductor No.	Use	Base Color	First Tracer
2-4-6-8	1	Red	Red	
Three Section	2	Yellow	Orange	
Heads	3	Green	Green	
	4	Veh. Neutral	White	
1-3-5-7	5	Red	Red	Black
3,4,5 Section	6	Yellow	Orange	Black
Heads	7	Yellow Arrow	Blue	Black
	8	Green	Green	Black
	9	Green Arrow	Black	White
	10	Veh. Neutral	Green	White
2-6 Ped.	11	Walk	White	Red
	12	Don't Walk	Orange	Red
4-8 Ped.	13	Walk	Blue	Red
	14	Don't Walk	Red	Green
	15	Ped. Neutral	White	Black
2-6 Ped.	16	Ped. Button	Black	Red
4-8 Ped.	17	Ped. Button	Red	White
	18	P.B. Neutral	Blue	White
* Illum. Sign	19	Illum. Sign	Black	
* Blank Out Sign	20	Blank Out Sign	Blue	

- * Illuminated Street Sign Neutral Any unused Color
- * Blank Out Sign Neutral Any unused Color

Vehicle Cable Color Code for Span Wire
CONDUCTOR COLORS AND SEQUENCE TABLE

Phase	Conductor No.	Use	Base Color	First Tracer
	1	Red	Red	
2-6 Veh.	2	Yellow	Orange	
	3	Green	Green	
	4	Red Arrow	Red	White
1-5 Veh.	5	Yellow Arrow	Black	
	6	Green Arrow	Blue	
4-8 Veh.	7	Red	Red	Black
	8	Yellow	Orange	Black
	9	Green	Green	Black
3-7 Veh.	10	Red Arrow	Black	Red
	11	Yellow Arrow	Black	White
	12	Green Arrow	Blue	Black
	13	Veh. Neutral	White	
	14	Spare	White	Red
	15	Spare	Green	White
	16	Spare	White	Black

Note: All field cables (signal cables and video detection cables) shall be tagged with direction. The color coding applied by the City is: evergreen for north, red for south, yellow for east and blue for west.

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Appendix C –CONTACT INFORMATION

City Traffic Engineer

T. Douglas Hess, P.E.
Telephone: 561-416-3369
Email: dhess@myboca.us
Municipal Services Department
201 W. Palmetto Park Road
Boca Raton, Florida 33432-3795

Traffic Operations Engineer

Emmanuel Posadas, P.E. , P.T.O.E.
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Email: eposadas@myboca.us
Municipal Services Department
201 W. Palmetto Park Road
Boca Raton, Florida 33432-3795

Chief Signal Technician

William Welch
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