S T A T E **O F** **T E N N E S S E E**

January 1, 2015

SPECIAL PROVISION

REGARDING

CITY OF MURFREESBORO CABINET SPECIFICATIONS

SECTION 1 -- CABINET CONSTRUCTION

1-1 The cabinet shall be of weathertight construction fabricated from sheet aluminum (0.125" thick Type 5052-H32). Cabinets fabricated from aluminum sheet shall not require painting unless otherwise required on the bid sheet. All welds on fabricated cabinets shall be internal and continuous; spot welding is not acceptable.

1-2 The cabinet shall be equipped with properly rated circuit breaker(s) conforming to the National Electric Code to accept #8 AWG wire. There shall be three properly rated circuit breakers as follows:

1-2.1 One breaker shall provide service for the controller, conflict monitor load switches, fan and other controller appurtenances.

1-2.2 One breaker shall provide service for the flasher and flash circuit.

1-2.3 One breaker shall provide service for the GFI duplex receptacle and cabinet light.

1-3 The cabinet shall be of suitable size to allow access to all cabinet terminals for installation and maintenance with shelf space for all provided equipment and one detector amplifier per phase.

1-4 The cabinet shall have a field test panel equipped with the following switches:

1-4.1 Per phase, eight (8) three-position vehicle detector simulation for momentary, locked call, and no call.

1-4.2 Per even phase, four (4) three-position pedestrian simulation for momentary, locked call, and no call.

1-4.3 Stop timing per controller. When in stop timing, switch shall apply "stop timing" to both rings of the controller.

1-4.4 Signals on/off. When in "Off" position, switch shall remove AC power to load switches and all signal output indications.

1-4.5 Interval advance switch wired through the stop timing switch to apply interval advance to the controller only when stop timing switch has been enabled.

1-5 The control cabinet shall have the following door switches installed:

1-5.1 A normally open switch, which is to be tied to the indicator lamp control and logic ground so that when the door is closed, controller indicators will go off.

1-5.2 A normally closed switch which is to be tied to the cabinet light so that cabinet light will be on when the door is open and off when the door is closed.

1-6 The cabinet shall have the following suppression equipment:

1-6.1 EDCO #ACP-340, or equal, for service input, including filter.

1-6.2 EDCO #SRA-6LCA, or equal, for each phase loop.

1-6.3 EDCO #SRA-64A-30, or equal, for pedestrian push-button inputs.

1-6.4 EDCO SPA-100T, or equal, for flasher and flash circuit.

1-6.5 GE-MOV Type V150LA20A, or equal, for all load switch outputs.

1-6.6 Auxiliary relays and fan with a resistor/capacitor circuit to suppress generated noise.

1-6.7 RF filter in controller cabinets to filter RF noise over the range of 60 hertz through 20 megahertz. The RF filter may be incorporated as part of the Main Power Suppressor.

1-7 The cabinet shall have a police subpanel equipped as follows:

1-7.1 An auto/flash switch, which shall provide for normal controller operation in "Auto" position. When placed in "Flash" position, switch will place intersection on flash and will allow the controller to cycle through the timer power switch on the test panel.

1-7.2 An auto/manual switch which in "Manual" position shall activate the manual control enable switch, and the controller shall time all clearance intervals as the interval advance input is activated.

1-7.3 A "Main Power" switch, which shall derive its power from the protected side of the line surge protector, shall control the coil voltage of a mercury contactor, which shall control the primary AC operating voltage of the cabinet. When the "Main Power" switch is "Off," the contactor shall be "off," and the only AC power present in the cabinet shall be at the duplex receptacle, the lamp, and the "Main Power" switch circuit.

1-7.4 A Switchcraft Part Number 12B, or equivalent, phone jack which shall be terminated on the closed side of the manual switch and wired to the interval advance to provide manual control with a push button when the auto/manual switch is in the manual position.

1-7.5 The door lock shall be keyed for Standard Econolite #9452283P01 or Eagle E7322, or equal. Two keys per cabinet shall be supplied.

1-7.6 The police subpanel shall have an extruded neoprene seal.

1-8 The cabinet shall be wired for vehicle and pedestrian NEMA load switches according to the following:

1-8.1 The four-phase controllers shall be wired for four vehicle phases, two overlaps, and two pedestrian phases. Eight NEMA load switch positions shall be provided per cabinet--four for vehicle phases, two for overlap use, and two for pedestrian use.

1-8.2 The eight-phase controllers shall be wired for eight vehicle movements, one overlap, and four pedestrian phases. Sixteen (16) NEMA load switch positions shall be provided--eight for vehicle phases, four for pedestrian, and four for overlap use. It shall be possible to change the load switch positions by changing cabinet wiring on the rear panel.

1-8.3 The load switches shall have controller output indicators mounted on the front panel of the switch. The load switches shall be the Crydom "cube" type, or approved equal, with a rating of 15 AMP or greater. Load switches made from discrete components shall not be acceptable.

1-8.4 Unless otherwise specified, each four-phase cabinet shall include four load switches and each eight-phase cabinet shall include eight load switches.

1-9 The cabinet shall be provided with a minimum of two 12- position copper ground strips electrically insulated from the mounting surface to accept #10 AWG wire and smaller.

1-10 The cabinet must have a tie point to tie all system grounds within the cabinet to a single reference point. All grounds (AC-return, chassis, and logic ground) must be referenced to a single ground point at the electric service.

1-11 All cabinet wiring shall be neatly routed, laced and permanently secured. All cable shall be secured to the panel, where practical. There shall be no holes drilled through the cabinet walls to mount panels or secure cables.

1-12 All inputs to and outputs from the controller and other equipment, whether used or not, shall be terminated in barrier type terminal strips. All terminal strips shall be clearly marked with fade resistant letters on the associated panel. All unused wiring shall be terminated at a terminal strip position.

1-13 All barrier terminal connections shall utilize spade-type connectors. Minimum terminating screw size for barrier terminal strips shall be according to the current level of the terminated wire and shall be subject to the following restrictions:

1. NEMA level functions - #6 screw
2. AC level, 0-10 ampere rating - #8 screw
3. AC level, greater than 10 ampere rating - #10 screw

1-14 All terminals in the cabinet shall be of the barrier type. The following field connector terminals shall be provided:

1-14.1 Three (3) signal output positions per load switch bay.

1-14.2 Eight (8) positions per phase for vehicle loop detector harness. The normally closed contact is not required to be terminated, however this wire shall be neatly wired tied and capped off.

1-14.3 One position per phase for pedestrian detector inputs.

All of the above terminals shall be designed to accept terminal connections 0.4 inch in width, except for the loop detector panel which shall accept 0.3 inch in width.

1-15 The cabinet shall be equipped with all necessary terminals, harnesses, and wiring to connect power, vehicle detectors, and controller monitor.

1-16 All loop detector wiring shall take place on a series of double-tie multi-position terminal strips located on the lower left cabinet wall panel.

1-16.1 Loop field wiring facilities shall be provided for 8 phase controllers as follows:

1. Loop field inputs:
   - Field inputs shall be #8 screws (minimum of 45 positions)
   - Field loop inputs (3 positions per cable, LOOP- CHASSIS-LOOP)
   - Field pedestrian input (1 position per ped field input)

2. Loop inner panel/cabinet wiring:

- Inner panel wiring terminations shall be #6 screws (minimum of 20 positions).
- Loop cables (single channel) 12 each, (one cable for phases 1,3,5,7,) (two cables for phases 2,4,6,8)
- Vehicle detector call (one input per phase)
- Delay override inputs (one input per phase), 110 volts
- Pedestrian detector call (one per ped phase)
- AC Line (6 positions)
- Earth ground (Buss mounted to panel surface)
- Logic ground (Buss insulated from mounting surface, however jumpered to earth ground)
- AC Common (Buss insulated from mounting surface, however jumpered to earth ground)

1-16.2 Loop field wiring facilities shall be provided for 4 phase controllers as follows:

1. Loop field inputs:
   - Field inputs shall be #8 screws (minimum 24 of positions)
   - Field loop inputs (3 positions per cable, LOOP- CHASSIS-LOOP)
   - Field pedestrian input (1 position per ped field input)

2. Loop inner panel/cabinet wiring:
   - Inner panel wiring terminations shall be #6 screws (minimum of 12 positions).
   - Loop cables (single channel) 6 each, (one cable for phases 1,3) (two cables for phases 2,4)
   - Vehicle detector call (one input per phase)
   - Delay override inputs (one input per phase), 110 volts
   - Pedestrian detector call (one per ped phase)
   - AC Line (4 positions)
   - Earth ground (Buss mounted to panel surface)
   - Logic ground (Buss insulated from mounting surface, however jumpered to earth ground)
   - AC Common (Buss insulated from mounting surface, however jumpered to earth ground)

1-17 The cabinet shall be wired for and include a cube type NEMA flasher. All cabinets shall have a two-circuit flasher. The flasher shall have output indicators mounted on the front of the flasher case and shall be rated at a minimum of 15 amperes.

1-18 The cabinet flash sequence shall be accomplished via jumper straps or wires. It shall be possible to program or omit flash on one circuit per vehicle and overlap phase.

1-19 Cabinet shall be wired to provide external start following start-up out of manual and conflict flash along with monitor reset.

1-20 Each cabinet shall include one thermostatically controlled fan, which shall comply with the following specifications:

1-20.1 Fan shall have permanently lubricated bearings. There shall be noise suppression devices on the fan. The thermostat must be adjustable from 70 degrees F to 160 degrees F. The fan must be mounted at the top interior of the cabinet and be easily removable for replacement or repair by using common hand tools. No outside roof mounting is acceptable.

1-20.2 No specially manufactured fan will be allowed. The fan must be available from two or more manufacturers.

1-20.3 Fan must have a flow rate of such volume that it will evacuate cabinet volume at a minimum rate of three times per minute. The thermostat shall be located at the top of the cabinet next to the fan. The filter and air intake must be located on the lower inside portion of the cabinet door. The filter must be of a type and size that can be replaced by a commercially available filter and must be replaceable without requiring any special tools or equipment.

1-21 The main door of the cabinet shall have a cylinder lock to accept Automatic Signal Division key #2. Two keys shall be provided per cabinet.

1-22 The cabinet doors shall have extruded neoprene seals.

1-23 The cabinet shall include an incandescent light and GFI duplex receptacle, which can be used when the main circuit breaker is off.

1-24 All relays external to the controller or appurtenances shall meet the following requirements:

1-24.1 Flash transfer relays shall be AEMCO (#136-4962, Midland Ross #187-02T) A1, or equal; 10 amp contacts, 8-pinch Cinch-Jones base.

1-24.2 Unless otherwise specified, each cabinet shall include four (4) flash transfer relays.

1-25 The cabinet shall have a door stop self-latching mechanism, which will provide a positive retention of the door when open. This mechanism shall be located at the bottom of the cabinet and shall have a minimum of two locked positions--90 degrees and 120 degrees.

1-26 A three-point locking mechanism shall be provided to secure the door at three points when closed--top, center, and bottom.

1-27 All cabinets shall be provided with a minimum of two shelves, fabricated from the same material as the cabinet. They shall be adjustable vertically and shall be mounted to the cabinet wall with U-channel mounting strips with spring-retained nuts and machine screws. All U-channels are to be welded to the cabinet. The lower shelf shall provide mounting space for the loop detector amplifiers. The upper shelf shall be installed with a minimum seven-inch clearance above the bottom shelf and shall provide space for controller, monitor, and communications unit. There shall be a minimum two-inch clearance between the cabinet wall and any device located on the shelf. A minimum of 20 percent of the cabinet interior volume and 20 percent of the shelf space, but not less than 12 inches, shall be available for future City use.

1-28 Panels shall be located in the cabinet as described below:

1-28.1 Detectors	Lower left wall
1-28.2 AC power	Lower right wall
1-28.3 Auxiliary/police switches	Door
1-28.4 Load switch bay	Back wall
1-28.5 Closed Loop	High left wall
1-28.6 Communication	High left wall

1-29 The load bay shall be hinged on the bottom for fold-down inspection of the rear terminal. All interior panels shall be adjustable vertically through the use of U-channels mounted on the walls of the cabinet. All panels shall contain only discrete wiring to the terminal strips; no printed circuit boards shall be allowed.

SECTION 2.0 -- POLE-MOUNTED CABINETS

2-1 All provisions of Section 1 shall apply to pole-mounted cabinets.

2-2 Pole-mounted cabinets shall be provided with all necessary pole-mounting hardware. Hardware shall be of sufficient strength to securely hold the cabinet and shall have a workmanlike appearance.

2-3 The bottom center of the cabinet shall be constructed so that conduit having a maximum diameter of 4 inches can be attached to the cabinet without having to cut or punch through any supporting ribs or reinforcing members.

2-4 Unless otherwise stated in the bid documents, all four-phase controllers shall be provided in pole-mounted cabinets.

2-5 Pole-mounted cabinets shall have minimum outside dimensions of 30 inches (width) by 17 inches (depth) by 50 inches (height).

2-6 All pole-mounted cabinets shall have interior welded support plates for attachment of mounting hardware. The plates shall be a minimum size of 2 inches by 4 inches by 1/4 inch and shall be located on the vertical centerline 6 inches from the top and 6 inches from the bottom.

SECTION 3.0 -- BASE-MOUNTED CABINETS

3-1 All provisions of Section 1 shall apply to base-mounted cabinets.

3-2 Unless otherwise stated in the bid documents, all eight-phase controllers shall be provided in base-mounted control cabinets.

3-3 All necessary installation hardware and templates shall be provided.

3-4 Base-mounted cabinets shall have the minimum outside dimensions of 40 inches (width) by 26 inches (depth) by 55 inches (height). Bolt spacing of 34-1/2 inches on centers (width) by 19 inches on center (depth) shall be located on the inside of the cabinet.

SECTION 4.0 – DOCUMENTATION

The following specific items shall be provided as described:

4-1 At least two (2) documentation packages for each wired signal controller cabinet shall be supplied to contain a complete schematic including the back panel, load switch panels, detector panel, flash transfer relays, surge protectors, police panel, and the technician panel.

4-2 Complete instructions for field modifications throughout the range of the capabilities of the cabinet such as changes in phasing or signal sequence, flash programming, etc., should be included.

4-3 All components and switches shall be labeled for identification in the wiring diagrams and must match cabinet labels.

4-4 The documentation packages shall be in a clear plastic pouch or pocket securely fastened to the inside of the cabinet door and shall be readily accessible.

4-5 Cabinet schematics shall be provided in a digital “.dwg” or “.dgn” format enabling importation into the Owner’s CADD system(s) for the purpose of enabling facilitation and documentation of future wiring modifications.