

**Do Not Return Via Email or Fax**

**This is Not an Order**

**Mailing Address:**  
 P. O. Box 1948  
 Mobile, Alabama 36633  
 (251) 208-7434

**Purchasing Department  
 and Package Delivery:**  
 Government Plaza  
 4<sup>th</sup> Floor, Room S-408  
 205 Government St  
 Mobile, Alabama 36644

**READ TERMS AND CONDITIONS  
 ON REVERSE SIDE OF THIS PAGE  
 BEFORE BIDDING**

Typed by: en Buyer: 004

**Please quote the lowest price at which you will furnish the articles listed below**

DATE 05/14/2021	BID NO. 5561	DEPARTMENT VARIOUS	Commodities to be delivered F.O.B. Mobile to: As Specified
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**This bid must be received and stamped by the Purchasing office not later than: 12:00 PM, Friday, June 4, 2021**

QUANTITY	ARTICLES	UNIT	UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
	<p align="center"><b>TRAFFIC SIGNAL EQUIPMENT                      CABINETS, CONTROLLERS</b></p> <p>Please observe instructions on Reverse side.</p> <p>Please quote your prices in the unit specified in the bid.</p> <p>All prices to be delivered pricing, FOB Mobile.</p> <p>Products bid are to be compatible with existing equipment currently in use by the City of Mobile.</p> <p>Provide Specifications on Traffic Signal Control Cabinets/Controllers.</p> <p>Pricing to be firm for a six (6) month period following the award of this bid. At the option of the City of Mobile and the successful vendor(s), the award of this bid may be extended for five (5) additional six (6) month periods.</p> <p>Items with options may be selected in place of the base bid item.</p> <p>Approximate quantity is for each type of item, not for each optional item.</p> <p>All items must meet requirements as per attached Specifications.</p> <p align="center">Page 1 of 3</p>					
			<b>TOTAL</b>			

*Bid on this form ONLY. Make no changes on this form. Attach any additional information required to this form.*

**RETURN ONE SIGNED COPY OF THIS BID  
 IN ENCLOSED ENVELOPE**

State delivery time within \_\_\_\_\_ days of receipt of P.O.

Firm Name \_\_\_\_\_

Typed Signature \_\_\_\_\_

By \_\_\_\_\_

We will allow a discount \_\_\_\_\_% 20 days from date of receipt of goods and correct invoice of completed order.

1. All quotations must be signed with the firm name and by an authorized officer or employee.
2. Verify your bid before submission as it cannot be withdrawn or corrected after being opened. In case of error in extension of prices, the unit price will govern.
3. If you do not bid, return this sheet and state reason. Otherwise, your name may be removed from our mailing list.
4. The right is reserved to reject any, or all quotations, or any portions thereof, and to waive technicalities if deemed to be in the interest of the City of Mobile.
5. This bid shall not be reassignable except by written approval of the Purchasing Agent of the City of Mobile.
6. State brand and model number of each item. All items bid must be new and latest model unless otherwise specified.
7. If bid results are desired, enclose a self-addressed and stamped envelope with your bid. (All or None bids only)
8. Do not include Federal Excise Tax as exemption certificate will be issued in lieu of same. The City is exempt from the Alabama and City sales taxes.
9. PRICES ARE TO BE FIRM AND F.O.B. DESTINATION UNLESS OTHERWISE REQUESTED.
10. BID WILL BE AWARDED ON ALL OR NONE BASIS UNLESS OTHERWISE STATED.
11. Bids received after specified time will be returned un-opened.
12. Failure to observe stated instructions and conditions will constitute grounds for rejection of your bid.
13. Furnish literature, specifications, drawings, photographs, etc., as applicable with the items bid.
14. Vendor May be required to obtain City of Mobile Business License as applicable to City of Mobile Municipal Code Section 34-50. For Business License inquiry contact the Revenue Department at (251) 208-7461 or [cityofmobile.org/taxes.php](http://cityofmobile.org/taxes.php).
15. If a bid bond is required in the published specifications, see below:  
Each Bid Shall be Accompanied By A **Cashier's Check, Certified Check, Bank Draft Or Bid Bond** For the Sum Of Five (5) Percent Of The Amount Bid, Made Payable To The City Of Mobile And Certified By A Reputable Banking Institution. All Checks Shall Be Returned Promptly, Except The Check Of The Successful Bidder, Which Shall Be Returned After Fulfilling The Bid.
16. Contracts in excess of \$50,000 require that the successful bidder make every possible effort to have at least fifteen (15) percent of the total value of the contract performed by socially and economically disadvantaged individuals.
17. All bids/bid envelopes must have the bid number noted on the front. Bids that arrive unmarked and are opened in error shall be returned to vendor as an unacceptable bid.
18. If successful vendor's principal place of business is out-of-state, vendor may be required to have a Certificate of Authority to do business in the State of Alabama from the Alabama Secretary of State prior to issuance of a Purchase Order. Vendors are solely responsible for consulting with the Secretary of State to determine whether a Certificate is required. See [www.sos.alabama.gov/BusinessServices/ForeignCorps.aspx](http://www.sos.alabama.gov/BusinessServices/ForeignCorps.aspx). Please note that the time between application for and issuance of a Certificate of Authority may be several weeks.
19. Vendors do not need a City of Mobile Business License or Certificate of Authority from the Alabama Secretary of State to submit a bid, but will need to obtain the Business License and Certificate of Authority, if applicable, prior to issuance of a Purchase Order.

## BID CONTINUATION SHEET

Page \_\_\_\_\_ of \_\_\_\_\_

QUANTITY	ARTICLES	UNIT	UNIT PRICE		EXTENSION	
			Dollars	Cents	Dollars	Cents
Page 2 of 3						
Qty 1-5	TS2-Type II <b>1. Base Mount Cabinet Assembly with Controller</b>  Make _____ Model _____  Unit Price \$ _____					
Qty 1-5	TS2-Type II <b>2. Pole Mount Cabinet Assembly with Controller</b>  Make _____ Model _____  Unit Price \$ _____					
Qty 1-5	TS2-Type II <b>3. Base Mount Cabinet without Controller</b>  Make _____ Model _____  Unit Price \$ _____					
Qty 1-5	TS2-Type II <b>4. Pole Mount Cabinet without Controller</b>  Make _____ Model _____  Unit Price \$ _____					
Qty 1-5	TS2-Type II <b>5. Standard NEMA TS-2 Controller</b>  Make _____ Model _____  Unit Price \$ _____					
THE ABOVE ITEMS MUST MEET THE ATTACHED SPECIFICATIONS.						
			<b>TOTAL</b>			

**RETURN ONE SIGNED COPY OF THIS QUOTATION IN ENCLOSED ENVELOPE**

**READ ABOVE INSTRUCTIONS BEFORE QUOTING**

Firm Name \_\_\_\_\_

By \_\_\_\_\_

We will allow a discount \_\_\_\_\_% 20 days from date of receipt of goods and correct invoice of completed order.

**BID CONTINUATION SHEET**

QUANTITY	ARTICLES	UNIT	UNIT PRICE		EXTENSION		
			Dollars	Cents	Dollars	Cents	
	<p align="center">Page 3 of 3</p> <p>All vendors will be required to provide verification of enrollment in the E-Verify program. Additional information may be found at <a href="http://immigration.alabama.gov/">http://immigration.alabama.gov/</a></p> <p>If the successful vendor's principal place of business is out-of-state, vendor may be required to have a Certificate of Authority to do business in the State of Alabama from the Secretary of State prior to issuance of a Purchase Order.</p> <p>Vendors are solely responsible for consulting with the Secretary of State to determine whether a Certificate is required. See: <a href="http://www.sos.alabama.gov/BusinessServices/ForeignCorps.aspx">www.sos.alabama.gov/BusinessServices/ForeignCorps.aspx</a>. Please note that the time between application for the issuance of a Certificate of Authority may be several weeks.</p> <p>Upon notification, vendor will have 10 business days to provide the Certificate of Authority and the E-Verify numbers to the Purchasing Department before award can be completed. (Vendors will possibly need to pay the expedite fee to meet this requirement because application is not sufficient. We must have a copy of the certificate with your Company ID number).</p> <p>Vendors do not need a City of Mobile Business License or Certificate of Authority from the Alabama Secretary of State, nor the E-Verify for certification to submit a bid, but will need to obtain the Business License and Certificate of Authority verification and/or provide the E-Verify Certification, if applicable, prior to issuance of a Purchase Order.</p> <p>State of Alabama Local Vendor Preference Law 41-16-50 (a) and (d) will apply to this purchase.</p> <p>If you have any questions please feel free to contact the Purchasing Department at 251-208-7434 or <a href="mailto:purchasing@cityofmobile.org">purchasing@cityofmobile.org</a>.</p> <p align="center"><b>TO BE AWARDED ON A PER ITEM BASIS</b></p>						
			<b>TOTAL</b>				

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# CITY OF MOBILE SPECIFICATIONS FOR TRAFFIC SIGNAL EQUIPMENT

## I. General.

The following are the requirements for traffic signal equipment. These requirements may be supplemented or amended by the requirements given elsewhere in the bid documents, on plan sheets, and on the details in the ALDOT Special and Standard Highway Drawings.

Requirements specified in these specifications shall comply with the latest editions of the NEC and the NESC. All equipment shall conform to the requirements in the NEMA Standards Publication No. TS 2-2016, "Traffic Control Systems" or latest revisions and shall conform to the requirements specified within these specifications. All equipment shall meet the latest NEMA Environmental and Operating Standards. In case of conflict with cited Standard Publications and these specifications, the requirements of these specifications shall govern.

For purposes of these specifications wherever the following terms or abbreviations are used, the meaning shall be interpreted as follows:

A	Amps
AC	Alternating Current
ANSI	American National Standards Institute
ASTM	American Society for Testing Materials
AWG	American Wire Gage
DC	Direct Current
Hz	Hertz
IMSA	International Municipal Signal Association
ITE	Institute of Transportation Engineers
LED	Light Emitting Diode
MUTCD	Manual on Uniform Traffic Control Devices
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
UL	Underwriters Laboratories
V	Volts
VA	Volt Amps
W	Watts

Descriptions and definitions of the equipment, words, and terminology used in these specifications are given in the MUTCD, the NEMA TS 2-2016 Standards Publication, ITE publications, and the NEC.

## II. Cabinet Assembly with Controller.

The cabinet assembly shall be configured and bench-tested prior to installing the cabinet assembly. An Electrician from the City of Mobile Electrical Department Traffic Division shall inspect the cabinet assembly prior to turning on the system.

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### (a) DESCRIPTION.

A cabinet assembly with controller shall consist of a controller unit, conflict monitor, auxiliary devices, electrical devices and other equipment as specified in these specifications, plans, or proposal mounted and wired into a cabinet to make a complete operational traffic cabinet assembly.

### (b) CABINET DESIGN.

The cabinet shall be an approved weatherproof enclosure. It shall be designed for base mount or pole mount as shown on the plans. The cabinet shall be clean-cut in design and appearance.

#### 1. MATERIAL.

The cabinet shall be fabricated from cast aluminum or shaped sheet aluminum. Unless otherwise shown on the plans, the cabinet shall be aluminum finish. When painting of the cabinet is specified, the cabinet shall be primed and finished with two coats of high-grade enamel paint, complying with the requirements of Section 855.

#### 2. CABINET DIMENSIONS.

The cabinet shall be large enough to provide ample space to house the controller unit, conflict monitor, auxiliary devices, electrical devices, and other equipment as specified in these specifications, plans or proposal. The cabinet shall accommodate the largest controller dimensions for the specific number of phases required by the plans or proposal.

The minimum size of pole mounted controller cabinet shall be 41 inches in height, 28 inches in width, and 16 inches in depth.

The minimum size of base mounted controller cabinet shall be 54 inches in height, 38 inches in width, and 16 inches in depth.

#### 3. DOORS.

When closed, the doors shall fit closely to gasketing, making the cabinet weather-resistant and dust-tight. Door hinges, bolts, and pins shall be of stainless steel or equivalent corrosion resistant material.

**Main Cabinet Door:** A hinged main cabinet door shall be provided permitting complete access to the interior of the cabinet. When opened, this door shall be provided with a device designed to hold the door in an opened position.

**Secondary Access Door:** An access door which allows access to the back side of the terminal facility shall be provided unless a pole mounted cabinet is required.

**Auxiliary Cabinet Door:** A small, hinged, auxiliary door (police compartment door) shall be provided on the outside of the main cabinet door. The auxiliary door shall permit access to a switch panel, but shall not allow entrance to the controller mechanism nor to exposed electrical terminals.

#### 4. GASKETING.

Gasketing shall be provided on all door openings and shall be dust tight. Gaskets shall be permanently bonded to the metal. The mating surface of the gasketing shall be covered with a silicone lubricant to prevent sticking to the mating.

5. LOCKS AND KEYS.

The main cabinet door and secondary access door shall each be equipped with a sturdy brass or stainless steel lock. The locks shall be a traffic industry conventional lock and operate with a No. 2 key. The locks shall be permanently lubricated and shall be covered with a weatherproof tab.

The small auxiliary door (police compartment door) shall be equipped with a lock and shall use a standard skeleton key.

Two keys shall be furnished for each type of lock.

6. SHELVES.

The cabinet shall be supplied with two mounting shelves. One shelf shall be used for storage of the controller and its associated hardware and the other shelf for storage of detectors.

A pull out drawer with lid shall be installed and centered under the bottom shelf. The drawer shall be made of aluminum and come out on full extension drawer slides with ball bearings. The lid on the pull out drawer shall have a non-slip surface, provide an approximate 16 inch x 14 inch working area and have the ability to bear a constant 25 pound burden. The drawer shall include a rear hinge with sufficient storage to hold at least two copies of the cabinet drawings and other related cabinet documentation.

7. CABINET LIGHTING.

Cabinets shall be provided with a minimum of two (2) white light LED modules. One (1) lighting module shall be installed along the front top section of the cabinet and the second lighting module shall be installed underneath the bottom cabinet shelf in such a location as to provide light to the load bay area of the cabinet. Both LED lighting modules shall be controlled by a NEMA rated, commercial quality, pushbutton door switch.

8. POLICE PANEL SWITCHES.

The police door switch panel shall contain only two switches, a power ON/OFF switch, and a flash ON/OFF switch.

The power ON/OFF switch shall be a signal head off switch and not an AC power off switch for the cabinet. This switch shall not interrupt the controller power nor interrupt the controller cycling.

The flash ON/OFF switch shall apply a flash mode to the flasher relay and shall neither interrupt the controller power nor interrupt the controller cycling.

There shall be no remote plug-in contained within the police panel area.

9. POLE MOUNT HARDWARE.

A cabinet intended for side-of-pole mounting shall be provided with an adapter (exclusive of lag bolts or banding) necessary to permit mounting to a 4.5 inch diameter or larger pole. The adapter shall accommodate lag bolts up to 3/8 inch diameter or banding up to 1 inch wide. Mounting holes shall be provided at or near the top and bottom of the cabinet.



10. GROUNDING.

Ground electrodes at controllers shall be a copper clad rod 10 feet in length and 5/8 inch in diameter, driven to a depth of 8 feet and bonded by copper wire or strap of the same cross sectional area as No. 6 AWG wire.

11. CONVENIENCE RECEPTACLE.

A convenience outlet shall be provided as part of the terminals and facilities. The convenience receptacle shall be a duplex, three prong, NEMA Type 5 – 15R grounding type outlet and shall have independent ground fault circuit protection.

12. CABINET VENTILATION.

Louvered vents shall be located on the main cabinet door. Vents shall allow the release of excessive heat and any explosive gases that might enter the cabinet.

A cabinet vent air filter, minimum size of 16 inches x 12 inches x 1 inch, shall be mounted on door and held in place by a spring.

A thermostatically controlled power vent and fan shall be provided. The thermostat shall activate the fan at 110 °F and de-activate the fan at 90 °F with an accuracy of  $\pm 5$  °F.

13. IDENTIFICATION PLATE.

An aluminum identification plate shall be affixed to the cabinet door. The identification plate shall be sized to provide the message "City of Mobile" either etched or embossed in 1 inch high letters. The letters shall be delineated in black enamel.

14. DATA LABEL.

A data label shall be placed on the inside of the cabinet door to provide the following information:

- Manufacturer's name – All equipment installed cabinet
- Date of Manufacture
- Wiring Schematics Number
- Controller Model Number
- Controller Serial Number
- Conflict Monitor Model Number
- Conflict Monitor Serial Number
- Time Base Coordinator Model Number (If applicable)
- Time Base Coordinator Serial Number (If applicable)
- Communication Unit Model Number (If applicable)
- Communication Unit Serial Number (if applicable)
- Master Model Number (If applicable)
- Master Serial Number (If applicable)
- Time Clocks Model Number (If applicable)
- Time Clocks Serial Number (If applicable)

**(c) AUXILIARY DEVICES.**

1. GENERAL.

Auxiliary devices shall conform to the requirements of NEMA Standard Publication No. TS 2-2016, "Traffic Controller Assemblies".

2. SOLID STATE FLASHERS.

The flasher shall be jack mounted.

3. FLASH TRANSFER RELAY.

The flash transfer relay shall be a heavy-duty relay designed for continuous duty. It shall mount on an eight pin spade plug base.

4. SOLID STATE LOAD SWITCH.

The signal load switches and signal load base plate shall be furnished and wired in place for each phase provided.

Load switches shall be triple signal, NEMA input light indicating, rated for 10 A at 165 °F . The actual switching component shall have a minimum 500 V PIV rating.

5. DETECTOR TEST SWITCHES.

When specified, detector test switches shall be furnished to check all detector control circuits.

6. MERCURY CONTACTOR.

A mercury contactor input power relay shall be a 40 A relay for 2 phase and 4 phase controllers and a 60 A relay for 8 phase controllers.

**(d) TERMINALS AND FACILITIES.**

1. GENERAL.

The following define the performance and construction requirements of cabinet terminals and facilities that are considered to be of the attached or nonplug-in type. These additional specifications cover the physical requirements, electrical requirements, interface, cabling, supporting terminal facilities, and labeling.

2. OPENINGS.

The cabinet shall be provided with necessary openings for mounting and connection as specified.

3. ARRANGEMENT OF DEVICES.

The controller equipment and terminal blocks shall be so arranged within the cabinet that they will not upset the entrance, training, and connection of the incoming conductors.

4. TERMINAL AND PANEL WIRING.

No printed circuit boards will be allowed in the cabinet wiring facility. Every panel and terminal shall be hardwired.

Each cabinet assembly is to be furnished with panels in the cabinet mounted in such a way as to provide visibility and accessibility.

All panel wiring shall be neat, firm, and hardwired.

5. TERMINAL PANEL.

As a minimum, the panel shall be provided with the following terminal blocks:

- Terminal block to provide connections for the circuit breaker and power supply line.
- Terminal block unfused, for neutral side of power supply line.
- Terminal blocks for conductors of signal control cable. One terminal for each signal circuit and one or more terminals for the common conductor shall be provided.

The terminal blocks shall be located at least 6 inches from the bottom of the base mount cabinet and arranged for adequate electrical clearance between terminal blocks.

6. POWER TERMINAL STRIP.

Terminal strip shall be supplied for incoming power.

7. INSERT TERMINALS.

All components, connectors, plug terminals, and insert terminals shall be clearly annotated.

8. TERMINAL STRIP SHIELDING.

If terminal points are located adjacent to a shelf so that possible shorting can be accomplished by shifting of components, the terminal strips shall be shielded.

9. TERMINAL POINTS AND TERMINAL STRIPS.

All terminal points and terminal strips shall be the double tie type and shall be clearly annotated.

There shall be no more than two connections made on any terminal point.

Connections shall be made by using ring tongue terminal connections stamped from one piece of pure copper.

The barrel will be formed with a brazed butted seam and shall be pre-insulated with an appropriate sleeve.

The terminal connections shall be required to be the correct size for the wire and terminal strip bolts.

Terminal connections used on solid wire shall be soldered.

10. WIRING.

Wiring with controller cabinet shall be neatly laced and identified.

All wires shall be cut to a proper length before assembly. No wire shall be doubled back to take up slack.

The outgoing traffic control signal circuits shall be of the same polarity as the line side of the power supply; the common return of the signal circuits shall be of the same polarity as the grounded side of the power supply.

All wiring to AC+ shall be colored black. All wiring to AC- shall be colored white. All wiring to chassis ground shall be colored green.

11. CABLES.

All cables shall be self-contained and have continuous jackets from terminal facility into connector.

The jacket shall be solid flexible sleeving or expandable self-fitting polyester sleeving. Spiral wrap type sleeving will not be accepted.

The position of cables between the components must be such that when the door is closed, it does not press against the cables or force the cables against various components inside the cabinet.

All cables shall be self-contained and shall not be split to feed more than one connector.

12. DETECTOR PANEL.

A separate panel shall be furnished for detector wiring with all NEMA functions available and wired to the terminal strips.

The panel shall also include an earth ground buss with terminal points parallel and adjacent to the loop connection terminals for lightning protection.

A twelve-position double tie blank terminal strip shall be mounted on detector panel for future use.

13. SWITCH PANELS.

An internal switch panel shall be mounted on the inside of the main door. All switch functions shall be permanently and clearly labeled.

14. GROUNDING.

All logic ground, AC neutral, and chassis ground within the equipment and cabinet shall be isolated, split with separate ground buses being required for AC neutral and earth ground.

All lightning protection shall be grounded to the chassis ground. Lightning protection shall be installed before the power service to the cabinet is turned on.

All neutral conductors shall be grounded at the controller and at each terminal point.

15. LINE FILTERS.

Line filters shall be furnished to protect the controller from line voltage surges. Line filters for two phase controllers shall be rated at 25 A and four phase controllers shall be rated at 30 A through eight phase shall be rated at 45 A.

16. RADIO INTERFERENCE SUPPRESSION.

Each cabinet shall be equipped with a radio interference suppressor installed. The suppressor shall be connected to filter interference completely from the controller and associated equipment.

17. MAINTENANCE PANEL SWITCHES.

These switches shall be mounted on the inside of the main door, on the back side of the auxiliary compartment (police compartment). All switch functions shall be permanently and clearly labeled. The switches shall be of a rocker type and protected to prevent accidental switching. The following switches shall be provided: STOP-TIME, Auto/Flash (NEMA TS-2 section 5.5.1), Signal ON/OFF (heads only).

The STOP-TIME switch shall be connected to a three position switch that is labeled as followed: The top position shall be labeled as "STOP-TIME", which shall set the STOP-TIME bit to the controller, stopping the controller cycle, holding it in its current state; the middle position shall be labeled as "DISABLED", which disables the STOP-TIME bit in the monitor; the bottom position shall be labeled as "RUN", which enables the STOP-TIME bit in the monitor.

The Auto/Flash switch be installed and labeled in accordance with the specifications contained in NEMA TS-2, Section 5.5.1.

The Signal ON/OFF switch shall be a two position switch the kills the power to the signal heads, making the intersection dark. This switch shall not interrupt the controller power nor shall it interrupt the controller cycling.

18. MAIN CIRCUIT BREAKERS.

A circuit breaker shall be furnished. Circuit breakers shall be rated at 20 A for two phase controllers, shall be rated at 30 A for three and four phase controllers, and shall be rated at 40 A for five through eight phase controllers.

The main circuit breaker shall turn off all power to the cabinet and shall not be used for the power switch, which is located in the service panel.

19. POWER SUPPLY.

Unless otherwise specified the controller unit and associated equipment shall operate reliably on 115 V; 60 Hz single phase alternating current.

Any internal DC voltages required to satisfactorily operate a cabinet assembly shall be from a regulated power supply designed to generate all DC voltages required, constructed as an integral part of the cabinet assembly.

The grounded side of the power supply shall be carried throughout the controller in a continuous circuit.

20. TIMER CONNECTIONS.

The electrical connections from the timer to the outgoing and incoming circuits shall be made in such a manner that the timer may be replaced with a similar unit, without the necessity of disconnecting and reconnecting the individual wires leading there from. This can be accomplished by means of a multiple plug and jack, a spring-connected mounting, or equivalent arrangement.

21. SIGNAL LOAD SWITCH ARRESTOR.

The load switch output shall have a metal-oxide varistor, Type V150LA20A.

22. REPLACING LIGHTNING PROTECTION.

All lightning protection devices shall be replaceable without removing any panels.

23. INDICATOR LIGHTS.

Controllers having indicator lights with a design or in circuit life of less than 75,000 hours shall have a micro-switch located on the cabinet door that will extinguish the indicators when the door is closed.

24. NEMA INDICATION WIRING.

All NEMA functions plus NEMA coded status bits and voltage monitor outputs as listed in the NEMA Standards Publication No. TS 2-2016. Outputs shall be brought out and wired to an individual tie point of a terminal strip before further routing.

25. PREEMPTION (PRIORITY CONTROL).

When preemption is required by the plans or proposal, electrical devices, logic circuits and special wiring shall be provided which will assume control over local traffic control equipment to require display of special safety modes giving preferential right-of-way to emergency vehicles or protection at railroad crossings.

**(e) CONFLICT MONITOR.**

1. TYPE.

Conflict Monitor shall be a NEMA Type 12L and conform to the requirements of NEMA Standards Publication No. TS 1-1989 Section 6, "Conflict Monitor Specifications", or any subsequent publication, plus the following features:

2. MONITOR REMOVAL.

The intersection shall remain in flash operation when the monitor has been removed.

3. BLOWN FUSE MONITOR.

The intersection shall go to flashing operation when the monitor fuse blows.

4. POWER SUPPLY MALFUNCTION.

The intersection shall go to flashing operation when the controller power supply malfunctions.

5. CONTROLLER POWER WITH TRIPPED CONFLICT MONITOR.

The conflict monitor shall not interrupt controller power when tripped.

6. STOP TIMING WITH TRIPPED CONFLICT MONITOR.

The conflict monitor shall apply stop timing on the controller when tripped.

7. INDICATION OF DRIVE FAILURE.

The conflict monitor shall indicate which drive failure has occurred (Red Fail).

8. DISPLAY AND PRINTING.

The unit shall have a LCD display, it must also have a printer port, RS232, and be capable of printing all memory-stored failures, with the type failure and date.

9. CLOCK.

The unit shall have a real time clock.

10. EVENT LOG.

The unit shall have an event log that contains the following data:

- AC power interruption/restoration logging;
- Logs reset after failure;
- Log 24 V values;
- Log CVM failure;
- Load switch failure;
- Log all faults with time and date.

11. EXTENDED MONITORING.

The unit shall have the following extended monitoring:

- Dual indication monitoring per channel;
- Short vehicle clearance detection.

12. DISPLAY OF INTERSECTION STATUS.

The unit shall be capable of displaying intersection status.

13. READBACK.

The unit shall have program card readback.

14. TERMINATION OF UNUSED INPUTS.

All unused inputs will be brought out and terminated on a terminal strip.

15. MONITOR INPUT WIRING.

Monitor inputs shall be wired to field output terminals.

**(f) SURGE PROTECTION FOR CABINET ASSEMBLY.**

1. PROTECTION OF CABINET ASSEMBLY.

All cabinet assemblies shall be furnished with a surge protector on the AC service input, which meets or exceeds the following performance requirements.

- Unit shall be capable of withstanding repeated 20,000 A surges a minimum of 25 times.
- Unit shall have internal follow-current limiters (resistive elements).
- Unit shall contain a minimum of three active clamping stages.

- Unit shall self-extinguish within 8.3 milliseconds after the trailing edge of surge.
- Parallel impedance of limiters shall be less than 0.15 ohms.
- Unit voltage shall be to the circuit breaker before cabinet voltage filters.
- Electrical connections on the unit shall be durable enough to accommodate a No. 6 AWG wire.

The unit shall have a mounting plate for easy removal and replacement and shall be mounted in a neat workmanlike manner in the controller cabinet with as short a run as possible from the power input to the circuit breaker.

2. PROTECTION OF SIGNAL LOAD SWITCHES.

Each load switch shall be furnished with a gas tube or metal-oxide varistor, Type 150LA20A.

Unit shall have an impulse breakdown of less than 1000 V in less than 0.1 microsecond at 10 kV per microsecond.

Unit shall be capable of withstanding 20 A AC for 1 second applied 10 times at 3 minute intervals on either section.

Unit shall have a current rating of 20,000 A (8/impulse) one time.

Unit shall have a striking voltage of 300 to 500 V DC.

Unit shall have a minimum holdover of 155 V DC.

Unit shall be installed across the Triac of each section of the load switch. The center electrode of the gas tube surge protector shall be connected to pin number 12 of the load switch plug. The load switch receptacle pin number 12 shall be wired to a minimum No. 8 wire ground buss. The ground buss shall be connected to the chassis ground and a ground rod. Connection terminal shall be provided a minimum distance possible from the physical center of the ground buss.

3. PROTECTION OF CONTROLLER UNIT AND CONFLICT MONITOR.

Power and neutral for controller and conflict monitor shall be wired through a high-speed approved suppressor. The output of the arrestor to failsafe, controller, etc., shall be through shielded cable or twisted pair to the units AC plus and AC minus inputs.

The surge protection device shall meet or exceed the following performance requirements.

Protectors, after being subjected to twenty five 20 kA (8 X 20  $\mu$ s) pulses must remain operative and exhibit less than 5 percent plus or minus change in clamp voltage before and after the test.

The protector clamp shall never exceed 250 V when subjected to the 20 kA surge.

The peak current shall be 20,000 A.

The continuous service current shall be, 10 A maximum, 120 V AC, 60 Hz.

FILTERING SPECIFICATIONS, MIL-STD-220 Insertion Loss Test Data

Insertion Loss Requirements

Frequency	Insertion Loss (db)
60 Hz	0
10 kHz	34

50 kHz	55
100 kHz	76
500 kHz	68
2 MHz	58
5 MHz	58
10 MHz	58
20 MHz	63

4. PROTECTION OF REMOTE DETECTOR AND INTERCONNECT CABLE.

Each remote detector input line and interconnect line, as it enters the cabinet shall be furnished with a surge protection device that meets or exceeds the following requirements.

Unit shall be capable of withstanding 10,000 A 10:20 microsecond standard waveform surges a minimum of 50 times.

Unit shall have internal follow-current limiters (resistive elements).

Unit shall self-extinguish within 8.3 milliseconds after the trailing edge of surge.

Unit shall not have thermal circuit breakers in place of limiters.

Limiter resistance shall be between 0.15  $\Omega$  and 0.39  $\Omega$ .

Unit shall have a mounting plate for easy removal and replacement and shall be mounted in the controller cabinet in a neat workmanlike manner.

5. PROTECTION OF LOOP DETECTORS (EXTERNAL SURGE PROTECTION).

External surge protection for each detector must meet the following requirements.

Unit shall be a three terminal device capable of protecting the detector against differential (between the loop leads) surge, and against common mode (between leads and ground) surges.

Unit shall be of the inductive type with a maximum DC resistance of 150 m $\Omega$ .

Unit inductance shall be able to protect the detector electronics when the detector is subjected to a 400 A surge across the detector leads.

Unit shall be a two stage device.

Unit shall clamp a 250 A surge to 25 V within 40 nanoseconds. Surge shall be applied between the two detector leads.

Unit shall clamp a 250 A COMMON mode (between leads and ground) surge to 35 V. These do not include protector lead IR drop.

Unit shall withstand repeated surges.

Unit and loop terminals to be physically mounted approximately 6 inches from bottom of cabinet.

**(g) WIRING DIAGRAM.**

Two copies of cabinet wiring diagram shall be supplied as well as copies of the following:

- Controller circuit diagrams and schematics;
- Controller Operations Manual;
- Conflict Monitor diagrams and schematics.
- Flasher diagrams and schematics;
- Load Relay diagrams and schematics;



- Diagrams and schematics of any external hardware supplied;
- Template of Base Mounting if base mounted.

Cabinet prints shall include flash color change instructions for all phases and all overlaps.

Cabinet prints shall be keyed to show every input and every output from every terminal. If prints use multiple ground and neutral busses, busses shall be numbered. All grounds and neutrals shall be keyed to the busses that they are connected to.

Cabinet prints shall show every connector.

**(h) CONTROLLER UNIT.**

1. TYPE.

Controller shall be NEMA TS-2 Type 2 and listed on the Alabama Department of Transportation's Approved Traffic Control Devices and Materials of the bid date for this project. Controller shall be NTCIP and fully meet the ATC Standard 5.2b and proposed ATC 5201 Standard v06.

The phase requirements required on the plans will indicate the physical and electrical construction of the controllers; however, controller unit shall conform to NEMA requirements.

Unless otherwise described in these specifications, or required by the plans or the proposal, the following requirements are applicable to all controller units.

2. SOFTWARE COMPATIBILITY.

Controller shall be compatible with Centracs 2.0 Advanced Transportation Management System. Controller shall include datakey receptacle, with an option to include any necessary datakey.

3. USER INTERFACE.

The front panel of the controller shall consist of the display, keyboard and connectors for all necessary user connections. The standard controller shall have a monochrome menu display, with an optional LCD touch screen display.

**III. Master Cabinet Assembly.**

**(a) MASTER CABINET.**

The following additional requirements shall apply to the cabinet for a master cabinet assembly.

The master cabinet assembly shall house a hardwire master interconnect panel to provide for seven wire interconnect 120 V to be complete with three NEMA load switches, and complete with 120 V relays. The required functions provided shall consist of three dials; three offsets and flash; outputs and inputs. Panels shall have all components mounted on 0.125 inch sheet aluminum. The panel shall be completely wired in-place to include all necessary harness, and shall be wired to conform to the requirements of the MUTCD for system flash.

Terminal block facilities shall be provided for the interconnection.

**(b) MASTER CONTROLLER UNIT.**

1. GENERAL.

The master controller for an interconnected traffic control signal system shall be the apparatus required to provide supervisory functions under normal operation as described for interconnected controllers. The master control shall be compatible with the controller unit supplied with the cabinet assembly with controller.

2. MOTOR.

The master controller shall be driven by a synchronous motor or be provided with a synchronous control mechanism which will maintain a constant time cycle; however, when it is not necessary to keep a traffic control signal system in step with adjacent systems or adjacent non-interconnected controllers, an induction motor driven master controller may be specified.

3. SUPERVISORY FUNCTIONS.

- Means for automatically establishing offset time relations of local controllers.
- Hand operated switch for turning off completely all traffic control signal lights at interconnected local controllers.
- Hand operated switch for transfer of traffic control signal lights at each local controller to give flashing indications.
- Hand operated switch for selecting offset at which all interconnected local controllers shall operate in accordance with three distinct timing plans.
- Hand operated switch for selecting two or three interval setups on which each of the interconnected local controllers shall operate.

The above requirements shall be obtainable when specified, by means of an automatic time switch, in which case the automatic switching schedule shall be required.

**IV. Cabinet Assembly without Controller.**

The cabinet assembly without controller shall meet the specifications and standards as described in Section II (a) through (g) as defined above.

**V. Controller Unit.**

These specifications set forth the minimum requirements for a shelf mounted, two (2) through sixteen (16) phase, fully actuated, digital, solid state controller. The controller shall be configurable to meet all applicable sections of the NEMA Standards publications for TS-2.

**(a) ADVANCED TRAFFIC CONTROLLER FOR NEMA-STYLE CABINETS.**

1. TYPE.

Controller shall be NEMA TS-2 Type 2 and listed on the Alabama Department of Transportation's Approved Traffic Control Devices and Materials of the bid date for this project. Controller shall be NTCIP and fully meet the ATC Standard 5.2b and proposed ATC 5201 Standard v06.

The phase requirements required on the plans will indicate the physical and electrical construction of the controllers; however, controller unit shall conform to NEMA requirements.

Unless otherwise described in these specifications, or required by the plans or the proposal, the following requirements are applicable to all controller units.

2. SOFTWARE COMPATIBILITY.

Controller shall be compatible with Centrac 2.0 Advanced Transportation Management System.

3. USER INTERFACE.

The front panel of the controller shall consist of the display, keyboard and connectors for all necessary user connections. The standard controller shall have a monochrome menu display, with an optional LCD touch screen display.

**(b) STANDARD NEMA TS-2 CONTROLLER.**

1. TYPE.

Controller shall be NEMA TS-2 Type 2. Type 2 controller shall be capable of operating as a Type 1 controller.

The phase requirements required on the plans will indicate the physical and electrical construction of the controllers; however, controller unit shall conform to NEMA requirements.

2. USER INTERFACE.

The front panel of the controller shall consist of the display, keyboard and connectors for all necessary user connections. The standard controller shall have a monochrome menu display.

The controller shall include an option that allows updating software using a Windows based computer, a USB thumb drive, or an SD card. The use of removable PROMS or EPROMS from the controller shall not be acceptable.

**CITY OF MOBILE  
SPECIFICATIONS FOR TRAFFIC SIGNAL EQUIPMENT  
BID SHEET**

**Cabinet Assembly with Controller.**

Option touch screen

Option data key

**Master Cabinet Assembly with Controller.**

Option touch screen

Option data key

**Cabinet Assembly without Controller.**

**Advanced Traffic Controller with NEMA-style cabinet.**

Option touch screen

Option data key

**Standard NEMA TS-2 Controller.**



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