

GEORGE FLAGGS, JR.  
MAYOR



WILLIS T. THOMPSON  
ALDERMAN

MICHAEL A. MAYFIELD, SR.  
ALDERMAN

## City of Vicksburg

1401 WALNUT STREET • VICKSBURG, MS 39181 • (601) 636-3411

June 19, 2017

G.F. \_\_\_\_\_  
M.M. \_\_\_\_\_  
W.T. \_\_\_\_\_

JUN 14 2017

Board of Mayor and Aldermen  
City of Vicksburg  
Vicksburg, Mississippi 39181-0150

Gentlemen:

Attached are the specifications for the advertising of Traffic Signal Components for the Traffic Department.

The purpose of this request is to purchase on an as needed bases.

Funds were allocated and are available.

I respectfully request that the Mayor and Aldermen of the City of Vicksburg authorize the advertising for sealed bid for this purpose..

Sincerely,

A handwritten signature in cursive script that reads "Ann Grimshel".

Ann Grimshel, CPPB  
Purchasing Director

attachment

*Incorporated 1825*

City Website: <http://www.vicksburg.org>

# CITY OF VICKSBURG

P O Box 150  
Vicksburg, MS 39181-0150

SEALED bids for Traffic Signal Components shall be received by the City Clerk or appointed designee in the Office of the City Clerk at 1401 Walnut Street until 9:00 a.m. on the \_\_\_\_\_ day of \_\_\_\_\_ 2017. The bids will be publicly opened and read aloud at the meeting of the Board of Mayor and Aldermen in their regular meeting at 10:00 a.m. on the \_\_\_\_\_ day of \_\_\_\_\_ 2017.

Bidders are cautioned that the City Clerk does not receive the daily U.S. Mail on or before 9:00 a.m. Bids will be time-stamped upon receipt according to City Clerk's time clock.

Specifications and instructions for bidding are on file in the office of the City Clerk, second floor, City Hall, corner Crawford and Walnut Streets, Vicksburg, Mississippi.

~~Cash cashier's check, certified check or bidder's bond in the amount of 5% of bid must accompany same. A performance bond and a payment bond, each in the amount of 100 percent of the contract, issued by a Surety Company licensed to operate in the State of Mississippi will be required by the successful bidder.~~

The Mayor and Aldermen of the City of Vicksburg reserve the right to reject any and all bids and to waive informalities.

## NOTICE TO BIDDERS

Bids must be submitted on this form. Bids made otherwise will be subject to rejection. The above bid description must be shown on the front of envelope in which this bid is submitted. The above bid description must also be shown on the front of the express envelope, if one is used. The City of Vicksburg assumes no responsibility for unmarked envelopes being considered for award. Only one bid per envelope, please. Bidders are required to sign this form in the space provided. It is requested that complete bids are either typed or printed in black ink only. The requirements of these specifications are minimum acceptable.

Item			
No.	Quantity	Unit	Items

## INSTRUCTIONS TO BIDDERS

1. Unless otherwise requested, submit only one copy of each bid.
2. Bids, amendments thereto, or withdrawal requests received after the time advertised for bid opening will be void regardless of when they were mailed.
3. Quote prices on units specified with packing included; or redelivery check, title and inspection when applicable to motor vehicle.
4. Attach complete specifications for any permitted substitutions offered, or when amplification is desirable or necessary.
5. If specifications or descriptive literature is submitted with bids, enter the bidder's name thereon.
6. If the article bid upon has a trade name or brand, show the same in the bid.
7. Sample, when required, must be submitted free of expense, unless otherwise specified, in accordance with the conditions and instructions in the body of this bid notice.
8. Each Bidder shall have a Certificate of Responsibility to bid on contracts for public projects in which the bid price exceeds \$50,000.00 and for private projects in which the bid price exceeds \$100,000.00, as required by the laws of the State of Mississippi. Each Bidder shall show on the outside of the envelope containing his bid; his current Certificate of Responsibility number and expiration date, or if applicable, a statement certifying that the bid enclosed does not exceed \$50,000.00 for a public project or \$100,000.00 for a private project; his name; and the name of the Contract for which the bid is submitted. Failure to show these items on the outside of the envelope containing the bid will result in the bid being returned to the Bidder unopened. Public funds are involved in this project.

### TERMS AND CONDITIONS

1. The Mayor and Aldermen of the City of Vicksburg reserve the right to reject any and all bids, and to waive all technical informalities.
2. Unit prices will govern over extended prices, unless otherwise stated in notice.
3. Prompt payment cash discount, when applicable, shall be taken on all payments made on or before the tenth day of the month following the month in which the items and the correctly executed invoice were received.
4. In case of default of contractor, the City reserves the right to purchase any or all items in default in open market, charging contractor with any excessive costs. Should such charge be assessed, no subsequent bids of the defaulting contractor will be considered until the assessed charge has been satisfied.
5. All materials and products offered must be guaranteed to meet the requirements of the specification indicated, given, or referred to.
6. Prices bid must be based upon payment within the month following the month in which the items and invoices were received.
7. The right is reserved for the Mayor and Aldermen of the City of Vicksburg to make an award which is determined to be to the best interest of the City of Vicksburg.
8. The right is reserved to reject any bid in which the delivery time is considered sufficient to delay the operation for which the item is intended.
9. Prices must be firm.
10. The successful bidder shall indemnify and save harmless the Mayor and Aldermen of the City of Vicksburg and all City officers, agents, and employees from all suits or claims of any character brought by reason of infringing on any patent, trademark, or copyright.
11. Ambiguous bids which are uncertain as to terms, delivery, quantity, or compliance with specifications may be rejected or otherwise disregarded.
12. Any contract entered into by the Mayor and Aldermen of the City of Vicksburg resulting from this bid notice shall be subject to cancellation at the end of any fiscal or appropriation year unless otherwise provided by law.
13. Reference to manufacturer's product by make, model, series number, etc., is intended only to establish a standard of quality.

### BID

I, the undersigned, certify that this proposal does not violate any federal or state antitrust laws. Motor Vehicle Commission License No. (If applicable) : \_\_\_\_\_ Date: \_\_\_\_\_

In compliance with the invitation, and subject to all conditions thereof, the undersigned offers and agrees, if this bid is accepted within sixty days from date of opening, to furnish any and all items quoted on at prices as set forth after the item and make delivery as required after receipt of order, delivered, all transportation costs included and prepaid and, unless otherwise stated and accepted herein unless otherwise specified in the invitation to bid. Prompt payment cash discount of \_\_\_\_\_ per cent is allowed.

Bidder: \_\_\_\_\_ Street or P O Box \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_ Telephone No. \_\_\_\_\_

By: \_\_\_\_\_ Title \_\_\_\_\_

(BIDS MUST BE SIGNED IN WRITING)

Federal Employer's Identification Number: \_\_\_\_\_

## Traffic Signal Components

The following are the minimum specifications for traffic signal components which are used by the City of Vicksburg Traffic Department.

### **Item 1 - Signal Heads**

#### Adjustable Face Traffic Control Signal Heads

##### General:

All traffic signal heads shall be of the adjustable type. Materials and construction of both types of sections shall be the same and shall conform to the specifications that follow.

##### Definitions:

Signal Head -	An assembly containing one or more signal faces which may be designated accordingly as one-way, two-way, etc.
Signal Face -	That part of a signal head provided for controlling traffic in a single direction.
Signal Section -	That part of a signal face containing an optical unit.
Optical Unit -	LED
Signal Indication -	The illumination of a traffic signal lens or equivalent device or a combination of several lenses or equivalent devices at the same time.

These specifications are for standard 12" traffic signal sections, which shall be considered as standard. . In general, signal face will usually have three, four or five sections (never less than three) and beacon face will usually have only one section.

However, the number of faces per head and the number of sections per face shall be specified on each order.

##### Housing:

The housing of each section shall be of one piece plastic material, of approved composition, with sides, top and bottom integrally molded. The housing shall be at least .090" thickness and shall be ribbed so as to produce the strongest possible assembly consistent with light weight. Two sets of internal bosses shall be provided in each section for horizontal mounting of a terminal block.

The top and bottom exterior of the housing shall be flat and parallel to assure perfect alignment of assembled sections. The top and bottom of the housing shall have an opening for Tri-Stud fittings.

Individual signal sections shall be fastened together either with machine screws between each section or by the three bolt and two washer method. Complete signal faces shall provide positive locked positioning when used with serrated brackets, mast arm or span wire fittings. Page 1

### Housing Door:

The doors shall be of the same material as the housing and shall be suitably hinged and held securely to the body of the housing by simple non-corrosive locking devices which can be operated without tools. All other door parts, such as hinge pins, lens clips, etc., shall also be of non-corrosive material or material treated to retard corrosion. Door hinge pins shall be so designed that the door will not accidentally become disconnected from housing when open regardless of signal position. Doors shall be field removable with simple tools.

Weather-resisting, mildew-proof neoprene or silicone rubber sponge gasketing between the body of the housing and the doors, shall be provided which shall exclude dust and moisture.

### Visors:

Each signal section shall have a visor which tilts slightly downward approximately 8 degrees from the horizontal. The visor shall be of sheet construction. All edges shall be deburred and smooth with no cutting edges.

All visors shall be of the tunnel type and approximately 10" long for 12" heads.

The visor shall be attached to the door with non-corrosive screws and shall be designed to fit tightly to the door and shall not permit any perceptible filtration of light between the door and the visor.

### **Item 2 - Span Wire Clamp**

The clamp shall attach to the span wire and to the balance adjusting device or the cable entrance fitting. The clamp shall have a minimum span wire shoe above the span which shall be 8" long and fit 1/4" to 7/16" span wire, utilizing a minimum of two "J" or "U" type bolts 3/8 or larger that tighten a clamp protector against the span wire within the shoe. Centered on the bottom of the clamp shall be a suspension pin, 1/2" in diameter and a clevis opening 1/2" wide.

### **Item 3 - Balance Adjusting Device**

The balance adjusting device shall provide a horizontal pivot between the span wire clamp and the fitting below the device. The pivot point shall be mechanically controlled from pivoting free to fixed. The adjuster shall be attached in the clevis of the clamp and provide a clevis matching the clamp.

### **Item 4 - Cable Entrance Fitting**

The cable entrance fitting shall provide weatherproof entrances for two 1/2" signal cables and mechanical attachments to the signal section or bracket. The top of the fitting shall attach to the clamp or adjuster, and provide a minimum of five in-line positions for the suspension pin with one

end position over the centerline of the attachment point for the signal section. Note: The mechanical attachment for the signal section or bracket shall be tri-stud and shall include all washers, nuts and locking plates required for attachment..

#### **Item 5 - Backplates**

Shall be of the one piece design for standard three section signal heads.

May be of pieced sections specifically made and fitted for five section heads, tee section heads and inverted tee section heads.

Shall be readily attachable to the signal heads with screws or equal through pre-drilled holes, without having to drill extra holes and shall fit properly and be rigid.

#### **Item 6 - Bottom Plug**

The bottom plug shall be made of plastic, yellow in color and shall fit into bottom hole by firmly pressing in without the use of tools.

#### **Item 7 - Cable**

The signal cable shall be four conductor, stranded, IMSA 19-1-#14AWG cable in one thousand foot (1000') rolls.

#### **Item 8 - Wire**

The guy wire shall be 5/16" in diameter and galvanized and shall be in two hundred fifty foot (250') rolls.

#### **Item 9 - Detector Loop Sealant**

##### **I. Scope**

The sealant is intended to provide environmental protection to the wires of a detector loop traffic detection system. The material shall provide compressive yield strength to withstand normal vehicular traffic as well as sufficient flexibility to withstand normal movement in asphalt and concrete road pavements, while protecting the loop wire from moisture, penetration, fracture and shear forces.

## II. General

- A. The sealant shall be a one part elastomeric compound requiring no mixing, measuring or application of heat prior to or during its installation.
- B. The sealant shall, within its stated shelf life and original undamaged packaging, cure only in the presence of moisture. The rate of cure will depend on temperature and relative humidity at the time of installation.
- C. The sealant shall have flow characteristics which insure complete encapsulation of the wires.
- D. The sealant shall not run out of the detector saw cut in sloped road bed areas during or after application.
- E. The uncured sealant shall be designed to permit clean-up with a cleaner that will not threaten harm to workers or the environment.
- F. The sealant shall be designed to enable vehicular traffic to pass over the properly filled 1/4" to 3/8" wide saw cut immediately after installation without danger of the sealant pulling out of the saw cut during cure.
- G. The sealant shall exhibit minimal shrinkage during cure so as not to require any additional material after cure.
- H. The sealant shall provide the best performance when the surface temperature is between 40° F to 100° F.
- I. The sealant shall be classified "not regulated for surface transportation" according to USDOT regulation.
- J. The cured sealant shall be land-fill disposable.

## III. Physical Requirements

- A. The sealant shall have physical properties which enable the product to meet the General Description (Table 1) requirements.
- B. The sealant shall not contain solvents incompatible with asphalt (Toluene, Mineral Spirits, or other similar hydrocarbons).

Table 1

<u>Property</u>	<u>Requirement</u>	<u>Test Procedure</u>	<u>ASTM Reference</u>
Physical properties of the uncured (wet) sealant:			
A. Density	10.0 - 10.6 lb/gal	A. Weight/Gallon	D-1875
B. Total solids by weight	75% minimum	B. Determination of non-volatile content	D-2834
C. Viscosity	5,000-85,000 cps	C. Viscosity	D-1048B
D. Drying time	Touch: 24 hr max	D. Tack-free time	D-1640
E. Non-Flow	70% min	E. Retention Test <sup>1</sup>	---

## Physical properties of the cured encapsulant:

A. Hardness (indentation)	60-85	A. Rex hardness	D-2240 <sup>3</sup>
B. Tensile strength	800 psi min	B. Tensile and elongation	D-412A <sup>2</sup>
C. Elongation at break	400-700%	C. Tensile and elongation	D-412A <sup>2</sup>

- NOTES:
1. See attached testing procedure
  2. Jaw speed: 10"/min
  3. Maintain measuring pressure for ten seconds and record initial and final value. Final value shall be within five units of the original value.

## IV. Environmental Aspects

- Properly installed and cured sealant shall exhibit resistance to effects of weather, vehicular abrasion, motor oils, gasoline, antifreeze solution, brake fluid, deicing chemicals and salt normally encountered in such a manner that the performance of the vehicle detector loop wire is not adversely affected.
- The cured sealant shall be temperature stable and exhibit no degradation in performance throughout the ambient temperature ranges experienced within the state of Mississippi.

## V. Dispensing

- The sealant shall be available in metric sized, pliable packaging for dispensing from a commercially available 66cm air assisted applicator gun and generate less than 65cc of solid waste per liter of sealant.
- The sealant shall be dispensable from bulk containers (five gallon pails or 55 gallon drums) with a commercially available pumping system.



## VI. Life/Reliability

A. The sealant shall have the following shelf life in undamaged containers when stored below 80°F:

1. Liter ply packs: Nine months after receipt.
2. Five gallon pails (containing 4.5 US gallons): Twelve months after receipt.
3. Gallon drums (containing 50 US gallons): Twelve months after receipt.

### Retention Test for Detector Loop Sealant:

I. Title: Percent by weight retention test.

II. Scope: To measure the non-flow properties of a one component sealant.

III. Equipment and Materials:

1. Balance
2. Tongue depressor
3. Two ounce ointment cans or equivalent
4. One inch wide masking tape
5. Percent retention test fixture
6. B-D 10cc syringe
7. Sample of sealant to be tested

IV. Procedure:

1. Put a strip of masking tape on both ends of the test fixture completely covering the slot.
2. Weigh the fixture with masking tape (a)
3. Sample of sealant shall be tested at 75-79°F and stirred for one minute prior to testing
4. Fill the syringe with the sample and inject the sample into the slot in the test fixture.
5. Using a tongue depressor, scrape off any excess sealant from the top of the test fixture so that the sealant fills the test fixture slot and is level with the top of the fixture.
6. Re-weigh the fixture with the sample material filling the slot (b).

7. Put the fixture on top of the two ounce ointment cans and remove the masking tape from the sides.
8. Wipe off and discard any sealant on the pieces of masking tape. Do not discard the pieces of masking tape.
9. The test period is for five minutes, starting when the two strips of masking tape are removed from the ends of the test fixture. During the test period the sealant may flow out of the slot onto and down the sides of the test fixture.
10. After the five minute test period, using a tongue depressor, wipe off and discard any sealant that has run out of the slot onto the sides of the test fixture, so that the only remaining sealant is in the slot of the fixture.
11. Replace the same pieces of masking tape that were removed at the beginning of the test, back onto the fixture.
12. Re-weigh the test fixture with the residual amount of sealant (c).

$$\frac{\text{Final weight of sample}}{\text{Original weight of sample}} \times 100 = \% \text{ Retention}$$

Final weight of sample =  
(After test)

(c) Weight of fixture and residual sample - (a) weight of fixture with masking tape

Original weight of sample =  
(Before test)

(B) Weight of fixture and original sample - (a) weight of fixture with masking tape

### **Item 10 - Loop Detector Amplifiers**

Description: This work shall consist of furnishing four channel card rack mounted loop detector amplifier units complete with all equipment necessary for installation in the traffic controller cabinet.

Material Requirements:

Materials furnished for use shall conform to the following:

Each cabinet shall be provided with a card rack assembly fully wired to the terminal facility and detector panel to accommodate requirements of the plans.

The e card rack should be wired for a power supply, Opticom #262 card and the required number of slots for detection. The card rack assembly shall be mounted securely to the middle shelf in each cabinet.

The front panel of each detector shall include erasable, write-on pads for channel identification purposes of at least 1 centimeter square. One pad per channel.

Each two channel detector will have the ability to modify the presence time by Delay or Extension. Internal dip switches will provide for the selection of Delay time of 0 to 31 seconds in 1 second increments and Extension time of 0 to 7.75 seconds in .25 second increments.

Each four channel card will include a front panel switch position for each channel to provide for manual reset per channel. The manual reset will have the capability to be activated by an external ground level signal, > 15 microseconds duration, to cause all presence indications to be reset. This input shall be wired in place in the card rack and terminated on the left side of the cabinet.

Each detector card shall contain a remote reset input.

Detector units will include a convenient thumb wheel switch per channel to allow selection of Sensitivity, Pulse, Presence, Reset or Off on a per channel basis.

Detector units shall include 8 sensitivity choices in 2:1 steps over a range of 128:1 to enable selection of the proper sensitivity to achieve detection of all licensable motor vehicles over multiple turn loops in asphalt or reinforced concrete pavements and/or multiple loops which may be connected in series, parallel or series/parallel with lead-in/homeruns to over 1000'.

Detector units shall operate over an inductance range of 2 to 2000 microhenries.

Each channel shall automatically self tune within 10 seconds after application or interruption of supply voltage.

Each channel shall automatically recover from intermittent opens or multiple shorts to ground.

Each channel shall tolerate and continue to operate with no change with a single point short to ground on the loop or lead-in system.

Each channel shall provide a continuous, non-resettable (fail-safe) output and indication in response to an open loop / open lead-in system. The open loop indication and output shall not be resettable as long as the open exists, except that they shall be defeated when the channel Off position is selected.

Each detector unit shall be provided with a loop test switch position to verify loop system integrity.

Each detector unit shall sequentially scan (excite and measure) its channel inputs to eliminate crosstalk (mutual interference/coupling) between closely spaced large loops in adjacent lanes and/or lead-ins in common sawcuts and /or homeruns in common conduits. Only one channel input per unit shall be active at any point in time.

Each unit shall contain an internal regulator circuit rated to operate over a range of 20 to 36 VDC. It will have internal current limiting and thermal shutdown provisions. The four channel plug-in units shall consume less than 250 MA.

Each unit shall meet the environmental requirements of NEMA Standard TS 1 Section 15 over a temperature range of -35°F to +165°F and humidity range of 0 to 99% RH. Plug-in units shall mate with a 44 terminal, 22 position double-row 0.156" center spacing edge connector. Contact fingers plated with .05 mils gold.

Physical size shall not exceed 1.95" (50mm) wide by 4.5" high and 8" deep, including pull handle.

Weight shall not exceed 1.0 lbs. for each plug-in.

Detectors shall be warranted by the supplier to be free of defects in materials and workmanship for a period of (1) year from date of installation but not to exceed (2) years from date of shipment from manufacturer.

Each detector input circuit shall be equipped with a three terminal surge protection device capable of protecting the detector amplifier against differential mode surges and common mode surges. The unit must withstand six 400 Amp (8 X 20 us) differential mode surges and six 1000 Amp (8 X 20 us) common mode surges. The unit must clamp these surges at 35 volts maximum in less than 40 nanoseconds. Differential capacitance shall be less than 50 picofarads. The unit shall be epoxy encapsulated.

## **Item 11 - Solid State Traffic Controllers**

### **Material Requirements:**

#### **A. Controller Units.**

The purpose of this subsection is to describe the minimum acceptable design and operating requirements for a solid state two to eight phase traffic signal controller that utilizes digital concepts for all interval settings and timing.

All definitions shall be in accordance with NEMA Standards Publication TS1-1983 Part 1.

Programming of controller unit variables shall be by way of a front panel keyboard and display.

The controller unit shall prevent the alteration of the keyboard set variables. The controller shall use English language menus.

The units shall be shipped With a universal "Access" code. This code shall also be user programmable via the keyboard.

All variables and variable names shall be displayed for visual verification at the time of data entry.

The controller unit shall maintain user programmable variables in EEPROM memory to assure continued safe and efficient controller unit operation in the event of power loss. No batteries are required except for models with coordination and time base clocks which utilize RAM for continuous clock operation.

The controller unit shall perform all of its functions within the environmental conditions specified in NEMA Standards TS 1-1983 Section 2.

Input-output interface of the controller shall meet the following requirements:-

1. The electrical limits of inputs and outputs shall meet the requirements of NEMA Standards TS 1-1983 Section 13.2,
2. Input functions and number of terminals shall meet the requirements of NEMA Standard TS 1-1983 Section 13.3.
3. Output functions and number of terminal shall meet the requirements of NEMA Standard TS 1-1983 Section 13.4.
4. Connectors and connections shall conform to NEMA Standard TS 1-1983 Section 13.5.
5. An RS-232C interface and connector shall be provided for interconnecting to a printer, another like controller unit, a local personal computer, or a remote personal computer through an external modem.

It shall be possible to transmit ASCII coded information (date, letters, heading, etc.) to an 80 column or larger printer. The larger printer must be RS232C compatible, be able to receive ASCII coded serial data at 1200 baud, eight data bits, odd parity, and utilize X-ON/X-OFF protocol.

The controller unit timing and operational data shall be individually transmitted to the printer. The printout shall be in a format easily understood by a person familiar with traffic engineering terminology. The unit to printer transmissions shall not interrupt normal controller unit operation.

The controller unit timing and operational data shall be individually transmitted to/from another like controller unit. The unit to unit transmissions will not interrupt normal controller unit operation except when Ring Structure data is changed. When the received Ring

Structure data is different from that running, the receiving unit shall automatically revert to the Start Flash interval. The receiving unit shall time the Start Flash time and resume normal operation in the programmed initialization interval.

The controller unit timing and operational data shall be individually transmitted to/from a personal computer running the appropriate software. The transmissions shall not interrupt normal controller unit operation except when Unit Structure data is changed. When the received Unit Structure data is different from that running, the receiving unit shall automatically revert to the Start Flash interval. The receiving unit shall time the Start Flash time and resume normal operation in the programmed Initialization interval.

The controller unit active status (Traffic Timers, Coord Timers, Preempt Timers, and Time Base Current) shall be individually transmitted to the personal computer running the appropriate software.

The controller unit report logs shall be individually transmitted to the personal computer running the appropriate software.

The controller unit shall allow the user access from a remote personal computer and also from a local laptop personal computer. The user shall be able to communicate with the intersection controller, as described, in order to monitor current operation; record and analyze traffic conditions by time and pattern; and modify, upload and download any controller program or timing parameter.

Provision for a separate communications port shall be made for purposes of using the controller in a system's environment. In the event the controller is used as a 'system controller', no changes to the controller shall be allowed, other than the addition of an internal communications module (modem board), and the unit shall not require reprogramming of timing data.

Timing shall be digital; analog timing is prohibited.

It shall not be permissible to connect two controllers together for the purpose of increasing their control capacity. Special equipment not specifically covered by this specification shall be electronic and solid state in construction.

The power supply shall be easily removable from the main frame with the use of only common tools. The power supply shall have overvoltage and overcurrent protection for D.C. plus voltages. The power supply shall be readily accessible.

All controllers shall be provided with frames fully wired for maximum expansibility capable of operating up to 8 phases.

The controller frame shall be furnished completely enclosed in a durable sheet aluminum (or approved alternate) housing, with a durable finish. The housing shall be designed to adequately dissipate the heat generated by the controller circuitry. The controller frame shall have the serial number permanently stamped, engraved or printed on the outside of the housing.

The design of the controller unit shall be such that electronic components are logically grouped and arranged on plug-in modules or printed circuit assemblies.

The printed circuit boards shall be constructed in accordance with TS 1-1982 Section 14.2.3. The identification of the component parts shall be etched or silk screened on the circuit boards.

The controller shall provide the proper intervals and interval sequences as required in the specifications and as shown on the plans. The controller shall be able to skip any traffic phase for which a vehicle or pedestrian call does not exist.

The controller shall provide for the setting of each interval, portion of interval or function by means of push-buttons. The controller shall be calibrated in seconds and tenths of seconds. Setting of timing and function values shall be accomplished without use of special tools or wiring changes.

There shall be provisions for position indication of all parameters. Display shall be self-evident to permit verification of stored information. Steps required to use push-button timing controls shall follow a natural sequence, misleading information shall not be displayed at any time. Controls shall be labeled and completely identified as to what their function and use is.

The interval and function controls shall be located on the front of the controller and shall be properly designated as to the function each control performs.

The required intervals, portions of intervals, and functions for each phase of operation shall be as listed in the table below:

<u>Required Functions</u>		
Interval (Function)	Minimum Range	Increment
Minimum (Initial)	0 sec. - 99 sec.	1 sec.
Extension (Passage)	0 sec. - 9.9 sec.	0.1 sec.
Maximum	0 sec. - 99 sec.	1 sec.
Maximum 2	0 sec. - 99 sec.	1 sec.
Yellow Clearance	0 sec. - 9.9 sec.	0.1 sec.
Red Clearance	0 sec. - 9.9 sec.	0.1 sec.
Walk	0 sec. - 99 sec.	1 sec.

Pedestrian Clearance	0 sec. - 99 sec.	1 sec.
Added Initial	0 sec. - 9.9 sec. per actuation	0.1 sec.
Maximum Initial	0 sec. - 99 sec.	1 sec.
Minimum Gap	0 sec. - 9.9 sec.	0.1 sec.
Time to Reduce	0 sec. - 99 sec.	1 sec.
Time Before Reduction	0 sec. - 99 sec.	1 sec.

In addition to the time settings and functions listed and the functions required in NEMA Standards TS 1 -1985 Section 14.3.2 the following functions shall be provided:

- (1.) Per phase response to NA 1 and NA 2 inputs.
- (2.) A per phase vehicle call.
- (3.) A per phase pedestrian call.

Functions and indications required on a per ring basis shall conform to NEMA Standards TS 1 -1983 Section 14.3.3.

Functions and indications required on a per unit basis shall conform to NEMA Standards TS 1-1983 Section 14.3.4. In addition, the following per unit functions shall be provided:

- (1.) Start-up Flash - An adjustable time period (0-99 secs) shall be provided for flashing operation prior to the initialization routine.

Upon activation of the input the controller shall service all waiting calls before proceeding to the flash entry phases. After servicing these phases, the controller shall begin flashing operation.

The priority of input functions shall be in the following order:

- |                       |                            |
|-----------------------|----------------------------|
| (1.) Power Up         | (7.) Remote Flash          |
| (2.) External Start   | (8.) Manual Control Enable |
| (3.) Phase Omit       | (9.) Ring Force Off        |
| (4.) Pedestrian Omit  | (10.) Phase Hold           |
| (5.) Interval Advance | (11.) Pedestrian Recycle   |
| (6.) Stop Time        |                            |

The controller unit displays shall be easy to read backlit LCD display with a front panel adjustment that operates within the temperature ranges of the NEMA Standards TS1-1983 Section 2.

The controller unit shall utilize multi-segment alpha/numeric characters for displaying programming information and controller timing.



The display shall be clearly readable in ambient light including the cabinet light or full sunlight from a distance of four feet at a 45 degree angle.

The display shall have two modes of operation. The first mode shall be a dynamic mode, it shall show the current timing interval and the time remaining in that interval. The second mode shall be a program mode, it shall show the interval and time/date programmed and/or being programmed.

The unit shall provide the ability to simultaneously display the variable and its value for all applicable entries, i.e., all eight phases of passage time. The following per phase indicators shall be provided:

- |                            |                                      |
|----------------------------|--------------------------------------|
| (1.) Phase on              | (5.) Phase Red, Yellow, Green, Walk, |
| (2.) Phase next            | and Don't Walk                       |
| (3.) Phase Vehicle Call    | (6.) Number of cars waiting ---      |
| (4.) Phase pedestrian call | (7.) Vehicle & pedestrian recall     |

Per ring function indications shall be provided as follows:

- |                  |                             |
|------------------|-----------------------------|
| (1.) Walk        | (10.) Red Clear             |
| (2.) Don't Walk  | (11.) Red Rest              |
| (3.) Min. Green  | (12.) Added Initial         |
| (4.) Passage     | (13.) Time Before Reduction |
| (5.) Max. Out    | (14.) Time to Reduce        |
| (6.) Gap Out     | (15.) Max 1                 |
| (7.) Force Off   | (16.) Max 2                 |
| (8.) Green Dwell | (17.) Green Dwell           |
| (9.) Yellow      | (18.) Stop Time             |
|                  | (19.) Hold                  |

In addition to the features required in NEMA Standards 1-1983, the following per phase features shall be provided:

- (1.) Cars before reduction
- (2.) Extended pedestrian clearance
- (3.) Actuated rest-in-walk
- (4.) Soft vehicle recall
- (5.) Selective phase omit
- (6.) Phase detector modifiers for stretch, delay and/or detector switching

The following per unit features shall be provided:

- (1.) Entry and exit phases for remote flash

- (2.) Exclusive pedestrian phase
- (3.) Remote selected sequence modifiers
- (4.) Timed trailing overlaps
- (5.) Provides print out and unit to unit transfer
- (6.) Up to 4 rings that provides capability to assign phases to ring 1 thru 4, define preferred sequences within each ring, and define which phases in other rings can operate concurrently with each phase

The controller unit shall contain a reserve data base of controller unit variables stored in Programmable Read Only Memory (PROM). It shall be possible for the operator to activate the reserve data base by loading it into memory through a simple procedure utilizing front panel controls only.

#### B.Coordination/Time Base Program:

Each controller unit shall be equipped with an internal program for coordination and time base control. The coordination shall also accept dial, split, and offset commands from hardware

interconnected systems. The coordination program shall provide sixteen timing plans each with new phase times, cycle lengths, and coordinated phases. Three offsets shall be provided for each timing plan. Coordination settings and activity shall be monitored by the controller unit display.

Offset transition shall be by one of three methods:

- (1) Shortway transition, or
- (2) Infinite dwell transition, or
- (3) Dwell with interrupt transition

The coordinator shall provide for selecting in each of the sixteen programs which phase(s) are to be coordinated. The coordinated phase(s) shall operate as non actuated in the coordinated mode. The controller shall monitor the sync pulse so that it will revert to free operation if:

- (1) No sync pulse is received for three consecutive cycles
- (2) No offset line is active for 15 seconds
- (3) More than one offset line is active for 15 seconds.

The coordinator shall be capable of manual front panel selection of dial-split-offset combinations. Manual selection shall override interface commands. Manual sync of the pattern shall be controlled through the front panel.

The coordinator shall be capable of free operation. During this mode, all coordinator control of the controller operation shall be removed. The coordinator shall recognize input requests that conflict with the internal coordination operation and automatically revert to free mode when the inputs are active. These remote inputs include stop time, manual control enable and preemption.

The internal coordinator shall provide techniques to guarantee that all unused time from the non-coord phase(s) in the background cycle shall be reallocated to the coord phase(s).

The coordinator shall provide for a controlled release (permissive period) to each of the non-coord phases in sequence. When a call is not present for the phase to be serviced next in sequence, the coordinator shall reallocate that phase's time to the end of the coord phase. The time, allocated to any actuated phase shall never exceed that programmed regardless of when it may appear in the background cycle because some other phase gaped out earlier than the limit set in the program.

Prior to the completion of the coord phase time and the beginning of the first permissive period, the coord phase pedestrian shall display the ped clear indication and dwell DON'T WALK until such time as the coord phase terminates and returns to green or the last permissive period in the cycle is complete without the coord phase terminating.

The user shall enter the coord phase(s), the phase times, and offsets. All timings shall be in seconds so there shall be no conversion from seconds to percent and vice versa. The cycle length, yield points, permissive periods, and force off points shall be calculated internally.

The coordinator shall provide an adjustable time for each phase for each of the sixteen programs. The phase time shall be adjustable from 10 to 250 seconds. For the coord phase(s) this shall become the minimum phase time and for the actuated phases it shall become the maximum phase times.

The coordinator shall provide for selecting in each of the sixteen timing programs secondary coord phase(s) in each ring. The secondary coord phases shall operate as non-actuated when coordinated. The secondary coord phases shall maintain a fixed position in the pattern cycle in relationship to the coord phase. It may begin early but shall not terminate later the allocated times would imply.

The coordinator shall provide for operation modifiers to be selected for each actuated phases in each of the sixteen timing programs. The five modifiers shall be:

- (1) Minimum Vehicle Recall
- (2) Maximum Vehicle Recall
- (3) Pedestrian Recall
- (4) Maximum Vehicle Recall and Pedestrian Recall
- (5) Phase Omit

The coordinator shall provide a means to select one of the alternate sequences or the standard sequence as a function of the pattern (Dial/Split/Offset) in effect. When the coordinator is running a pattern, the external interface inputs shall not override the pattern sequence.

The coordinator shall provide two types of permissive periods.

The permissive period shall control the time period during which the coordinator releases the co-ord phase(s), allowing the controller unit to begin servicing calls on the non coord phases.

The first type of permissive operation shall consist of a standard vehicle permissive. The length of the period shall be determined by the phase time and the minimum time (minimum time = minimum green or maximum initial + vehicle yellow + red clear).

The second type of permissive operation shall consist of a separate pedestrian permissive concurrent with the vehicle permissive. The length of this period shall be determined by the phase time and walk + ped clear + phase yellow + red clear.

When the controller unit yields during any permissive period, the coordinator shall allow the controller unit to service all the subsequent phase(s) in normal order before returning to the coord phase(s) and it shall not yield on subsequent permissive periods in the same cycle.

The internal Time Base Control shall be a special program operating within the controller unit. A minimum of 100 different Time Base Control events shall be capable of being programmed over a 99 year time frame on a Time-of-Day, Day-of-Week, and Month Day-of-Year basis. Time Base Control events shall be entered through the controller unit front panel or transferred from another like controller unit. Time Base Control settings and activity shall be monitored on the controller unit display.

The Time Base Control program shall output dial, split, and offset commands to the coordination program. It shall be possible to perform functions not necessarily traffic related within the Time Base Control program by programming and using the three auxiliary outputs.

The Time Base Control shall be provided with a line frequency driven clock and backed up by a battery supported crystal controlled clock. During normal operation, the line frequency driven clock shall control all timings and resynch the crystal controlled dock to the line frequency clock once per minute. When power is removed and reapplied, the crystal controlled clock shall provide the current time to the line frequency clock.

A battery backup voltage source shall be provided with the TBC circuitry. In the battery backup mode time shall be maintained to within  $\pm 0.005\%$  as compared to WWV time standard.

The Time Base Control shall provide for daylight savings time to be programmed to occur automatically as defined by law in most states, to occur automatically at any user selected date, or not to occur.

A program day shall be the list of traffic and/or auxiliary events to occur in a 24 hour period. The Time Base Control program shall provide for at least 99 program days to be defined.

It shall be possible to equate program days which may require the same event listing to effectively multiply the event capacity.

It shall be possible to copy an entire program day event listing to another program day to establish a data base for editing to create a similar but different program day event listing.

The exceptions to the normal day-of-week event listings shall utilize Time-of-Year Special program days. Part of the Time-of-Year Special program days shall be utilized for special

The Time Base events shall be implemented from a weekly schedule of program days on a day-of-week (except for special days) basis.

The Time-of-Year event structure shall provide a means of substituting nine alternate weekly schedules for the normal weekly schedule.

In addition to dial, split, and offset commands, the Time Base Control program shall provide the following as traffic events:

- a. Flashing (voltage monitor inactive)
- b. Free
- c. Maximum two timing by phase
- d. Phase omit by phase

Maximum two Timing by Phase and Phase Omit by Phase are Green Mode modifiers and shall not be part of an event which selects a pattern (Dial/Split/Offset) or Flash.

There shall be three auxiliary outputs available. Each output shall be non-cyclic, each totally independent of any other output. The outputs shall not be affected by any other input including the On-Line input. The auxiliary outputs may begin and/or end concurrently with another program.

The coordination programs shall be capable of being selected based on manual (keyboard) inputs, Time Base Control event, and interconnect inputs. Program select priority shall be:

- a. Manual Inputs
- b. TBC Events
- c. Interconnect Inputs

When the TBC On-Line input is active, the TBC events have no priority and program selection shall be based on manual inputs or interconnect inputs.

When the On-Line input active, the coordination routine reverts to TBC control based on sync monitor failure.

An automatic flash input shall cause vehicle and pedestrian calls to be placed on all phases. The controller unit shall assure the completion of the Minimum Green or Walk plus Ped Clearance time on the current phase(s) and shall proceed immediately, thereafter, to the vehicle clearance intervals followed by the phase(s) programmed as the Entry Phase(s). After the Entry Phase(s) Minimum Green or Walk plus Ped Clearance, the controller shall proceed to the vehicle clearance intervals. Upon completion of the vehicle Red Clearance interval, the controller unit shall initiate flashing operation (Voltage monitor output inactive). The controller unit shall maintain this condition -Voltage Monitor inactive and Red Dwell as long as the, Test A (Remote Flash) input is active.

When the input becomes inactive, the controller unit shall move immediately to the beginning of the phase(s) programmed as the Exit Phase(s), with a Green/Walk display, calls on all phase vehicle and pedestrian, and shall cease flashing operation (Voltage Monitor output active).

C. Preemption:

Internal Preemption shall be a special program operating within the controller unit. The preemption program shall accept commands from at least two preempt inputs and provide the timing and signal display programmed to occur response to each. The controller shall be able to cycle in each of the six preempts.

The preemption program shall recognize the current signal display at the time of preempt and shall provide transition timing and signal display to the programmed preempt condition. Two preempt conditions with an intermediate set of clearances shall be capable of being programmed (i.e., Track Clear and Dwell). Once the preempt dwell has been satisfied, the preemption program shall provide an exit transition timing and signal display to the programmed return-to normal condition.

Preemption parameters shall be entered through the controller unit keyboard or transferred from another like controller unit.

Preemption settings and activity shall be capable of being monitored on the controller unit display. Preemption program shall provide 13 timing intervals for each preempt routine and one timing interval for each ring in the controller unit. The timing intervals and range shall be:

Interval	Range
I. Min Grn/Wlk - Ring 1	0 to 99 see
II. Min Grn/Wlk - Ring 2	0 to 99 see

The minimum timing intervals per preempt routine shall be as follows:

Interval	Range
A. Delay Before Preemption	0 to 999 see
B. Preempt Duration	0 to 999 see

1. Selective Ped Clear	0 to 99 see
2. Selective Yel Clear	0 to 9.9 see
3. Selective Red	0 to 9.9 see
4. Track Clear	0 to 99 see
5. Track Ped Clear	0 to 99 see
6. Track Yellow Clear	0 to 9.9 see
7. Track Red Clear	0 to 9.9 see
8. Dwell (Hold)	0 to 99 see
9. Return Ped Clear	0 to 99 see
10. Return Yellow Clear	0 to 9.9 see
11. Return Red Clear	0 to 9.9 see

**\*\* Exit Phase (Return-to-Normal Display)**

The preemption program, shall provide the signal display for an orderly and safe transition from the point of entry to the first preempt green state (Track Green), from the first to second green state (Track Green to Dwell), and from the second green to the return-to-normal green state (Dwell to Normal).

The controller unit shall be provided with a resident series of diagnostic capabilities describing its own internal state. It shall not require internal access or changes to the controller unit to initiate diagnostic programs.

The controller unit shall perform diagnostics enabling operator verification of proper operation.

The "automatic" diagnostics shall be performed without an operator request. The diagnostics evaluation shall be displayed on the controller unit front panel display.

The controller unit shall contain provisions to monitor the operation of the microprocessor.

The monitor shall receive signals at least once every 100 milliseconds from the microprocessor. When the signal has not received for 200 milliseconds +/- 20%, the processor monitor shall initiate flashing operation (Voltage Monitor output inactive).

When flashing is initiated as a result of the processor monitor, it shall illuminate a front panel indication labeled "Watchdog". The monitor shall be deactivated when there is a power failure and shall become active when power is restored.

The monitor shall attempt an automatic restart of the microprocessor to the power up Start Flash timing condition. The controller unit shall operate as though power had been removed long enough for a full restart and reapplied. The front panel Watchdog indicator shall remain illuminated until the controller unit front panel has been manually addressed.

The controller unit shall perform diagnostics enabling operator verification of properly

operating inputs, outputs, keyboard, and display. The "operator initiated" diagnostics shall be performed only after an operator request through the controller unit front panel.

For all input and output functions (standard & special), the controller shall simultaneously display the state of all functions of a given category so that conditions such as a missed wire or crosstalk errors may be instantaneously demonstrated

Each cabinet shall be provided with 3M's model 262 phase selector to achieve emergency vehicle preemption. A quantity of 2 - 262 phase selector shall be provided with each four through eight phase cabinet assembly. Only 1 - 262 phase selector shall be required for a two phase cabinet assembly.

D. Alarm Monitoring:

The controller shall monitor and maintain internal logs of the following conditions, as a minimum, including the date and time of occurrence. These logs shall be displayable on the controller unit, printable via the RS232 port and transmitted to an on-street master or personal computer. As a minimum the following event change of status shall be logged:

Cycle Fault	Voltage Monitor	Preempt
Power On/Off	Conflict Flash	Local Free
Coord Failure	Special Status	Local Flash
Cycle Failure	Remote Flash	Coord Fault

A minimum of the last 40 events shall be maintained in the controller unit.

E. System Detectors:

The controller shall have the ability to receive input data from up to eight special (system) detectors in addition to the normal actuated controller unit phase detectors. The user shall have the option to assign any of the phase detectors as 'system detectors'.

The controller shall process all system detector data, consisting of volume and occupancy, and shall be capable of transmitting the results of this processing to eight the on-street master or computer (local or remote). As a minimum, the following parameters shall be determined per system detector:

--raw volume count	--raw occupancy percent
--average volume percent	--average occupancy percent

The controller shall generate a System Detector Report based on an operator determined logging interval and sample period. The report shall include raw volume and occupancy along with averaged volume and occupancy percent for the sample period. This report shall have the capacity to store up to six sample periods. A sample period data set shall remain



until the report capacity is exceeded at which time the oldest sample period data set shall be replaced by the new data set.

Each detector, both phase and special system, shall be tested by a diagnostics routine for conformance to specified parameters. The detector diagnostics shall monitor activity on each detector for constant calls, absence of calls, and erratic output. These parameters shall be user programmable.

Detectors which have failed the diagnostics and those subsequently operating within diagnostic parameters shall be automatically logged in a Detector Failure Report, including date and time of occurrence. This report shall have the capacity to store up to 20 diagnostic events and the event shall remain until the report capacity is exceeded at which time the oldest event shall be deleted and the new event added.

F. Measures of Effectiveness:

Measures of effectiveness (MOE's) shall be accumulated and reported to enable the evaluation of coordination pattern parameters based on actual data collected during the time periods the

Volume shall represent the average number of actuations during the sequence cycle, for each phase, over the duration of the pattern.

The Stops measurement shall represent the average number of vehicles which must stop at an intersection during the cycle, for each phase, over the duration of the pattern.

Delay shall represent the average time, in seconds, that vehicles are stopped during the sequence cycle, for each phase, over the duration of the pattern.

The Utilization measurement shall represent the average seconds of Green time used by each phase during the sequence cycle for the duration of the pattern.

A MOE Report shall be provided to report the above calculated parameters. This report shall have the capacity to store up to 12 patterns of MOE's and shall be displayed, printed and transmitted in the same manner as the Alarm Log.

The controller shall provide speed monitoring capability in the form of a Speed Trap function. The controller unit shall provide for up to two independent Speed Traps with operator selectable detector spacing of either 11 or 22 feet, dependent upon the application.

Provision shall be made in the controller to monitor the speed in MPH or ICPH. A nominal speed range shall be settable for each pattern, with the percent of vehicles higher, within and lower than this nominal speed range logged for reporting.

A Speed Report shall be provided and shall have the capacity to store up to 12 patterns of Speed data. The pattern Speed data shall remain until the report capacity is exceeded at which time the oldest pattern Speed data shall be deleted and the new added.

The controller shall provide a Communications Report, when used with an on street master, which will allow the user to view a list of communications failures along with date and time of occurrence. This report shall have a minimum capacity of 20 events (faults). The fault event, including date and time of occurrence, shall remain until the report capacity is exceeded at which time the oldest fault shall be deleted and the new fault event added. This report shall be displayed, printed and transmitted in the same manner as the Alarm Log.

Indication shall be provided on the front panel of the controller unit to denote when a carrier signal is being received, valid data is being received and when the unit is transmitting.

The controller shall be Eagle Signal Corporation's Model EPAC300 series.

G. Load Switches and Flashers:

The controller and cabinet assembly shall be provided with the number of external load switches required to provide the sequence called for on the plans.

The load switch sockets shall be wired for triple-signal load switches conforming to Section 5 of NEMA Standards Publication Number TS -1983. All load switch driver outputs coming out of the controller unit shall be on separate terminal points from the respective inputs to the load switches. These separate points shall be bussed for normal operation. All load switch outputs which may be programmed for flashing or programmed for monitor connection shall be on separate terminal points from the respective inputs to the flash transfer relays or monitor inputs. These separate points shall be bussed for normal operation.

The flasher socket shall be wired for a type 3 solid state flasher conforming to Section 8 of NEMA Standards Publication Number TS 1-1983. Flashing of main street load switch output indications shall be placed on one circuit and flashing for minor street load switch output indications shall be placed on the other circuit. It shall be possible to easily change the flash indication from the front side of the panel using simple tools without the need to unsolder or resolder connections.

Load switch and flasher bases shall be so designed and constructed as to receive all such devices which may be manufactured to the maximum size requirements permitted under the NEMA Standard Publication Number TS 1-1983.

All support(s) shall be provided so that, as a minimum, it is supporting the flasher and load switch of the maximum size at the point(s) between three inches and seven inches from the panel surface.

At least 90% of the area beneath the load switch or flasher shall be open to allow for free flow of air across the, load switches or flasher. There shall be no obstruction within one inch above or below the units within the open area.

H. Conflict Monitor:

A Processor Based Conflict Monitor shall be supplied and meet the following specifications:

The controller assembly shall be provided with a conflict monitor which shall cause the signals to go into flashing operation should a conflict in signal indications be sensed. The stop time input shall be applied to the controller whenever the monitor causes the signals to go into flash. The conflict monitor shall conform to NEMA Standards TS 1-1983 Part 6. The conflict monitor provided shall contain the number of input channels necessary to monitor the maximum number of load switches possible in the controller cabinet terminal facilities.

**Items 12 and 12a:**

Item 12 - Pole and Item 12a - Base Mounted Cabinets for Control Equipment:

Basic Construction - the controller and all associated equipment shall be provided in a weatherproof metal cabinet of clean-cut design and appearance. All exposed edges shall be free of burns and pit marks.

The cabinets shall be welded steel or aluminum construction meeting the requirements of Subsection 907-722.25. The cabinet shall have a smooth natural finish. Handles and locks shall be rust proof.

Welds - All welds shall be neatly formed and free of cracks, blow holes, and other irregularities. All welds shall be made by the Heliarc welding method. Welds on the exterior faces of the cabinet shall be reduced to a minimum.

All cabinets shall be provided with a hinged, rain tight and dust tight main door which shall encompass at least 80 percent of the full area of the cabinet front. The main cabinet door shall have a number two Corbin lock. Two keys shall be supplied with each cabinet and shall be securely attached to the outside of the cabinet when delivered. A neoprene gasket shall be used to seal the main cabinet door. Hinges shall be made of 14 gauge stainless steel. All cabinets shall be furnished with at least two position door stops which shall hold the main door open at approximately 90 and 180 degrees. The door stops shall be designed to lock into position and withstand the force of a 30 MPH wind. A three-point locking system shall be required and shall consist of the following security points:

- (a) Center of cabinet (lock);
- (b) Top of cabinet (operated by door handle); and
- (c) Bottom of cabinet (operated by door handle).

Security points (b) and (c) shall be designed so that they will remain in the locked position until the main cabinet lock is unlocked. Door handle operation shall be such that the handle is vertical when in the locking position, and the opening motion shall swing the handle away from the location where the key is inserted. The handle shall be capable of being padlocked to prevent opening when padlocked.

A small hinged, and gasketed "door-in-door" or "police door" shall be included on the outside of the main controller door. The auxiliary door shall not allow access to the controller, its associated equipment, or exposed electrical terminals, but shall allow access to a small "Police" panel. The police door shall encompass the full area of the police panel. The police door shall be equipped with a lock whose key will not unlock the main door. Two keys shall be furnished for each lock and shall be securely attached to the outside of the cabinet when delivered. The police door shall be located in the top half of the main door. The police panel may be either of cast aluminum or sheet aluminum. The police panel shall contain a flash switch- when in the ON position, the intersection shall flash as shown on the plans. AC. power shall be removed from the load switches. Stop timing shall be applied to the controller. Each cabinet shall contain at least two adjustable shelves to accommodate mounting of the controller and all included auxiliary equipment. The shelves shall permit the controller and/or auxiliary equipment to be withdrawn from the cabinet for inspection or maintenance without breaking any electrical connections or interrupting operation of the controller. The range of adjustability shall be the full height of the cabinet in maximum increments of two inches.

Screws used for mounting shelves or adjustable shelf mounts shall not protrude beyond the outside wall of the cabinet.

The manufacturer's name shall not appear on the outside of the cabinet, but shall appear on the inside of the cabinet door, with the year and month of manufacture. This can be done by a plate welded to the door, or by a moisture resistant label (or other approved methods).

The cabinet shall be of adequate dimensions to properly house the controller, a coordinating unit if required, and all required appurtenances and auxiliary equipment intended to be contained therein: all in an upright position, with a clearance of at least three inches from the vent fan and filter, to allow for proper air flow. In no case shall more than 70 percent of the cabinet space be used. There shall be at least two inches of clearance on each side of the shelf between the equipment and side walls of the cabinet.

The base mounted cabinets shall be arranged and equipped for base mounting on a concrete foundation. An anchor bolt template, galvanized anchor bolts, nuts, and hardware as required for base mounting shall be furnished with each cabinet. The Contractor shall caulk around the base of the cabinet and foundation to seal the cabinet and prevent moisture and dirt from entering the cabinet.

The cabinet shall contain suitably designed, rain-tight vents on the door of the cabinet. Vents shall allow the release of excessive heat and/or any explosive gases which might enter the cabinet. Vents shall have adequate opening area to permit the proper flow of air drawn by the vent fan. The intake vent shall be designed so that no water shall be drawn into the cabinet.

The intake and exhaust vents shall be located such as to provide for maximum passage of air around and over the equipment contained therein. A removable dust filter shall be mounted

on the inside of the main door completely covering the intake vent. The cabinet air filter shall be of the throwaway type and its minimum area shall be 250 square inches. The filter shall be installed, positioned and firmly held in place so that all intake air is filtered with no bypassing permitted through cracks, clearance spaces or gaps. Positive retainment shall be provided on all sides to prevent warpage of the filter and prevent the entry of foreign matter around the edges. All cabinets shall have a thermostat controlled exhaust fan located at the top of the cabinet. The exhaust fan shall have a minimum rating of 100 Q.F.M. The fan shall be rated for continuous duty and a lifetime of at least three years. A standard fuse of sufficient rating shall be used to protect against surges and short circuits. The thermostat controlling the exhaust fan shall be manually adjustable to turn on between 90oF and 150oF with a differential of not more than 10°F between automatic turn-on and turnoff. Service switches shall be required for all cabinets. Toggle Switches-The following toggle switches shall be provided in the cabinet:

A three-position run-remote-stop time switch-This switch can be used to put the controller in stop time manually or by remote input.

2. Flash switch-When in the ON position, the intersection shall flash as stipulated on the plans. A.C. power shall be removed from only the load switches.
3. Controller ON-OFF Switch-when in the OFF position, A.C. power shall be removed from all circuits of the controller assembly and the intersection shall go to flashing operation.
4. A detector test push-button switch for each vehicle and pedestrian detector circuit shall be provided in a panel on the inside of the front door. The switch and wiring shall place an actuation for the respective vehicle or pedestrian phase when pushed. The switch(es) shall be labeled "Call Switch" and the phase # as well as whether it is vehicle or pedestrian.
5. Signal-head power switch- when in the OFF position all power to the signal heads shall be removed.

A three wire 115 VAC duplex receptacle shall be mounted and wired in the cabinet. The receptacle shall have a 15 ampere circuit breaker and shall remain in service even when the power switch is turned off. All cabinets shall be provided with a minimum of a 20 watt fluorescent fixture with bulb mounted in the top of the cabinet. A toggle switch shall be provided to turn the light on and off.

The wiring in the cabinets shall conform to applicable requirements of the National Electrical Code (NEC), NEMA and all of the specifications, contained herein. All wiring shall be neat and firm. Wires shall be neatly laced into cables with nylon lacing or nylon tie wraps. Cables shall be secured with nylon cable clamps.

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

be easily traceable and without entanglement. All terminal strips and load switches for field wiring shall be exposed for test purposes or maintenance without removal of the controller or its related equipment. MS connectors and wiring harness for the controller unit, conflict monitor and external logic units shall be furnished and wired into the cabinet. All conductors which are subject to flexing during the opening of cabinet doors, or the removal of equipment shall be stranded with a minimum of 19 strands. All conductors used in the controller cabinet shall be #22 AWG or larger, and shall conform at least to Military Specification: MIL-W-16878D, Type B or D, Vinyl-Nylon jacket, 600 volt, @ 105°C. Conductors used in controller cabinets shall conform to the following color codes: AC- neutral = white; AC+ line = black; Safety Ground

= white with green stripe. Safety ground is to be electrically isolated from AC- neutral, All wires shall be proper length before assembly. No wire shall be doubled back-to take up excessive length. The wire and insulation shall be adequate to handle the current and voltage in the cabinet. The harnesses shall be neatly arranged and provided with the flexibility for the connectors to reach at least 40 inches from the top of the terminal block panel.

Cabinets for four-phase controllers shall be wired and shall have the necessary logic to provide two vehicle overlaps with capability of being assigned some combination of phases at a future date by the simple addition of wire jumpers.

Electrical connections from the controller and auxiliary devices to outgoing and incoming circuit shall be made in such a manner that the controller and/or auxiliary devices can be replaced with a similar unit, without the necessity of disconnecting and reconnecting the individual wires leading therefrom. The shall be accomplished by means of MS connectors and other approved NEMA standard connectors using the NEMA standard pin assignments.

Terminals shall be provided, as a minimum, for the following:

- (a) Terminal with circuit breaker with an internal power line switch for the incoming power line;
- (b) Terminal, unfused, for the neutral side of the incoming power line;
- (c) Terminals and bases for signal load switches and outgoing signal field circuits;
- (d) Terminals and bases for signal flasher and outgoing signal field circuits;
- (e) Terminals for detector lead-in wires;
- (f) Terminals for all required auxiliary equipment;
- (g) Terminals for interconnect cable;
- (h) Terminals for future preemption input lines; and

- (I) Terminals, for installation of incoming and outgoing multipair voice grade telephone lines.

Adequate electrical clearance shall be provided between terminal strips. The controller and auxiliary equipment, panel(s), terminals and other accessories shall be so arranged within the cabinet that they will facilitate the entrance and connection of incoming conductors.

Soldering of conductors to terminal lugs may be omitted provided a calibrated ratchet-type crimping tool is used.

All input and output circuit connections to the controller unit, conflict monitor, external logic units, load switches, loop detectors, coordination units, and all other auxiliary equipment shall be made by the use of terminal strips.

Terminal strips shall be provided for connecting the field wires to the output of the load

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

A copper ground bussbar shall be mounted on the back or side of the cabinet wall for the connection of A.C neutral wires and chassis ground wires. It shall be securely fastened to the cabinet. If more than one ground bussbar is used in a cabinet, a minimum of a No. 10 AWG copper wire shall be used to interconnect them. Each bussbar shall have at least two positions where a No. 6 AWG stranded copper wire can be attached.

All cabinets shall be furnished with a minimum of two circuit breakers (a minimum of 30 amperes. One circuit breaker shall control the dual outlet and the service lamp. The other circuit breaker shall control all other electrical connections.

Each cabinet shall be provided with surge protection as follows:

1. AC service input shall be protected by an EDCO SHP300-10 unit capable of withstanding at least 20 surges of at least 20,000 amperes each 8, X 20 n. second wave form. The unit shall have at least three fictive clamping stages and have internal follow current limiters. The unit must self-extinguish within 8.5 milliseconds after the trailing edge of the surge. The parallel impedance of , the limiters shall be less than 0.15 ohms. The peak clamp voltage shall be 350 volts at 20 KA.
2. Each detector input line from a remote detector cabinet or pedestrian push-button shall be protected by an EDCO SRA16C 1 two stage hybrid device capable of withstanding a minimum of 30 surges of at least 5,000 amperes each applied to the input.

The device shall have one input lead, one output lead, and a ground lug in ' order for the signal wire to "pass through" the protector. The voltage across the output must be

held to 30 volts when the input is subject to a 2,000 ampere, 10:20 microsecond surge. The unit must not interfere with the normal operation of the signal equipment, and must respond in less than 20 nanoseconds.

3. The interconnect lines and signal loads shall be protected by an EDCO SRA60B unit capable of withstanding a 10 KA, 8 x 20 nanosecond surge five times without damage. The response time of the unit shall be less than 50 nanoseconds. The maximum clamping voltage shall be no greater than 400 volts at one MA. The units must be individually packaged for interconnect line protection and in a package of three for the signal loads.
4. The external data communications pair shall be protected at the cabinet entry point by a two stage series of hybrid device capable of withstanding a peak surge of 4,000 amps, 8 x 20 microsecond wave form. The device shall have a minimum life of 50 surges at 4000 amps with a response time of less than 20 nanoseconds. The maximum clamping voltages shall be 200V on the incoming telephone line and 15V on the incoming multi-pair voice grade interconnect line.

A radio interference suppressor shall be provided in a series with A.C. power before it is distributed to any equipment inside the cabinet. The filter shall provide a minimum attenuation of 40 decibels, and a frequency range of 200 kilohertz to 60 megahertz. It shall be hermetically sealed in a metal case. The filter shall have the same minimum circuit rating as the main circuit breaker and shall meet the standards of the Underwriter's Laboratories, Incorporated and Electronic Industries Association.

The manufacturer shall provide cabinet noise suppression as required by the particular controller. The thermostat contact and vent fan shall be properly suppressed.

Each cabinet shall be furnished with three copies of the cabinet wiring diagram and field wiring diagram. These prints shall be full size and completely legible. Where possible, diagrams shall be to a scale picture image of the cabinet layout. Diagrams shall show the complete wiring of all cabinet components, an switches, terminal board connections, flash transfer relays, lightning arrestors, surge protectors, load switch panels, terminals, and any other control functions. Each item shall be clearly identified as to its function.

All components in the cabinet shall be located according to their function and in such manner that they may easily be found on the wiring diagram. Field wiring and cabinet wiring diagrams shall be designated on the diagrams using the traffic movement designations as shown on the plans. Association of phase numbers with their designated traffic movement shall be clearly indicated on the wiring diagram.

A clear plastic pouch approximately shall be provided for each controller. The pouch shall not be mounted inside the controller cabinet, but shall be loose for placement inside the controller cabinet.



The supplier and/or manufacturer shall be required to provide the appropriate City of Vicksburg personnel with the support necessary to achieve properly operating units. This support shall include:

- A. Supplying complete wiring diagrams and other documentation necessary for City personnel to correctly connect field wiring.
- B. Supplying the appropriate City of Vicksburg personnel with a procedure for shop testing each controller assembly.
- C. Provide appropriate City of Vicksburg personnel with a checklist for proper connection of field wiring and cabinet preparation before turn-on.
- D. Provide, if required, a technician to travel to the City of Vicksburg to be present to assure that the controller assemblies are operating properly and/or to assist the City of Vicksburg personnel in trouble shooting problem intersections.
- E. Training shall include, but not be limited to, the following topics:
  - 1. Testing and Installation  
Recommended procedures for testing prior to installation, cabinet preparation and installation of the controller assembly into an operating environment.
  - 2. Programming and Operations  
Orient the staff to the specific operational features of the controller assembly. Topics shall include controller outputs and displays, controller timing and function programming, and controller/coordinator operations options.
  - 3. On-Street Maintenance  
Basic street level trouble shooting and maintenance procedures shall be covered in detail. Emphasis shall be placed on procedures required to troubleshoot problems and in bringing a failed or faulty intersection back into safe operation in as short a time as possible. Preventative maintenance shall be addressed.
  - 4. Bench-Level Maintenance  
To acquaint maintenance personnel with circuit theory and bench-level maintenance procedures to make basic equipment repairs.
  - 5. Training Time  
Total training time shall be not less than forty (40) hours.

**Items 13 through 33:**

Items 13 through 33 are replacement parts which will be used for the maintenance of the traffic controllers and, as such, must be the item (manufacturer and model) listed or a substituted item equal to the listed item both in fit and function.

Light Emitting Diode (LED) Traffic Signal- 12" specification- for span wire mounted signals  
The external lens shall be smooth on the outside to prevent excessive dirt/dust buildup. The LED retrofit replacement shall not require the removal of the reflector and socket; shall be weather tight and fit securely in the housing.

Red and Green LED indications shall exceed minimum ITE LED luminosity values and meet the minimum luminous intensity values per the attached Table 1, Specifications for Span wire Mounted Signals. Yellow LED indications shall meet the minimum luminous intensity values per the attached Table 1, Specifications for Span wire Mounted Signals. Supply independent lab test results showing the LED indications Satisfy ITE - Chapter 2a, VTCHS Part 2: Light Emitting Diode (LED) Vehicle Signal Modules, and attached Table 1,

Specifications for Span wire Mounted Signals.. Initial intensity of the LED ball indications shall meet or exceed 120% of the values in Table 1, Specifications for Span wire Mounted Signals. The increased intensity shall be demonstrated on the independent lab reports. No optical lens shall be used in order to meet these visibility requirements.. Photometric, luminous intensity and color measurements for yellow LED signal modules shall be taken immediately after the modules are energized. The measured chromaticity coordinates of LED signal modules shall conform to the chromaticity requirements of Section 8.04 and Figure 1 of the VTCHS standard.. The LED arrow modules shall have a full, filled profile, without the individual LED's being visible.. The arrows shall meet all applicable ITE specifications, and Caltrans specifications on light intensity

The individual LED light sources shall be wired so that a catastrophic failure of one LED light source will result in the loss of only that one LED light source, and the loss of no more than 1% of the total LED's with the LED signal module.. The power supply must current regulated.. Independent laboratory reports from Intertek Testing Services ETL Semko shall be supplied to verify modules meet the above requirements.

## **Item 34 A and B**

### **Bulldog III**

- A. Operating Modes- Momentary and Latching LED
  - Backward Compatible - Full compatibility with BDLM2 series products
  - Operating Temperature Range -34 C to +74 C (-30 F to +165 F)
  - Operating Voltage Range - 12-36 VDC, 9-25 VAC RMS (18 VDC Typical)
  - Operating Force - 2.0 lbs Maximum
  - MTBF - 8,800,000 hours Typical
  - Switch Operating Life - Greater than 300 Million Operations
  - "Off" Current \_ 15 microamperes Typical
  - "On" Resistance - 85 ohms Typical (Momentary)
  - Maximum "On" Current - 250 milliamperes (over current protection) Typical
  - Maximum "On" Time - 240 milliseconds Typical
  - Maximum "On" Time - 11 seconds Typical
  - Debounce Time - 85 milliseconds Typical
  - Luminous Intensity - 0.3 Lux @ 1 meter Minimum (Red)

Viewing Angle - 155 Typical  
LED Flash  
Beeper Volume - 68 dB @ 1 meter Typical  
Beeper Tones - Press - 2.6 kHz, Release 2.3 kHz 50 milliseconds Typical  
Push Button  
Yellow or Black  
Five (5) year warranty

#### **B. Housing for Bulldog III Pushbutton**

Yellow or Black  
Five (5) year Warranty

### **Items 35, A-E**

#### **A. Sensys Access Point Controller Card (APCC)( 5 yr warranty)**

**Interfaces:** Communicates with traffic controller via 2x22 pin edge connector to backplane  
(2) RS-422 full duplex to APCC radio(s) via RJ45 connector  
(2) USB 2.0 full speed  
RS-485 full duplex to EX cards via RJ45 connector  
10/100 Base T network access via RJ45 connector  
To/from configuration device (PC) via TCP/IP over 10/100 Base T Ethernet  
To/from central network management / data collection facilities via TCP/IP  
10/100 Base T Ethernet  
Cellular data modem

**IP connectivity:** HTTP, PPP, PPTP, SSH, optional encryption over tunnel  
10/100 Base T via RJ45 connector  
GSM GPRS connectivity (optional), dual band 900/1900 MHz GSM  
(Int'l version ) up to 153.6 kbps  
CDMA200 1xRTT connectivity (optional), dual band 800/1900 MHz CDMA  
(per specific cellular service provider) up to 15.6 kbps

**Per-Lane Data Processing:** Counts (volume)  
Occupancy  
Average and median speeds  
Binned speeds and vehicle lengths over selectable time intervals

**Per-Vehicle Data Processing:** Initial vehicle detect time

Gap

Speed

Length

**Memory Processor:** 400 MHz ARM9 processor

Linux 2.6 operating system

1 GB Flash

64 MB RAM

**Over the air Protocol:** Sensys Networks NanoPower (SNP) protocol (TDMA)

**Physical Layer Protocol:** IEEE 802.15.4 PHY

**Modulation:** Direct Sequence Spread Spectrum Offset Quadrature Phase-Shift Keying (DSSS O-QPSK)

**Transmit Receive Bit Rate:** 250 kbps

**Frequency Band:** 2400 to 2483.5 MHz (ISM unlicensed band)

**Frequency Channels:** Up to 16

**Channel Bandwidth:** Up to 2 MHz

**Antenna Type:** Microstrip patch antenna (behind front face panel)

**Antenna Field of View:** +60 degree (azimuth and elevation)

**Nominal Output Power:** 0 dBm

**Spurious Emissions:** \* 30-1000 MHz < -36 dBm

\* 1-12.75 GHz < -30 dBm

\* 1.8-1.9 GHz < -44 dBm

\* 5.15-5.3 GHz < -47 dBm

**Typical Receive Sensitivity:** -101 dBm (PER < 1%)

**Saturation (max input level):** > 10 dBm

**B. Sensys VSN240 Wireless Sensors:** (5 year warranty)

**Detection technique :** 3-axis magnetic field sensing

**Sampling Rate:** 128Hz

**Programmable Vehicle Detection Parameters:**

Z-axis detect threshold  
Z-axis undetect threshold  
X-axis undetect threshold  
Onset filter (MS)  
Holdover (MS)  
Auto-recalibration timeout (seconds)

**Over the Air Protocol:** Sensys NanoPower (SNP) protocol (TDMA)

**Physical Layer Protocol:** IEEE 802.15.4 PHY

**Modulation:**

Direct Sequence Spread Spectrum Offset  
Quadrature Phase Shift Keying (DSSS O-QPSK)

**Transmit / Receive Bit Rate:** 250 kbps

**Frequency Band:** 2400 to 2483.5 MHz (ISM unlicensed band)

**Channel Bandwidth:** 2 MHz

**Frequency Channels:** 16

**Antenna Type:** microstrip patch antenna

**Antenna Field of View:** 60 (azimuth & elevation)

**Nominal Output Power:** 0 dBm

**Spurious Emissions:**

30-1000 MHz: <-56 dBm  
1-12.75 Ghz: <-44 dBm  
1.8-1.9 Ghz: <-56 dBm  
5.15-5.3 Ghz: <-51 dBm

**Typical Receive Sensitivity:** -95 dBm (PER=1%)

**Saturation** (max input level): >10 dBm

## **C: Sensys RP240B-LL Repeater (5 year warranty)**

### **Interfaces:**

- To/from sensors via 802.15.4 PHY radio
- To/from another repeater via 802.15.4 PHY radio
- To/from access point via 802.15.4 PHY radio

**Over the air Protocol:** Sensys NanoPower (SNP) protocol (TDMA)

**Physical Layer Protocol:** IEEE 802.15.4 PHY

**Modulation:** Direct Sequence Spread Spectrum Offset Quadrature Phase Shift Keying

**Transmit Receive Bit Rate:** 250 kbps

**Frequency Band:** 2400 to 2483.5 MHz (ISM unlicensed band)

**Frequency Channels:** 16

**Channel Bandwidth:** 2 MHz

**Antenna Type:** Microstrip patch antenna (behind front face panel)

**Antenna Field of View:** +60 (azimuth & elevation)

**Nominal Output Power:** 0 dBm

### **Spurious Emissions:**

- 30-1000 MHz <-56 dBm
- 1-12.75 Ghz <-44 dBm
- 1.8-1.9 Ghz <-56 dBm
- 5.15-5.3 Ghz <-51 dBm

**Typical Receive Sensitivity:** -95 dBm (PER = 1%)

**Saturation (max input level):** >10 dBm

## **D. Sensys CC & EX Contact Closure Cards**

### **Interfaces:**

- To/from traffic controller via 2x22 pin edge card connector
- To/from access point via Sensy Access Box
- connections
  - \* IN post of CC card to CC post of Access Box
  - \* Access port of Access Box to access point
- detection data via RS485 serial comms
- power (48 VDC nominal)
- To/from other Sensys contact closure cards
- daisy chaining from OUT post of CC or Ex card to IN port of EX card
- daisy chaining via hardwired backplane connections
- To/from configuration device (PC) via TCP/IP over 10 base T Ethernet

### **TS2 Status Reporting:**

- All sensors active on channel
- status relay: closed (continuous Low or On state)
- TS2 state=1 (normal)
- No sensors active on channel (no data rec'd in last 60s)
- status relay: open (continuous High or Off state)
- TS2 state=2 (failure)
- No all sensors active on channel
- status relay: pulse modulation with 150 ms Off time
- TS2 state=5 (excessive inductance change)

## **E. Sensys AP240 Access Points**

### **Interfaces:**

- Communicates with traffic controller via 2x22 pin edge connector to backplane
- (2) RS-422 full duplex to APCC radio(s) via RJ45 connector
- (2) USB 2.0 full speed
- RS-485 full duplex to EX cards via RJ45 connector
- 10/100 base-t network access via RJ45 connector
- To/from configuration device (PC) via TCP/IP over 10/100 base-t ethernet
- To/from central network management / data collection facilities via TCP/IP
- 10/100 base-t ethernet
- cellular data modem

### **IP Connectivity:**

- HTTP, PPP, PPTP, SSH, optional encryption over tunnel
- 10/100 base-t via RJ45 connector
- GSM GPRS connectivity (optional)

- dual-band 900/1800 MHz Gsm (N. American version)
- up to 85.6 kbps
- CDMA2000 1xRTT connectivity (optional)
- dual-band 800/1900 MHz CDMA (per specific cellular service provider)
- up to 153.6 kbps

**Per-Lane Data Processing**

- Counts (volume)
- Occupancy
- Average and median speeds
- Binned speeds and vehicle lengths over selectable time intervals

**Per-Vehicle Data Processing**

- Initial vehicle detect time
- Gap
- Speed
- Length

**Memory Processor**

- 400 MHz ARM9 processor
- Linux 2.6 operating system
- 1 GB Flash
- 64 MB RAM

**Over the Air Protocol**

- Sensys Networks NanoPower (SNP) protocol (TDMA)

**Physical Layer Protocol**

- IEEE 802.15.4 PHY

**Modulation**

- Direct Sequence Spread Spectrum Offset Quadrature Phase-Shift Keying (DSSS O-QPSK)

**Transmit / Receive Bit Rate**

- 250 kbps

**Frequency Band**

- 2400 to 2483.5 MHz (ISM unlicensed band)

**Frequency Channels**

- Up to 16

**Channel Bandwidth**

- Up to 2 MHz



**Antenna Type**

Microstrip patch antenna (behind front face panel)

**Antenna Field of View**

+60 (azimuth & elevation)

**Nominal Output Power**

0 dBm

**Spurious Emissions**

30-1000 MHz: <-36dBm

1-12.75 Ghz: <-30dBm

1.8-1.9 Ghz: <-44dBm

5.15-5.3 Ghz: <-47dBm

**Typical Receive Sensitivity**

-101 dBm (PER< 1%)

**Saturation (max input level)**

>10 dBm

**36. GT1-LED Countdown Pedestrian Signal ( 5 years warranty)****Operating Temperature Range**

-40 to +74 C (-40 to +165 F)

**Operating Voltage Range**

80 to 135 V (60Hz AC)

**Power Factor (PF)**

>90%

**Total Harmonic Distortion (THD)**

<20%

**Voltage Turn-Off (VTO)**

35V

**Start up Time**

<75msec

**Lens & Shell Material**

UV Stabilized Polycarbonate

**Wiring**

16 AWG, Color Coded with Strain Relief

**LED Color**

Hand: Portland Orange

Person: Lunar White

**Default Mode**

Hand Only

### Terms and Conditions

This bid request is for a supply period of twelve months from date of award. All items will be ordered on an as needed basis during the life of the contract.

All items shall be delivered FOB the Purchasing Department, 1415 Walnut St, Vicksburg, MS 39180.

All bid prices shall be net, FOB destination, with transportation charges prepaid by the vendor.

The specifications, as stated, are minimum requirements and may be exceeded by the bidder. However, no additional consideration shall be given for exceeding minimum requirements and all bids will be evaluated against the specifications set forth in this bid.

Include in bid submittal, manufacturer's published literature describing items bid.

Delivery Schedule: Please specify, on page 1 of the bid sheet, the number of days within which the items will be delivered after receipt of award.

Billing shall be by two invoices (duplicate) sent to the Purchasing Department, City of Vicksburg, P O Box 150, Vicksburg, MS 39181-0150. The invoices shall list the quantity and items delivered, date of delivery, bid price of items, and total billing. The number of the purchase order issued to award this contract shall appear on the invoices. Correctly executed invoices received on or before the last day of the month will be paid by the tenth day of the following month.

Item #	Unit	Item Description		
		April 2015 - April 2016		
1	ea	Signal Heads, 3 section (LED)		
		Signal Heads, 3 section w/ green arrow (LED)		
		Signal Heads, 4 section w/ green arrow (LED)		
		Signal Heads, 5 section w/yellow/green arrow (LED)		
2	ea	Span Wire Clamp		
3	ea	Balance Adjusting Device		
4	ea	Cable Entrance Fitting		
5	ea	Backplates, 3 section		
		Backplates, 4 section, inverted T backplate		
		Backplates, 5 section, cluster backplate		
6	ea	Bottom Plug		
7	ft	Cable		
8	ea	Wire		
9	cs	Loop Sealant, 12 ply packs/cs		
10	ea	Loop Detector Amplifier, 4 channel		
11	ea	Solid State Traffic Controller		
12	ea	Pole Mounted Cabinet		
12a	ea	Base Mounted Cabinet		
13	ea	Conflict Monitor, 12 channel enhanced (EDI SSM-12LE)		
13a	ea	Conflict Monitor, 6 channel enhanced (EDI SSM-6LE)		
14	ea	NEMA Load Switch (TSC Model 200)		
15	ea	NEMA Flasher (TSC Model 204)		
16	ea	NEMA Flash Relay		
17	ea	Signal Bus Relay (Burakoll #1060APS120AC)		
18	ea	Detector Power Supply (Canoga Model 124A)		
19	ea	Surge Arrestor (EDCO #SPA 303)		
20	ea	Arrestor (EDCO #SHP 300-10)		
21	ea	Signal Pull Box (PL1212BA)		
22	ea	Signal Pull Box Cover (PC1212CA)		
23	ea	Arrestor (EDCO #SRA-6LCA)		
24	ea	Detector Opticom Model 711		
25	ea	Detector Opticom Model 721		
26	ea	Detector Opticom Model 722		
27	ea	Opticom Card Rack Model 760		
28	ea	Opticom Phase Selector Model 752		
29	ea	Opticom Phase Selector Model 754		
30	ea	Opticom Emitter Model 792H		
31	ea	Opticom Emitter Switch Model 793B		
32	ea	Span Clamp Model 708		
33	ea	Light Emitting Diode (LED)		
33a	ea	12" Red Sway Ball		
33b	ea	12" Yellow Sway Ball		
33c	ea	12" Green Sway Ball		
33d	ea	12" Red Arrow		
33e	ea	12" Yellow Arrow		
33f	ea	12" Green Arrow		
34	ea	Bulldog III Push Button		
34b	ea	Bulldog III Housing		
35	ea	Sensys Access Point Controller Card (APCC)		
35b	ea	Sensys VSN240 Wireless Sensors		
35c	ea	Sensys RP240 B-LL Repeater		
35d	ea	Sensys CC & EX Contact Closure Cards / cc 677.00		
35e	ea	Sensys AP 240 Access Points		
36	ea	GT1-LED Countown Pedestrian Signal		

## SEALED BID CHECKLIST

### Traffic Signal Components

The following conditions, checked required and as stated in the bid sheet and/or specifications, must be met prior to accepting your bid submittal for award considerations.

- | Required     | Not<br>Required |  |
|--------------|-----------------|--|
| _____        | <u>  X  </u>    | 1. Bid security in the amount of 5% bid included in the bid submitted.                                 |
| _____        | <u>  X  </u>    | 2. Performance and Payment Bond in the amount of 100 percent of the contract by the successful bidder. |
| <u>  X  </u> | _____           | 3. Bid sheet entries filled in and bid sheet signed.   |
| <u>  X  </u> | _____           | 4. Deviations described in detail.   |
| _____        | <u>  X  </u>    | 5. Manufacturer's literature enclosed in bid submittal. Submit two (2) copies.                         |
| _____        | <u>  X  </u>    | 6. Samples provided per specification requirements.  |
| <u>  X  </u> | _____           | 7. Prices bid are for units specified.   |
| _____        | <u>  X  </u>    | 8. Certificate of Responsibility. See the instruction to bidders for complete requirements.            |