

**CITY CLERK
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C-7947
01/29/2008



**CITY OF GLENDALE
MATERIALS MANAGEMENT
INVITATION FOR BID**

SOLICITATION NUMBER: 07-86
DESCRIPTION: Traffic Signal Cabinets, Controllers and MMUs
BID DUE DATE AND TIME: January 31, 2008 AT 2:00 P.M. LOCAL TIME

Offers for the materials or services specified will be received by the City of Glendale, Materials Management at the below specified location until the time and date cited. Offers received by the correct time and date will be opened and the name of each bidder and the amount of the bid will be publicly read.

Bid Opening and Submittal Location: City of Glendale
Attn: Materials Management
6829 North 58th Drive, Suite 202
Glendale, Arizona 85301-2599

Offers must be in the actual possession of Materials Management on or prior to the time and date, and at the location indicated above. Late offers will not be considered. Offers must be submitted in a sealed envelope with the Solicitation Number and the bidder's name and address clearly indicated on the envelope. See Paragraph 2.2 for additional instructions for preparing an offer.

OFFERORS ARE STRONGLY ENCOURAGED TO CAREFULLY READ THE ENTIRE SOLICITATION.

For questions regarding
General Terms and Conditions contact:
Jim Swaziek
Contract Analyst
623-930-2867
jswaziek@glendalecaz.com

For questions regarding
Scope or Specifications contact:
Avery Rhodes
Transportation Systems Manager
623-847-1162

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Materials Management

Solicitation Number: 07-86

Traffic Signal Cabinets, Controllers and MMUs

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**SECTION ONE
SPECIFICATIONS**

CITY OF GLENDALE
Materials Management
Solicitation Number: 07-86
Traffic Signal Cabinets, Controllers and MMUs

1.1 INTRODUCTION

1.1 It is the intent of the City of Glendale to establish a pricing agreement for the order and delivery of traffic signal cabinets, controllers and malfunction management units (MMUs).

1.2 DELIVERY

1.2.1 Contractor shall deliver all traffic signal cabinets, controllers and malfunction management units (MMUs) to the Materials Control (Warehouse) located at 6210 W. Myrtle, Bldg N, Glendale, 85301.

1.2.2 Deliveries may be made on regularly scheduled workdays between 7:00 a.m. and 3:30 p.m., or as requested by the contract administrator.

1.3 SPECIFICATIONS AND COMPLIANCE – TRAFFIC SIGNAL CABINETS

The bidder shall check the YES or NO boxes for each specification on each page of SECTION ONE. If the bidder checks the NO box for any specification, the bidder must provide an explanation in accordance with Paragraph 2.4 of SECTION TWO, the SPECIAL TERMS AND CONDITIONS.

Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
1.1	The Contractor shall furnish TS2 Type 1 traffic control modular cabinet assemblies.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
1.2	All equipment described in this IFB shall be provided. The MMU, traffic signal controller and fiber optic modems are specified herein but are considered incidental to the cabinet.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.0	Material		
2.1	The cabinet assembly shall meet, as a minimum, all applicable sections of the NEMA Standard Publication No. TS2-1998 except where modified herein.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.2	The cabinet shall be constructed from type 5052-H32 aluminum with a minimum thickness of 0.125 inches.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.3	The cabinet shall be designed and manufactured with materials that will allow rigid mounting, whether intended for pole, base or pedestal mounting. The cabinet must not flex on its mount.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2.4	A rain channel shall be incorporated into the design of the main door opening to prevent liquids from entering the enclosure. The cabinet door opening must be a minimum of 80 percent of the front surface of the cabinet. A stiffener plate shall be welded across the inside of the main door to prevent flexing. The top of the cabinet shall incorporate a 1-inch slope toward the rear to prevent rain accumulation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.5	Unless otherwise specified, the cabinet shall be supplied with a natural aluminum finish. Sufficient care shall be taken in handling to ensure that scratches are minimized. All surfaces shall be free from weld flash. Welds shall be smooth, neatly formed, free from cracks, blowholes and other irregularities. All sharp edges shall be ground smooth.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.6	Where painted cabinets are specified, the exterior shall be degreased and primed with a spray applied iron phosphate coat-equivalent to a four-stage iron phosphate coat prior to painting. The final coat shall consist of a powder coat paint (TGIC or equivalent) applied with a minimum thickness of 2 mils.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.7	All seams shall be sealed with RTV sealant or equivalent material on the interior of the cabinet.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.8	The lower section of the cabinet shall be equipped with a louvered air entrance. The air inlet shall be large enough to allow sufficient air flow per the rated fan capacity. Louvers must satisfy the NEMA rod entry test for 3R ventilated enclosures. A non-corrosive, vermin- and insect-proof, removable air filter shall be secured to the air entrance. The filter shall fit snugly against the cabinet door wall.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.9	The roof of the cabinet shall incorporate an exhaust plenum with a vent screen. Perforations in the vent screen shall not exceed 0.125 inches in diameter.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2.10	The sides of the cabinet near the top shall be drilled and tapped to be capable of receiving a standard hanger during the installation of the cabinet. The hanger shall be capable of being removed once the cabinet is installed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.11	Each cabinet shall be of sufficient size to accommodate all equipment. At a minimum, the cabinet sizes shall be 52" H x 44" W x 24" D unless otherwise specified.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A	Shelves		
2A.1	All cabinets shall be supplied with a minimum of one removable shelf manufactured from 5052-H32 aluminum. Shelf shall be a minimum of 10 inches deep.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A.2	The shelf shall have horizontal slots at the rear and vertical slots at the front of the turned down side flange. The shelf shall be installed by first inserting the rear edge of the shelf on the cabinet rear sidewall mounting studs, then lowering the shelf on the front sidewall mounting studs. The shelf shall be held in place by a nylon tie-wrap inserted through holes on the front edge of the shelf and around the front sidewall mounting studs	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A.3	The front edge of the shelf shall have holes punched every six (6) inches to accommodate tie-wrapping of cables/harnesses.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A.4	The cabinet shall have a minimum of one roll-out or otherwise concealable shelf that can be used as a shelf for a laptop computer or other tools when the cabinet door is opened.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B	Component Mountings		
2B	A minimum of one set of vertical "C" channels shall be mounted on each interior wall of the cabinet for the purpose of mounting the cabinet components. The channels shall accommodate spring mounted nuts or studs. All mounting rails shall extend to within 7 inches of the top and bottom of the cabinet. Sidewall rail spacing shall be 7.88 inches center-to-center. Rear wall rail spacing shall be 18.50 inches center-to-center.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C	Doors		

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2C.1	The main door and police door-in-door shall close against a weatherproof and dust-proof, closed-cell neoprene gasket seal. The gasket material for the main door shall be a minimum of 0.250 inches thick by 1.00 inch wide. The gasket material for the police door shall be a minimum of 0.250 inches thick by 0.500 inches wide. The gaskets shall be permanently bonded to the cabinet.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C.2	The main door shall be equipped with a three-point latching mechanism. The handle on the main door shall utilize a shank of 5/8 inches minimum diameter. The handle shall include a hasp for the attachment of an optional padlock. The cabinet door handle shall rotate counter-clockwise to open. The handle shall not extend beyond the perimeter of the main door at any time. The lock assembly shall be positioned so that the handle shall not cause any interference with the key when opening the cabinet door.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C.3	The main door hinge shall be a one-piece, continuous piano hinge with a stainless steel pin running the entire length of the door. The hinge shall be attached in such a manner that no rivets or bolts are exposed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C.4	The main door shall include a mechanism capable of holding the door open at approximately 90, 125, and 150 degrees under windy conditions. Manual placement of the mechanism shall not be required by field personnel. The main door shall be equipped with a lock. Minimum of two keys shall be supplied.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C.5	The police door-in-door shall be provided with a treasury type lock Corbin No.R357SGS or exact equivalent and a minimum of one key. The lock shall be modified to work with a 'Glendale' No. 2 key. Contact the COG traffic signal supervisor at (623) 930-2762 for more information.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D	Anchor Bolts		
2D	All base mounted cabinets require anchor bolts to properly secure the cabinet to its base. The cabinet flange for securing the anchor bolts shall not protrude outward from the bottom of the cabinet. Four anchor bolts shall be required for proper installation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2E	Main Panel, Terminals and Facilities		
2E.1	The main panel shall be constructed from 5052-H32 brushed aluminum of 0.125 inches minimum thickness and installed so as to minimize flexing when plug-in components are installed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.2	All main panels are provided with a mounting mechanism which allows easy access to all wiring on the rear of the panel without the removal of any cabinet shelves. Lowering of the main panel can be accomplished without the use of hand tools. Complete removal can be accomplished by the use of simple hand tools.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.3	The terminals and facilities shall as a minimum be available in the following configuration: Sixteen load switch sockets, six flash transfer relay sockets, one flasher socket, two Bus Interface Units (BIU) sockets, one MMU SDLC cable, one sixteen-channel detector rack with one BIU and one spare SDLC cable to accommodate a future sixteen channel detector rack with one BIU.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.4	All load switch and flash transfer relay socket reference designators shall be silk-screen labeled on the front and rear of the main panel to match drawing designations. Socket pins shall be marked for reference on the rear of the panel.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.5	A maximum of eight load switch sockets may be positioned horizontally or stacked in two rows on the main panel. Main panels requiring more than eight load switch sockets shall be mounted in two horizontal rows.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.6	The main panels shall have all field wires contained on two rows of horizontally mounted terminal blocks. One row shall be wired for the pedestrian and overlap field terminations. The other row shall be reserved for phase one through phase eight vehicle field terminations.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.7	All field output circuits shall be terminated on a non-fused barrier type terminal block with a minimum rating of 10 amps.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		YES	NO
2E.8	All field input/output (I/O) terminals shall be identified by permanent alphanumerical labels. All labels shall use standard nomenclature per the NEMA TS2 specification.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.9	It shall be possible to flash either the yellow or red indication on any vehicle movement and to change from one color indication to the other by use of a screwdriver.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.10	Field terminal blocks shall be wired to use four positions per vehicle or overlap phase (green, yellow, red, flash). It shall not be necessary to de-buss field terminal blocks for flash programming.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.11	The main panel shall contain at least one flasher socket (silk screen labeled) capable of operating a 15-amp, 2-pole, NEMA solid-state flasher.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.12	One RC network shall be wired in parallel with each group of three flash-transfer relays and any other relay coils.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.13	All logic-level, NEMA-controller and Malfunction Management Unit input and output terminations on the main panel shall be permanently labeled. Cabinet prints shall identify the function of each terminal position.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.14	At a minimum, three 20-position terminal blocks shall be provided at the top of the main panel to provide access to the controller unit's programmable and non-programmable I/O. Terminal blocks for DC signal interfacing shall have a number 6-32 x 7/32 inch screw as minimum.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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2E.15	All main panel wiring shall conform to the following wire size and color:	<input checked="" type="checkbox"/>	<input type="checkbox"/>																																													
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;"><i>Output</i></th> <th style="text-align: center;"><i>Wire Color</i></th> <th style="text-align: center;"><i>Wire Size (AWG)</i></th> </tr> </thead> <tbody> <tr> <td>Green/Walk</td> <td>Brown</td> <td>14</td> </tr> <tr> <td>Yellow</td> <td>Yellow</td> <td>14</td> </tr> <tr> <td>Red/Don't Walk</td> <td>Red</td> <td>14</td> </tr> <tr> <td>MMU (other than AC power)</td> <td>Violet</td> <td>22</td> </tr> <tr> <td>Controller I/O</td> <td>Blue</td> <td>22</td> </tr> <tr> <td>AC Line (power panel to - black wire main panel)</td> <td>Black</td> <td>8/10</td> </tr> <tr> <td>AC Line (main panel)</td> <td>Black</td> <td>10</td> </tr> <tr> <td>AC Line (power panel to - black wire main panel)</td> <td>Black</td> <td>8/10</td> </tr> <tr> <td>AC Line (main panel)</td> <td>Black</td> <td>10</td> </tr> <tr> <td>AC Neutral (power panel to - white wire main panel)</td> <td>White</td> <td>8/10</td> </tr> <tr> <td>AC Neutral (main panel)</td> <td>White</td> <td>10</td> </tr> <tr> <td>Earth ground (power panel)</td> <td>Green</td> <td>8</td> </tr> <tr> <td>Logic ground</td> <td>Gray</td> <td>22</td> </tr> <tr> <td>Flash programming-orange wire flasher terminal</td> <td>Black wire red or yellow field terminal</td> <td>14</td> </tr> </tbody> </table>	<i>Output</i>	<i>Wire Color</i>	<i>Wire Size (AWG)</i>	Green/Walk	Brown	14	Yellow	Yellow	14	Red/Don't Walk	Red	14	MMU (other than AC power)	Violet	22	Controller I/O	Blue	22	AC Line (power panel to - black wire main panel)	Black	8/10	AC Line (main panel)	Black	10	AC Line (power panel to - black wire main panel)	Black	8/10	AC Line (main panel)	Black	10	AC Neutral (power panel to - white wire main panel)	White	8/10	AC Neutral (main panel)	White	10	Earth ground (power panel)	Green	8	Logic ground	Gray	22	Flash programming-orange wire flasher terminal	Black wire red or yellow field terminal	14		
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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2E.16	All wiring, 14 AWG and smaller, shall conform to MIL-W-16878/1, type B/N, 600V, 19-strand tinned copper.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.17	The wire shall have a minimum of 0.010 inches thick PVC insulation with clear nylon jacket and rated to 105 degrees Celsius. All 12 AWG and larger wire shall have UL listed THHN/THWN 90 degrees Celsius, 600V, 0.020 inches thick PVC insulation and clear nylon jacketed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.18	Connecting cables shall be sleeved in a braided nylon mesh or poly-jacketed. The use of exposed tie-wraps or interwoven cables is unacceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.19	All Terminals and Facilities configurations shall be provided with BIU wiring assignments consistent with NEMA TS2-1998 specifications.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.20	All Terminals and Facilities configurations shall be provided with sufficient RS-485 Port 1 communication cables to allow for the intended operation of that cabinet. Each communication cable connector shall be a 15-pin metallized plastic shell D subminiature type. The cable shall be a shielded cable suitable for RS-485 communications.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.21	All main panels shall be pre-wired for a Type-16 Malfunction Management Unit (MMU).	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.22	All wiring shall be neat in appearance. All cabinet wiring shall be continuous from its point of origin to its termination point. Butt type connections/splices are not acceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.23	All connecting cables and wire runs shall be secured by mechanical clamps. Stick-on type clamps are not acceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.24	The grounding system in the cabinet shall be divided into three separate circuits (AC Neutral, Earth Ground, and Logic Ground). These ground circuits shall be connected together at a single point as outlined in the NEMA TS2 Standard.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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2E.25	The main panel shall incorporate a relay to remove +24 VDC from the common side of the load switches when the intersection is placed into mechanical flash. The relay shall have a momentary pushbutton to apply power to the load switch inputs for ease of troubleshooting.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.26	All pedestrian push button inputs from the field to the controller shall be opto-isolated through the BIU and operate at 12 VAC.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E.27	All wire (16 AWG or smaller) at solder joints shall be hooked or looped around the eyelet or terminal block post prior to soldering to ensure circuit integrity. Lap joint soldering is not acceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F	Power Panel		
2F.1	The power panel shall consist of a separate module, securely fastened to the right side wall of the cabinet. The power panel shall be wired to provide the necessary filtered power to the load switches, flasher(s), and power bus assembly. It shall be manufactured from 0.090-inch, 5052-H32 aluminum with a removable plastic front cover. The panel shall be of such design so as to allow a technician to access the main and auxiliary breakers without removing the front cover.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		YES	NO
2F.2	The power panel shall house the following components: 1. A minimum of a 30-amp main breaker. This breaker shall supply power to the controller, MMU, signals, cabinet power supply and auxiliary panels. Breakers shall be at minimum, a thermal magnetic type, U.L. listed for HACR service, with a minimum of 10,000 amp interrupting capacity. 2. A minimum of a 15-amp auxiliary breaker. This breaker shall supply power to the fan, light and GFI utility outlet. 3. An EDCO model SHP-300-10 or exact approved equivalent surge arrester. 4. A 50 amp, 125 VAC radio interference line filter. 5. A normally-open, 60-amp, mercury contactor Durakool model BBC-7032 or exact equivalent. 6. A minimum of 8-position neutral bus bar capable of connecting three #12 wires per position. 7. A minimum of 6-position ground bus bar capable of connecting three #12 wires per position. 8. A NEMA type 5-15R GFI utility outlet. 9. A 4 position plug-in connector for wiring to the power bus assembly.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G	Power Bus Assembly		
2G.1	The power bus assembly shall be manufactured from 0.090", 5052-H32 aluminum. It shall provide filtered power for the controller, malfunction management unit, cabinet power supply, and all auxiliary equipment.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G.2	Two spare filtered 110 V power outlets shall be provided.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G.3	It shall include the SDLC Bus connecting cables wired into a surface mounted compression terminal block.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G.4	The Power Bus Assembly shall house the following components: 1. A minimum of three and a maximum of six power connectors. 2. Two terminal strips to hardwire the power connections. 3. SDLC terminal block with pre-wired cables.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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2G.5	All cabinet equipment requiring filtered power to operate, shall be connected to the power bus assembly by a Burndy connector # SMS12PDH1 or exact equivalent, or hardwired directly to the supplied terminal blocks.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H	Vehicle Detection Rack		
2H.1	A minimum of one vehicle detector amplifier rack shall be provided in each cabinet in the following configuration: Supports up to eight channels of loop detection (four 2 channel detectors), two 2-channel preemption devices, and one BIU.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.2	If design plans show a signal with more than 8 detector channels than a second detector rack should be added.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.3	Detector rack BIU mounting shall be an integral part of the detector rack.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.4	All BIU connectors shall have jumper address pins corresponding to the requirements of the TS2 specification. The jumpers may be moved to change the address of any individual rack. The address pins shall control the BIU mode of operation. BIUs shall be capable of being interchanged with no additional programming.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.5	Each cabinet shall contain detector interface panels for the purpose of connecting field loops and vehicle detector amplifiers. The panels shall be manufactured from FR4 G10 fiberglass, 0.062 inches thick, with a minimum of 2 oz. of copper for all traces.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.6	One 8-position interface panel shall be provided for an 8-channel rack cabinet and one 16-position interface panel shall be provided for a 16-channel rack cabinet. The interface panel shall be secured to a mounting plate and attached to the left sidewalk of the cabinet.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.7	Each interface panel shall allow for the connection of eight or sixteen independent field loops. A ground bus terminal shall be provided between each loop pair terminal to provide a termination for the loop leading cable ground wire.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - TRAFFIC SIGNAL CABINETS	COMPLY	
		YES	NO
2H.8	Each interface panel shall provide a 10-position terminal block to terminate the field wires for up to two 2-channel preemption devices.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.9	A cable consisting of 20 AWG twisted pair wires shall be provided to enable connection to and from the panel to a detector rack. The twisted pair wires shall be color coded red and white wire.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.10	All termination points shall be identified by a unique number and silk screened on the panel.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.11	Each detector rack shall accommodate rack mountable preemption devices.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.12	Each detector rack shall be powered by the cabinet power supply and be connected to the power bus assembly by means of Burndy connector # SMS12PDH1.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H.13	Each detector rack shall be supplied with a full array of two (2) channel detector cards unless otherwise specified. The detector cards shall be EDI Oracle 2E or Reno C-1200-SS or approved equivalent.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I	Cabinet Test Switch and Police Panel		
2I.1	A test switch panel shall be mounted on the inside of the main door. The test switch panel shall provide as a minimum the following: <ol style="list-style-type: none"> 1. AUTO/FLASH SWITCH – When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall not be stop timed when in flash. Wired according to NEMA-TS2-1998 the MMU forces the controller to initiate the start-up sequence when exiting flash. 2. STOP TIME SWITCH – When applied, the controller shall be stop timed in the current interval. 3. CONTROL EQUIPMENT POWER ON/OFF – This switch shall control the controller, MMU, and cabinet power supply AC power. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2I.2	Momentary test push buttons for vehicle and pedestrian inputs are not required.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I.3	The police door switch panel shall contain the following: 1. SIGNALS ON/OFF SWITCH – In the OFF position, power shall be removed from signal heads in the intersection. The controller shall continue to operate. When in the OFF position, the MMU shall not conflict or require reset. 2. AUTO/FLASH SWITCH – When in the flash position, power shall be maintained to the controller and the intersection shall be placed in flash. The controller shall be stop timed when in flash. Wired according to NEMA-TS2-1998 the MMU forces the controller to initiate the start-up sequence when exiting flash. 3. AUTO/MANUAL SWITCH – Cabinet wiring shall include an AUTO/MANUAL switch and a hand cord with a police push button.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I.4	All toggle type switches shall be heavy duty and rated 15 amps minimum. Single- or double-pole switches may be provided, as required.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I.5	Any exposed terminals or switch solder points shall be covered with a non-flexible shield to prevent accidental contact.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I.6	All switch functions must be permanently and clearly labeled.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I.7	All wire routed to the police door-in-door and test switch push button panel shall be adequately protected against damage from repetitive opening and closing of the main door.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I.8	All test switch panel wiring shall be connected to the main panel via a 36-pin Burndy connector #SMS36R1, or exact equivalent.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I.9	All wiring from the main panel to the test switch panel shall be connected to the switch panel via a 24-pin Burndy connector #SMS24R1 or exact equivalent.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J	Resistor Panel		
2J	An odd phase red resistor panel shall be included in each cabinet	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2K	Auxiliary Devices		
2K.1	<u>Load Switches</u> Load switches shall be solid state and shall conform to the requirements of Section 6.2 of the NEMA TS2 Standard.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K.2	<u>Flashers</u> The flasher shall be solid state and shall conform to the requirements of section 6.3 of the NEMA TS2 Standard. Flashing of field circuits for the purpose of intersection flash shall be accomplished by a separate flasher. The flasher shall be rated at 15 amperes, double pole with a nominal flash rate of 60 FPM.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K.3	<u>Flash Transfer Relays</u> All flash transfer relays shall meet the requirements of Section 6.4 of the NEMA TS2 Standard. The coil of the flash transfer relay must be de-energized for flash operation. The full complement of relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K.4	<u>Bus Interface Units (BIUs)</u> All BIUs shall meet the requirements of Section 8 of the NEMA TS2 Standard. The full complement of BIUs shall be supplied with each cabinet to allow for maximum phase and function utilization for which the cabinet is designed. Each BIUs shall include power on, transmit and valid data indicators. All indicators shall be LEDs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2K.5	<p><u>Cabinet Power Supply</u> The cabinet power supply shall meet the requirements of Section 5.3.5 of the NEMA TS2 Standard.</p> <p>The cabinet power supply shall provide LED indicators for the line frequency, 12 VDC, 12 VAC, and 24 VDC outputs.</p> <p>The cabinet power supply shall provide (on the front panel) jack plugs for access to the +24 VDC for test purposes.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K.6	<p><u>Load Switch Jumpers</u> 10 load switch jumpers shall be provided with each cabinet.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2L	Auxiliary Cabinet Equipment		
2L.1	<p>The cabinet shall be provided with two (2) thermostatically controlled (adjustable between 80-150 degrees Fahrenheit) ventilation fans in the top of the cabinet plenum. The fan plate shall be removable with the use of simple hand tools for serviceability. A minimum of two exhaust fans shall be provided. The fan shall be a ball bearing type fan and shall be capable of drawing a minimum of 100 cubic feet of air per minute. Each Fan/Thermostat assembly shall be connected to the Power panel by means of a 4 position plug-in cable.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2L.2	<p>A 25-watt incandescent lamp mounted on a 14-inch flexible arm shall be included. The flexible arm shall be permanently mounted to the middle of the cabinet door. The lamp shall be wired to either a 15-amp ON/OFF toggle switch mounted on the power panel or to a door activated switch mounted near the top of the door.</p>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - TRAFFIC SIGNAL CABINETS	COMPLY	
		YES	NO
2L.3	A fluorescent lighting fixture shall be mounted on the inside top of the cabinet near the front edge. The fixture shall be rated to accommodate at minimum a F15T8 lamp operated from a normal power factor UL or ETL listed ballast. The lamp shall be wired to either a 15-amp ON/OFF toggle switch mounted on the power panel or to a door activated switch mounted near the top of the door.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2L.4	A resealable print pouch shall be mounted to the door of the cabinet. The pouch shall be of sufficient size to accommodate one complete set of cabinet prints.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2L.5	A minimum of two sets of complete and accurate cabinet drawings shall be supplied with each cabinet.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2L.6	A minimum of one set of manuals for the controller. Malfunction Management Unit and vehicle detector amplifiers shall be supplied with each cabinet.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2L.7	At a minimum, an additional electrical outlet shall be provided in the cabinet. The outlet shall be wired through a fuse to protect equipment using the outlet from surges. The outlet shall be placed in a manner such that devices can be plugged in while still allowing the cabinet door to close.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2N	Testing and Warranty:		
2N.1	The cabinet assembly and all other components shall be warranted for a period of one year from date of shipment. The manufacturer's warranty shall be supplied in writing with each component. Second party extended warranties are not acceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2N.2	Any defects shall be corrected by the manufacturer or supplier at no cost to the City.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2O	Replacement Coverage:		
2O	If a malfunction occurs during the warranty period, the supplier shall, within two (2) weeks after notification furnish a like unit, module, or auxiliary equipment, for use while the warranted unit is being repaired.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.3-	Specification - <u>TRAFFIC SIGNAL CABINETS</u>	COMPLY	
		YES	NO
2P	Reliability Clause:		
2P	While under warranty, the isolation and repair of any unit malfunction shall be the responsibility of the supplier. Any unit experiencing a total of three failures that has twice been returned to the supplier for repair shall be replaced with a new unit of the same type at no charge to the City. The replacement unit's warranty shall be that of a new unit. NOTE: Malfunctions do not include damage caused by lightning, power surges, negligence, acts of God, or use of equipment in a manner not originally intended by its manufacturer.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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1.4 SPECIFICATIONS AND COMPLIANCE – TRAFFIC SIGNAL CONTROLLERS

The bidder shall check the YES or NO boxes for each specification on each page of SECTION ONE. If the bidder checks the NO box for any specification, the bidder must provide an explanation in accordance with Paragraph 2.4 of SECTION TWO, the SPECIAL TERMS AND CONDITIONS.

Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
1	Description		
1	The contractor shall furnish a shelf mounted, two through sixteen phase, fully-actuated digital, solid state traffic controller. The controller shall meet, as a minimum all applicable sections of the NEMA Standards Publications for TS2 and NTCIP. Where differences occur, this specification shall govern. Controller versions shall comply with NEMA TS2 Types 1 and 2 versions of the controller shall be capable of operating as a Type 1 controller.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	Materials		
2	The controller shall be compact so as to fit in limited cabinet space.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A	Hardware		
2A1	<u>Electronics:</u>		
2A1.1	A microprocessor shall be used for all timing and control functions. Continuing operation of the microprocessor shall be verified by an independent monitor circuit, which shall set an output and indicate an error message if a pulse is not received from the microprocessor within a defined period.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A1.2	A built-in, high-efficiency switching power supply shall generate all required internal voltages as well as 24 VDC for external use. All voltages shall be regulated and shall be monitored with control signals. Fuses shall be mounted on the front of the controller for 120 VAC input and 24 VDC output.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No. 1.4-	Specification - <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2A1.3	Timing of the controller shall be derived from the 120 VAC power line. User-programmed settings and intersection configuration data shall be stored in Flash Memory. Memory requiring an energy storage device (battery or capacitor) to maintain user data shall not be acceptable. To facilitate the transfer of user-programmed data from one controller to another, a data transfer module (data key) using a separate serial flash memory device shall be included. This data transfer module shall be easily removable and directly accessible from the front of the controller. The controller shall not require this module to be present for proper operation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A1.4	The timing parameters shall be capable of being downloaded from a Windows based computer. The controller manufacturer shall provide a software program which stores the timing database and allows them to be downloaded directly to the controller.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A1.5	All controller software shall be stored in Flash Memory devices. The controller software shall be easily updated without the removal of any memory device from the controller. The use of removable PROMS or EPROMS from the controller shall not be acceptable. The controller shall include an option that allows updating software using a Windows based computer. This option shall allow updating the controller software via a serial or Ethernet port from the front of the controller. Updating the controller software shall require the intersection to be in flash for no more than ten seconds using Ethernet file transfer.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2A1.6	All printed circuit boards shall meet the requirements of the NEMA Standard plus the following requirements to enhance reliability: <ul style="list-style-type: none"> • All plated-through holes and exposed circuit traces shall be plated with solder. • Both sides of the printed circuit board shall be covered with a solder mask material. • The circuit reference designation for all components and the polarity of all capacitors and diodes shall be clearly marked adjacent to the component. Pin 1 for all integrated circuit packages shall be designated on both sides of all printed circuit boards. • All printed circuit board assemblies, except power supplies, shall be coated on both sides with a clear moisture-proof and fungus-proof sealant. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A2	<u>Front Panel:</u>		
2A2.1	The front of the controller shall consist of a panel for the display, keyboard and connectors for all necessary user connections. It shall only be necessary to open the front panel during option installation and maintenance of the electronic circuits.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A2.2	An alphanumeric liquid crystal display (LCD) shall be used to show program and status information. For ease of viewing, backlighting and multiple levels of contrast adjustment shall be provided.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A2.3	Front-panel operator inputs shall be via clearly labeled and environmentally-sealed electrometric keys.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A3	<u>Data Key:</u>		
2A3.1	A data key shall be available for use as a database storage device (backup) or as a database transfer module.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A3.2	The data key shall be hot swappable, so that it can be inserted and removed without powering down the controller.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A3.3	The data key shall be capable of storing the entire controller database and shall retain the information without use of battery or capacitor backup.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2A3.4	The controller shall not require this key to be present during normal operation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A4	<u>Computer Database:</u>		
2A4.1	A Windows computer software program shall be available for use as a database storage device and database transfer. The software program shall be capable of storing timing data from multiple controllers.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A4.2	The software shall be able to upload and download while the controller is in operation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A5	<u>Connectors:</u>		
2A5.1	All interface connectors shall be accessible from the front of the controller. Controller model shall be offered to accommodate both NEMA TS2 Type 1 and NEMA TS2 Type 2 cabinets.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A5.2	To facilitate special applications the controller shall have the capability of assignment of any input or output function to any input or output pin respectively on the interface connectors, with the exception of Flashing Monitor, Controller Voltage Monitor, AC+, AC-, Chassis Ground, 24VDC, Logic Ground and TS2 Mode bits.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A6	<u>Serviceability:</u>		
2A6.1	All electronic modules including the power supply shall be easily removable from the front of the controller using a screwdriver as the only tool. All power and signal connections to the circuit boards shall be via plug-in connectors.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A6.2	The controller layout shall allow the removal and replacement of any circuit board without unplugging or removing other circuit boards, except for the power supply. No more than two boards shall be attached together to form a circuit assembly.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2A6.3	The controller enclosure shall be designed so that one side of any circuit board is accessible for troubleshooting and testing while the controller is still in operation. This capability shall be accomplished without the use of extender cards or card pullers.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B	<u>Displays</u>		
2B1	<u>Dynamic Displays:</u>		

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2B1.1	Dynamic displays listed below shall be provided to show the operational status of the controller. Additional displays shall be offered for programming. It shall be possible to place vehicle, pedestrian and preemption calls from the keyboard while displaying status information.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.2	Intersection status display shall indicate a summary of ring, phase, coordination, preemption and time-based control status.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.3	Controller status display shall indicate current interval, pedestrian, density, maximum, and maximum extension timing by phase and ring. The status of vehicle and pedestrian signal outputs shall be displayed in combination with vehicle and pedestrian calls.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.4	Coordinator status display shall indicate the command source, current coordination pattern information, local and system cycle count, commanded/actual offset, offset correction, time-based control status, hold, force-off, vehicle permissive, split count down, split extension, offset from ring 1 and green band indications.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.5	Preemptor status display shall indicate priority (railroad, fire, emergency) preemptors and bus preemptors with calls, preemptor active, inhibit, and delay status. When a preemptor is active, the display shall also indicate preemptor interval, timing, duration, and hold status. A portion of the display shall indicate the controller status during preemption including current status, interval, and timing by phase and ring and the status of vehicle and pedestrian signals for each phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.6	Time base status display shall indicate the current time and date, the current day and week program, the active program step for both coordination pattern and time-of-day functions, the start time of the next program step, and the highest step used. The programmed selections of the active coordination pattern and time-of-day pattern shall also be displayed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.7	There shall be communications status displays for Port 1 (SDLC), Port 2 (terminal) Port 3, Ethernet and NTCIP.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2B1.8	Port 1 (SDLC) status display shall indicate the frame responses from the MMU, the terminal and facilities BIUs and the detector BIUs.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.9	Ports 2 and 3 status display shall indicate the interconnect format, transmit, valid data, data error, carrier detect and the last valid command.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.10	An Ethernet status display shall indicate the line speed, the line status, the total number of transmit and receive counts and the number of transmit and receive error counts.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.11	An NTCIP status display shall indicate the total number of SNMP and STMP transmit and receive counts.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.12	A detector status display shall indicate activity for up to 64 detectors. The display shall show detector calls as they are processed by the controller.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.13	Flash/malfunction management unit (MMU) status display shall indicate flash status plus MMU channel, conflict, and monitoring function status. A separate display shall indicate the results of the controller's comparison of its MMU programming to the programming in the controller.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B1.14	An input and output status display shall indicate the activity of all of the logic level inputs and outputs to the controller.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B2	Programming Displays:		
2B2.1	Programming displays in the form of menus shall aid the operator in entering data from the front-panel keyboard.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B2.2	A main menu shall allow the user to select a major function of the controller. A submenu shall then be displayed to allow the user to select a sub-function within the major function.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B2.3	English language and traffic engineering terminology shall be used throughout to facilitate programming. The display organization shall allow traffic personnel to program the controller without using reference cards or manuals. All data entry and data screens shall be in logical order.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2B2.4	Programming entries shall consist of alpha-numerical values, YES/NO and ON/OFF entries. During program entry, the new data shall be displayed as it is entered. Entries shall only be validated and stored when the consistency check is performed for entries that are constrained by other programmed data or when the ENTER or cursor key is pressed when they are not.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B2.5	An example of constrained data is the sequence of the phases within a ring. They need to be checked with the phase compatibility, phases in the ring and start phases among others.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B2.6	An example of non-constrained data is the vehicular extension time entry.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2B2.7	The keyboard entry software shall include context sensitive help screens. Help information shall be accessed by placing the cursor on the data entry in question then pressing the HELP key. Help screens shall be provided for all keyboard-entered data and shall include at a minimum range, description, and functional operation information for the data entry.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C	Programming		
2C1	<u>Programming Methods</u>		

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2C1	<p>Programming Methods: The methods listed below shall be available for controller configuration and timing entries. The manufacturer shall be able to provide as off-the-shelf items all of the firmware and software required to affect the listed methods and to implement network operation with system masters and host PC's.</p> <ul style="list-style-type: none"> • Manual data entry via the front panel keyboard • Downloading via telemetry from a system master connected to a host PC in a closed-loop system. • Downloading from a portable PC-compatible computer via an Ethernet or serial cable. • Transfer from one controller to another using the Ethernet port on each controller. • Transfer from one controller to another, or restoring for a back-up copy, using a data transfer module (data key). 	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2C2	<u>Programming Security</u>		
2C2.1	A minimum of three access levels shall be available to provide programming security.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C2.2	The highest or supervisor level shall have access to all programming entries including setting access codes.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C2.3	The second or data change level shall have access to all programming entries except access codes.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C2.4	The third or data display level shall only have access to displayed data. No access code shall be required to display data.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C2.5	User selectable, four-digit access codes shall be provided for the supervisor and data change access levels. Access codes shall initially be set to provide unrestricted access.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C2.6	If there has been no keyboard activity the controller shall automatically logoff the user after 30 minutes.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C3	<u>Programming Utility Functions</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2C3.1	A copy function shall permit copying all timing data from one phase to another. It shall also permit copying all timing plan from one timing plan to another, one detector plan and detector options plan to another, all coordination pattern data from one pattern to another and one sequence to another. This feature will facilitate data entry when programming any two or more phases with the same timing values, or detectors with the same programming, and/or two or more coordination patterns with the same pattern data.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C3.2	The controller unit shall contain a backup data base with user specified values stored in non-volatile memory. A copy function shall permit transferring the backup database to the active database.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C3.3	A memory-clear function shall permit the user to clear data entries for the following controller functions, either individually or all at once: <ul style="list-style-type: none"> • Configuration • Controller • Coordinator • Preemptor • Time base • Detectors • Logic Processor 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C3.4	A sign-on message shall allow the user to view the controller software version number. This message shall be displayed upon power-up until a key is depressed. It shall also be possible to display the sign-on message by keyboard selection. The sign-on display shall allow a user-defined message of up to two lines with 38 characters per line.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2C3.5	The controller shall have the capability to output a memory image of the user programmed settings and intersection configuration data in binary format. This shall allow transferring the memory image data to a data key.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D	Actuated Control Functions:		
2D1	Phase Sequence		

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Item No. 1.4-	Specification - <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2D1.1	The phase sequence of the controller shall be programmable in any combination of sixteen phases, eight concurrent groups and four timing rings.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D1.2	Phase sequence information shall be changeable from the keyboard and stored in EEPROM data memory.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D1.3	The standard phase sequence of the controller shall also be capable of being altered by coordination, time-of-day or external alternate sequence command. The controller shall allow reversing the normal phase sequence of each phase pair as shown below: <ul style="list-style-type: none"> • Phases 1 and 2 • Phases 3 and 4 • Phases 5 and 6 • Phases 7 and 8 • Phases 9 and 10 • Phases 11 and 12 • Phases 13 and 14 • Phases 15 and 16 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D1.4	The operator shall be able to select from a library of standard sequences. As a minimum the following shall be provided: <ul style="list-style-type: none"> • Standard NTCIP sequence • Two through eight phase controller • Sixteen phase quad left turn controller • Four single ring 4 phase controllers • Dual TS2 eight phase quad controllers • TXDOT three phase diamond controller • TXDOT four phase diamond controller 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D1.5	An exclusive pedestrian clearance movement shall be provided which will time and display the pedestrian indications with the vehicle movements remaining in all red.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D2	<u>Timing Intervals</u>		

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		COMPLY																													
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO																												
2D2.1	Timing intervals shall be programmable from 0-255 in one second increments or from 0-25.5 in one-tenth second increments, depending on the function.	<input checked="" type="checkbox"/>	<input type="checkbox"/>																												
2D2.2	<p>Four independent timing plans shall be provided and selectable on a time-of-day basis or by coordination pattern. Each plan shall contain the following interval timings:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Minimum Green</td> <td style="width: 50%;">Maximum 3</td> </tr> <tr> <td>Bike Green</td> <td>Dynamic Maximum</td> </tr> <tr> <td>Delay Green</td> <td>Dynamic Maximum Step</td> </tr> <tr> <td>Walk</td> <td>Yellow Clearance</td> </tr> <tr> <td>Walk 2</td> <td>Red Clearance</td> </tr> <tr> <td>Walk Maximum</td> <td>Red Maximum</td> </tr> <tr> <td>Pedestrian Clearance</td> <td>Red Revert</td> </tr> <tr> <td>Pedestrian Clearance 2</td> <td>Actuations before Reduction</td> </tr> <tr> <td>Pedestrian Clearance Maximum</td> <td>Seconds before Actuation</td> </tr> <tr> <td>Pedestrian Carryover</td> <td>Maximum Initial</td> </tr> <tr> <td>Vehicle Extension</td> <td>Time before Reduction</td> </tr> <tr> <td>Vehicle Extension 2</td> <td>Cars Waiting</td> </tr> <tr> <td>Maximum 1</td> <td>Time to Reduce</td> </tr> <tr> <td>Maximum 2</td> <td>Min Gap</td> </tr> </table>	Minimum Green	Maximum 3	Bike Green	Dynamic Maximum	Delay Green	Dynamic Maximum Step	Walk	Yellow Clearance	Walk 2	Red Clearance	Walk Maximum	Red Maximum	Pedestrian Clearance	Red Revert	Pedestrian Clearance 2	Actuations before Reduction	Pedestrian Clearance Maximum	Seconds before Actuation	Pedestrian Carryover	Maximum Initial	Vehicle Extension	Time before Reduction	Vehicle Extension 2	Cars Waiting	Maximum 1	Time to Reduce	Maximum 2	Min Gap	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Minimum Green	Maximum 3																														
Bike Green	Dynamic Maximum																														
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Vehicle Extension 2	Cars Waiting																														
Maximum 1	Time to Reduce																														
Maximum 2	Min Gap																														
2D2.3	<p>Guaranteed minimum interval values shall be specified at the time of purchase and shall not be changed or overridden from the keyboard. Values shall be provided for the following intervals:</p> <ul style="list-style-type: none"> • Minimum green • Walk • Pedestrian clearance • Yellow clearance • Red clearance • Red revert • Overlap Green 	<input checked="" type="checkbox"/>	<input type="checkbox"/>																												

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2D2.4	A bike green interval shall be provided that will replace the phase minimum green if the interval time is larger than the min green time and if a detector input designated as a bike detector has been activated.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D2.5	Two Walk and Pedestrian Clearance intervals shall be provided for each phase per timing plan. The second Walk and Pedestrian Clearance shall be activated by a time base action plan.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D2.6	Two vehicle extension intervals shall be provided for each phase per timing plan. The active vehicle extension interval shall be selected by a time base action plan.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D2.7	If enabled, a Delay Green timer shall delay the vehicle phase from starting until the timer has expired. This shall provide an additional all red for the vehicles movement until the timing is complete.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D2.8	The Pedestrian Walk interval shall extend from Walk to the smaller of the Walk Max time or the phase maximum in effect with a constant input from the "Walk Extension detector".	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D2.9	Volume density intervals shall include actuations before and cars waiting. Actuations before added shall provide a user-specified number of actuations that must occur before adding variable (added) initial time. Cars waiting shall provide a user specified number of actuations, or cars waiting, that must occur before starting gap reduction. Gap reduction shall be initiated by either time before reduction or cars waiting, whichever reaches its maximum value first.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2D2.10	The controller shall be capable of dynamically extending the maximum green time for each phase based on vehicle demand. Three maximum green intervals shall be selectable per phase based on either time-of-day, coordination pattern or external input. The initial interval shall be selectable as Max 1, Max 2, or Max 3. If the phase terminates due to max-out for two successive cycles, then the maximum green time in effect shall automatically be extended by a dynamic max step interval on each successive cycle until it is equal to dynamic maximum. If the phase gaps out for two successive cycles, then the maximum green time shall be reduced by the dynamic max step time until it reaches to the original max value.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D2.11	Each phase shall have a red maximum timing interval. An input (red extension) shall extend the all red period of the assigned phase as long as the detector input is true. This input must be true within the all red time of the assigned phase to be able to extend the all red period. If this detector fails then the all red extension feature shall be disabled.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D3	<u>Overlaps:</u>		
2D3.1	The controller shall provide sixteen internally-generated overlaps (A – P). These shall be individually programmable as standard, other (see section 5.3.2) or minus green/yellow. The green, yellow and red intervals shall be individually programmable following termination of the parent phase. The overlaps programmed as minus green/yellow overlaps shall provide overlap green when any of the overlap phases are green or when in transition between overlapped phases and a modifier phase is not green. The overlap will be yellow when an overlapped phase is yellow and the modifier phase is not yellow and none of the overlapped phases are next.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D3.2	The other overlap option shall provide for protected, pedestrian protected, not overlap, trailing, leading and advance green programming.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D3.3	A protected overlap shall be green, yellow or red like a normal overlap except its outputs shall be blank when the protected phase is green, or the controller is transitioning to a non-included phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2D3.4	A pedestrian protected overlap shall be green under the following conditions: <ul style="list-style-type: none"> • When an included phase is green and the protected pedestrian is NOT in walk or pedestrian clearance • When the controller is in transition between included phases and a pedestrian protected phase is not next • After servicing an included phase pedestrian demand if there is enough time before max out to service the overlap minimum green 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D3.5	The controller shall provide the capability of sixteen pedestrian overlaps. These shall be capable of overlapping the pedestrian displays of any combination of phases with a pedestrian movement.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D3.6	Overlap functions shall be programmable from the controller keyboard.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D4	<u>Conditional Service</u>		
2D4.1	The controller shall provide a programmable conditional service feature. When selected, the controller shall service an odd-numbered phase once normal service to that phase has been completed and enough time for additional service exists on the concurrent even phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D4.2	A conditional service minimum green time shall be programmable for each phase. This interval shall ensure a minimum green if the phase is conditionally served.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D4.3	It shall be possible to program the controller to re-service the even phase after conditionally serving an odd phase. Once an even phase has been conditionally re-served, the odd phase shall not be conditionally served again until returning to the concurrent group that is timing.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5	<u>Additional Features</u>		

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2D5.1	The following features shall be programmable for each phase in each of four separate detector plans: <ul style="list-style-type: none"> • Locking/non-locking detector memory • Vehicle recall • Pedestrian recall • Maximum recall • Soft recall • No-rest phase • Enable Added Initial 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.2	Also programmed by phase shall be: <ul style="list-style-type: none"> • Phase in use • Exclusive Pedestrian phase 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.3	Soft recall shall return the controller to the programmed phase in the absence of other calls.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.4	If a phase is designated as a no-rest phase the controller shall not rest in the phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.5	The controller shall permit power start and external start to be individually programmed by phase and interval. Start intervals shall be green, yellow red, or yellow with overlaps forced yellow.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.6	During a power start condition, the controller shall be capable of timing an all-red or flash interval before the power start phase(s) and interval are displayed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.7	The controller shall provide guaranteed passage operation on a per phase basis. When selected, this feature shall provide a full passage (vehicle extension) interval when a phase gaps out with a gap in effect less than the vehicle extension interval (preset gap).	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.8	The controller shall provide both single and dual entry operation. When selected, dual entry shall cause the controller to ensure that one phase is timing in each ring.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.9	It shall be possible via keyboard selection to inhibit the service of a phase with other phase(s) within the same concurrent group.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2D5.10	The controller shall provide the following additional selectable pedestrian functions: <ul style="list-style-type: none"> • Actuated phase rest in WALK • Flashing WALK output • Pedestrian clearance protection during manual control • Pedestrian clearance through yellow • Pedestrian indications remain dark with no call • Pedestrian timing shall be capable of being carried over from one phase to another 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.11	Programming shall be provided to inhibit re-service of odd phases (left turns) within the same concurrent group.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.12	The controller shall provide a programmable simultaneous gap termination feature. When programmed, phases in both rings shall gap out together in order to terminate the green interval and cross the barrier.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.13	The controller shall provide automatic flash selection per the requirements of the MUTCD. Both the flash entrance and exit phases shall be programmable through the keyboard, and flashing shall be controlled by either setting the fault/voltage monitor output to be FALSE or by flashing through the load switch driver outputs. If flash desired through the load switches, both the phase and overlap outputs shall be flashed either yellow or red as selected by the operator. Automatic flash shall be selectable by external input, system command, or time of day action plan.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2D5.14	The controller shall provide dimming for selectable load switch outputs. Dimming shall be accomplished by inhibiting the selected outputs for alternate half cycles of the 120 VAC line. Dimming shall be controllable by time of day and an external input; both functions must be TRUE for dimming to occur. Programming shall permit individual dimming of the Green/Walk, Yellow/Ped Clear, Red/Don't Walk outputs for each load switch.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E	Coordination		

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2E1	<u>Coordination Patterns</u>		
2E1.1	A minimum of 120 coordination patterns shall be provided. Each pattern shall allow selection of an independent cycle length, offset value and split pattern. The coordination patterns shall be selected using telemetry (system), hardwire, or non-interconnected (time base) coordination commands.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E1.2	The coordination patterns shall be selected by the coordination command using the following formats: <ul style="list-style-type: none"> • Pattern – This format shall allow selecting the coordination patterns directly, that is, commanding Plan 1 selects Pattern 1. Pattern command shall include 1-120 patterns, pattern 254 shall select free and pattern 255 shall select flash. • Standard – This format shall allow selecting the coordination patterns using a pattern number derived from a cycle offset-split command. Each pattern shall be assignable to a specific cycle-offset-split combination. The coordination pattern shall be selected using the formula $((((\text{Cycle} - 1) * 20) + ((\text{Split} - 1) * 5) + \text{Offset}))$. • TS2 – This format shall allow selecting the coordination patterns as a function of Timing Plan and one of three offsets. With this format a minimum of 20 Timing Plans shall be available for selection of one of sixty coordination patterns. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2E1.3	The following functions shall be programmable in each coordination pattern: <ul style="list-style-type: none"> • Cycle length • Split pattern • Offset value • Alternate-phase sequence • Split and offset in seconds or percentage • Crossing artery pattern • Permissive timing • Action plan • Coordinated phase split extension • Timing plan • Actuated rest in walk • Phase re-service • Ring extension • Split demand pattern • Ring displacement • Directed split preferences • Special function outputs 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E1.4	The following functions shall be programmable for each of the 120 Split patterns: <ul style="list-style-type: none"> • Coordinated phase • Split value by phase • Omit by phase • Min recall by phase • Max recall by phase • Pedestrian recall • Max and Pedestrian recall 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E2	<u>Cycle Length</u>		

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2E2.1	One cycle length shall be provided for each coordination pattern. The cycle shall be adjustable over a range of 30-255 seconds in 1-second increments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E2.2	The cycle length shall serve as the reference time for all coordination timing.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E3	<u>Synchronization</u>		
2E3.1	For systems with a single system sync pulse, coordination timing shall be synchronized to the leading edge of that pulse, which shall serve as the master zero reference for all offset timing.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E3.2	For hardwire systems with multiple sync pulses, the coordinator shall lock onto the correct sync by trying different syncs and checking for reoccurrence during successive cycles.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E3.3	After a valid system sync pulse has been received the coordinator shall check for the proper occurrence of the system sync pulse during each subsequent cycle. If a sync pulse does not occur, the coordinator shall self-sync and continue to operate with the last set of coordination commands for a programmable number of cycles from 0-255. If a sync pulse does not occur within the programmed period (or until the first sync pulse is received), the coordinator shall revert to the non-interconnected coordination mode.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E4	<u>Offset</u>		
2E4.1	Offset shall normally be defined as the time period from the system sync pulse to the beginning of the leading coordinated phase green (local zero). The coordinator shall also be capable of referencing the offset to the beginning of the lagging coordinated phase green, coordinated phase yield or start of yellow point.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E4.2	Offsets shall be programmable using both percent and seconds. The range shall be from 0-99% of the cycle length in 1% increments or 0-254 seconds in 1-second increments. An offset value of 255 shall result in free.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2E4.3	Offset changes shall be achieved by adding or subtracting cycle time over a maximum of three cycle periods to allow a smooth transition to the new offset. Other offset change methods shall be adding 20% to each cycle or to snap to the sync point once the permissive period are complete and the coordinated phases are green. Offset correction using dwell shall also be selectable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E5	<u>Split</u>		
2E5.1	Each split shall provide a split interval for each of sixteen phases. The split interval shall be programmable using percent or seconds. The range shall be from 0-99% of the cycle length in 1% increments or 0-255 seconds in 1-second increments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E5.2	Split interval settings shall determine the maximum time, including vehicle clearance (yellow and red), for a non-coordinated phase, or the minimum time for a coordinated phase. Phase termination shall be controlled by establishing a force-off point for each phase within the cycle. Except for the coordinated phases the force-off point shall be selectable to be a fixed point within the cycle or allowed to float. If floating force-offs are selected each phase shall time no more than its own split interval.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E5.3	During coordination, it shall be possible to operate a coordinated phase as actuated or non-actuated. If a coordinated phase is actuated, vehicle detections shall permit the coordinator to extend a phase beyond the normal yield point. Extended coordinated phase green shall be selectable using the same range as split interval settings (percent or seconds). If actuated coordinated phases are used they shall be able to have actuated or non-actuated (walk rest) pedestrian movements.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E6	<u>Permissive Periods</u>		
2E6.1	Permissive periods shall be provided to control the time period during which coordinated phases are released to service calls on non-coordinated phases.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2E6.2	All permissive timing shall begin at the lead coordinated phase yield point. A yield point shall be automatically computed for the coordinated phase in each ring. The coordinated phase yield points shall allow the coordinated phases to yield independent of each other. The yield point shall be the point at which the coordinated phase is released to allow the controller to service calls on non-coordinated phases. The computation shall take into account the coordinated phase split interval plus pedestrian and vehicle clearance times.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E6.3	Automatic permissive period operation shall be provided by automatically calculating a permissive period for each non-coordinated phase. The permissive period shall consist of a separate vehicle and pedestrian period computed from the phase split interval and the vehicle/pedestrian minimum time. The controller shall answer a call only during the associated phase permissive period. However, once the controller has been released to answer a call, all remaining phases shall be served in normal sequence.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E6.4	Single permissive period operation shall be provided by defining a single time period per cycle beginning with the yield point during which the controller is allowed to answer phase calls for any phase. The duration of this period shall be selectable in each coordination pattern.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E6.5	Dual-permissive period operation shall also be provided. During the first permissive period, the controller shall answer only vehicle or pedestrian calls on the phases following the coordinated phase. If the controller yields to a call during this period, calls on the remaining phases are served in normal rotation. During the second permissive period, the controller shall answer calls on all remaining phases except the first permissive phase. The duration of the two permissive periods, and the time at which to start the second permissive period (displacement), shall be selectable in each coordination pattern.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E7	<u>Phase Re-Service</u>		

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2E7.1	If actuated coordinated phases are in use it shall be possible to re-service non-coordinated phases within the same cycle if sufficient time remains. A phase shall be re-serviced only if the permissive period for the phase indicates there is sufficient time remaining in the cycle to service the phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E7.2	Phase re-service shall be capable of being enabled/ disabled in each coordination pattern.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E8	<u>Transition Cycles</u>		
2E8.1	The controller shall provide a smooth and orderly transition when changing from free operation to coordinated operation and from one coordination command to another.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E8.2	During a free-to-coordinated transition, the controller shall initiate a pick-up cycle beginning upon receipt of a sync pulse and a valid coordination command. The controller shall then enter coordination mode upon crossing a barrier or if resting in the coordinated phases.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E8.3	Each coordination command shall select a pattern. A command change shall be implemented concurrent with a sync pulse. Cycle, offset, and split changes shall not take effect until local zero.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E9	<u>Crossing Artery Control</u>		
2E9.1	The coordinator shall be capable of implementing dual coordination at an intersection where two arterials are under control of separate masters.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E9.2	An external input shall enable dual coordination. Once enabled, the coordinator shall place a continuous call on the crossing artery phases so as to ensure that these remain green for their full split interval.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E9.3	The coordinator shall output a crossing artery sync signal to indicate the beginning of the crossing artery phase split interval.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E9.4	Dual coordination shall force a selectable crossing artery split plan to be used so as to allow a particular split to be optimized for dual coordination in each coordination pattern.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E10	<u>Local Split Demand</u>		

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2E10.1	The coordinator shall provide a minimum of two split demand detector inputs, which shall allow the selection of a preferred split plan based on intersection demand.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E10.2	If the split demand detector indicates continuous vehicle presence during a programmed monitoring period beginning with the onset of a selected phase green, the coordinator shall force a selectable split plan to be in effect during the next cycle. This split plan shall remain in effect for a selected number of cycles from 0-255. A specific split plan shall be capable of being selected in each coordination pattern.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E11	<u>Adaptive Split Demand</u>		
2E11	The coordinator shall provide a method to select the split using measurement of each phase's green utilization. From the measurement the coordinator shall determine which phase or phases had excess time that was not used during the last measurement period. Then the excess time shall be added to the first set of preferential phases. If the first set of preferential phases gapped out during the last measurement period, then the excess time will be added to a second set of preferential phases. If both sets of preferential phases gapped out during the last measurement period then the time shall be added to the beginning of the coordinated phases.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E12	<u>Free Mode</u>		
2E12.1	The coordinator shall provide a free mode of operation, where all coordination control is removed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E12.2	Free mode operation shall be selectable by coordination commands, by external input or by keyboard entry.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E12.3	The coordinator shall revert to the free mode when active controller inputs or functions would interfere with coordination. Such inputs or functions shall include the following: <ul style="list-style-type: none"> • Manual control enable • Stop time • Automatic flash • Preemption 	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No.	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
1.4-			
2E12.4	The coordinator shall provide an active free mode, where coordination control is removed but the coordinator continues to monitor system sync so as to keep its timing in step with the system master.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E13	<u>Manual Control</u>		
2E13	The controller shall allow manual override of the current coordination command from the keyboard. The manual command shall allow selection of any coordination pattern to be in effect.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E14	<u>Interconnect Modes</u>		
2E14.1	Interconnect Modes: The coordinator shall be capable of operating with any of the following interconnect types: <ul style="list-style-type: none"> • Non-interconnected coordination (time-based) • Telemetry • Hardwired 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E14.2	The coordinator shall be compatible with fixed-time interconnect, which provides the sync pulse superimposed on the offset lines. It shall also operate within an interconnected system using a separate sync line. The non-interconnected coordination mode shall serve as a backup when using telemetry or hardwired interconnect.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2E15	<u>Master Coordinator</u>		
2E15	The coordinator shall output the coordination command, including sync pulse. This feature shall permit the controller to be used as a time-of-day master in a hardwired interconnected system.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F	<u>Preemption</u>		
2F1	<u>Railroad-Fire-Emergency Vehicle Preemption</u>		
2F1.1	The ten railroad-fire-emergency vehicle preemptors shall be selectable as a priority or non-priority type. Priority preemptor calls shall override non-priority preemptor calls. Low-numbered priority preemptors shall override higher-numbered priority preemptor calls. Non-priority preemptor calls shall be serviced in the order received.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2F1.2	Each preemptor shall provide a locking and non-locking memory feature for preemptor calls. If a preemptor is in the non-locking mode and a call is received and dropped during the delay time, the preemptor shall not be serviced.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.3	Preemptor timing intervals shall be programmable from 0-255 in one-second increments or 0-25.5 in one-tenth second increments, depending on function. Delay, max presence and duration timing intervals shall be programmed from 0 – 65535 seconds in one-second increments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.4	A programmable delay time interval shall be provided to inhibit the start of the preemption sequence. This interval shall begin timing upon receipt of a preemption call. This time shall be programmable from 0-255 seconds in one second increments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.5	An inhibit time shall be provided as the last portion of the delay time interval. During this time, phases that are not part of the preempt sequence shall be inhibited from service. This time shall be programmable from 0-65535 seconds in one second increments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.6	A programmable extend input shall cause the preemptor to remain in the dwell interval following the removal of the preempt call. If a preempt call is reapplied during this time, the preemptor shall revert to start of dwell interval. This time shall be programmable from 0-25.5 seconds in one-tenth second increments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.7	A programmable duration time shall be provided to control the minimum time that a preemptor remains active. This time shall be programmable from 0-65535 seconds in one second increments.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.8	A programmable maximum time shall be provided to control the maximum time that a preemptor input remains active and still be recognized by the controller. Once failed, the input must return to inactive state to be recognized again.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2F1.9	Phases timing at the beginning of a preemption sequence shall remain in effect for a minimum time before the controller advances to the next sequential interval. If the phase has been timing for longer than the programmed preemptor minimum time, the controller shall immediately advance to the next sequential interval. Minimum times shall be programmable for the following intervals: <ul style="list-style-type: none"> • Green/walk/pedestrian clearance • Yellow • Red 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.10	A phase shall advance immediately to pedestrian clearance if it has been timing a WALK interval at the beginning of a preemption sequence. It shall be possible to time the minimum pedestrian clearance through the yellow interval, or alternately to advance immediately to yellow. During preemption, pedestrian indicators shall be selectable as being a solid DONT WALK, OFF (blank) or fully operational.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.11	If an overlap is in effect when the preemption sequence begins, it shall be possible to terminate the overlap so that it remains red for the remainder of the preemption sequence. Overlaps terminating or forced to terminate shall time the preemptor minimum yellow and red clearance times.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.12	Each preemptor shall provide user-programmable green, yellow and red track clearance intervals. These shall begin timing immediately after the preemptor minimum red interval.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.13	Up to four permissive phases shall be selectable as track clearance phases. During the track clearance period, the selected phases shall time the track clearance green, yellow and red intervals once, and then advance to the hold interval. If track clearance phases are not selected the track clearance interval shall be omitted from the preempt sequence. Controller interval timing shall be used if track clearance interval times have been programmed as zero.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2F1.14	The preemption hold interval shall begin immediately after track clearance. It shall remain in effect until the preemptor duration time and minimum hold times have elapsed and the preemptor call has been removed or the preemptor maximum time has been exceeded. During the preemption hold interval, any one of the following conditions shall be selectable: <ul style="list-style-type: none"> • Hold phase green • Limited phase service • All red • Flash 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.15	Any valid phase, except a track clearance phase, shall be selectable as a hold phase. If hold phases are not selected, the controller shall remain in all red during the hold interval. If flash is selected for the hold interval, up to two permissive phases shall be selectable to flash yellow, and the remaining phases shall flash red. Overlaps associated with the phases flashing yellow shall also flash yellow unless they have been forced to terminate, in which case they shall remain red.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.16	The preemptor shall immediately cause flashing operation if the preemption input and the track interlock input are not in opposite states and the track interlock function is enabled.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.17	Each preemptor shall provide a user-programmable green, yellow and red hold interval, during which the hold phase(s) shall operate normally, except that the minimum green interval time shall equal the hold green time. At the completion of the hold green interval, the controller shall time the hold yellow and red clearance intervals prior to transfer to the exit phases.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.18	Up to four permissive exit phases shall be selectable to time after the preemption sequence has been completed. These shall serve as transition phases to return the controller to normal operation. It shall also be possible to place calls on selected phases upon exiting preemption. The option shall be provided to cause the preemptor to exit preemption to the correct phase to maintain coordination.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2F1.19	Each preemptor shall provide a user-programmable exit maximum time. Upon exiting the preemption sequence, this time shall serve as the maximum green time in effect for one controller cycle for all phases except hold phases.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.20	Preemptor linking shall permit preemption sequences, where lower-priority preemptors may call the higher-priority preemptors from their preemption sequence.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.21	Preemptor active outputs shall be provided for each of the preemptors. The output shall be set to ON when the preemption sequence begins and shall remain ON for the duration of the sequence. It shall also be possible to program preempt active outputs to be ON only during preempt hold intervals. Additionally, it shall be possible to program the non-active, non-priority preemptor outputs to flash while another preemptor is active.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F1.22	Preemptors shall normally override automatic flash. It shall be possible to inhibit this feature for each preemptor.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F2	<u>Bus Preemption</u>		
2F2.1	Ten bus preemptors shall provide control for bus or other low-priority vehicles. Bus preemptors shall have low priority and shall be overridden by railroad-fire-emergency vehicle preemptor calls.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F2.2	The preemptor shall be programmed to accept either a 6.25 pulse-per-second signal with a 50% duty cycle or a solid input to identify a bus preemptor call. Bus preemptor calls shall be capable of preemptor call memory and shall be served in the order received.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F2.3	Bus preemptor timing intervals shall be programmable from 0-255 in one second increments or 0-25.5 in one-tenth second increments depending on the function.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2F2.4	A re-service time shall be provided to avoid excessive utilization of the same bus preemptor. If a call is received before the re-service time has elapsed, the bus preemptor shall not be re-serviced. If re-service time has not been entered then all phases with a call when leaving the bus preemption sequence shall be serviced before the bus preemptor may be served again.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F2.5	Bus preemptors shall provide delay, inhibit, and maximum time functions similar to those for railroad-fire-emergency vehicle preemptors described above.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F2.6	Bus preemptors shall provide the following entrance intervals: <ul style="list-style-type: none"> • Green/walk/pedestrian clearance • Yellow • Red 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F2.7	At the completion of the entrance red clearance, the bus preemptor shall advance to the hold green interval. During this interval, up to four permissive phases shall be selectable to remain green until the minimum hold time has elapsed and the bus preemptor call has been removed or the preemptor maximum time has been exceeded.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F2.8	It shall be possible to program the controller to allow concurrent phases to be serviced for a bus preemptor with only one phase selected as the hold interval phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F3	<u>Preemption Safeguards</u>		
2F3.1	If a preemptor call is active when power is restored to a controller, the fault/voltage monitor output shall be set to FALSE, placing the intersection in flash. Similarly, if external start is applied during a preemption sequence, the intersection shall be set to flash. Intersection flash shall remain in effect until the preemptor call has been removed and the preemptor duration time has elapsed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F3.2	An input shall be provided to stop timing of the current active preemptor under control of the MMU/CMU.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2F3.3	A preemptor safety interlock shall be provided to cause the intersection to go into flash whenever the controller has been removed or has not been programmed for preemption. This shall be achieved with an appropriate signal to the MMU/CMU.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F4	<u>Transit Signal Priority</u>		
2F4.1	The controller shall include a transit signal priority algorithm that provides for transit vehicle movement through the intersection, while not interrupting coordination or skipping phases.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F4.2	A check-in detector input shall be provided that senses the arrival of the transit vehicle. When active this input shall initiate Transit Signal Priority (TSP).	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F4.3	A TSP delay shall delay the beginning of TSP operation until a set interval after check-in.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F4.4	A check-out detector input shall determine the departure of the transit vehicle.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F4.5	Assignment of a single pulse from the check-in detector and check-out detector to the controller inputs shall be programmable to any controller input. Inputs from devices that continuously pulse (pulsing as long as the vehicle requires TSP) shall be through EVP 1-4, for a controller with a C1 connector, or through Preemptor inputs 3 – 6, on a controller with a MSD connector.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F4.6	When under coordination the TSP sequence shall use alternate split times to accommodate transit vehicles while maintaining coordination.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2F4.7	When under free operation the TSP sequence shall use alternate maximum times to accommodate transit vehicle while not skipping phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G	<u>Time-Based Control and Non-Interconnected Coordination</u>		
2G1	<u>Clock/Calendar Functions</u>		

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2G1.1	The controller shall provide a time-of-day (TOD) clock, which shall be used for all time-based control functions. The only required clock settings shall be the current time (hour, minute and second) and date (month, day and year). Day of week and week of year shall be automatically computed from the date setting. It shall also be possible to set the number of hours that the local standard time is ahead or behind Greenwich Mean Time.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G1.2	During normal operation, the TOD clock shall use the power line frequency as its time base. When power is removed, the time shall be maintained by a crystal oscillator for up to 30 days. The oscillator shall have a timing accuracy of +/- 0.005% over the entire NEMA temperature range as compared to the Universal Coordinated Time Standard.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G1.3	In addition to entering time and date via the keyboard, it shall be possible to download the information from another controller, a computer or a system master.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G1.4	The controller shall include a time reset input. This feature shall reset the TOD clock to 03:30 whenever the time reset input is TRUE.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G1.5	The TOD clock shall automatically compensate for leap year and shall be programmable to automatically switch to daylight savings time.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G2	<u>Time-Based Control</u>		
2G2.1	Time-based control shall utilize a day plan program format. The month program shall consist of 200 programmable schedules, each assignable to one of sixteen day programs. Each day program shall consist of from 1 to 50 program steps which define a program for the entire day. Each program step shall be programmed with a starting time and an action plan number. The day plans shall also be assigned to days of the week and days of the month.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2G2.2	Time based control shall use action plans to assign: <ul style="list-style-type: none"> • Coordination pattern number • Vehicle detector plan number • Controller sequence • Timing plan • Vehicle detector diagnostic plan • Pedestrian detector diagnostic plan • Automatic flash • System override • Detector log • Dimming • Special functions • Auxiliary functions • By-Phase functions • Pedestrian recall • Walk 2 enable • Vehicle extension 2 enable • Vehicle recall • Vehicle max recall • Max 2 enable • Max 3 enable • Conditional service inhibit • Phase omit 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G2.3	There shall be a minimum of 36 holiday or exception day programs, which override the normal day program. Holiday programs shall be capable of being set as floating (occurs on a specific day and week of the month) or fixed (occurs on a specific day of the year). It shall be possible to program a fixed holiday so that it automatically repeats in the following year.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2G2.4	It shall be possible to manually force any of the action plans to override the current action plan. The forced plan shall be entered from the keyboard and shall remain in effect until removed.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G3	<u>Non-Interconnected Coordination</u>		
2G3.1	A minimum of 200 time base schedule programs shall be available for the day-programs. These shall not have to be entered in any special sequence. It shall be possible to add and delete steps from a day-program without affecting any other day-program. Each of the program steps shall permit selection of the following functions: <ul style="list-style-type: none"> • Day program assignment • Start time • Action plan 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G3.2	Selection of system override in an action plan shall allow the coordination pattern selected by the action plan to override the current telemetry or hardwire system commanded coordination pattern.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G3.3	When operating in the non-interconnected coordination mode the synchronization point for all cycles shall be referenced to a user selected reference time (sync reference), last event or last sync as selected from the keyboard. The sync reference time is that time at which all cycles shall be reset to zero.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2G3.4	If the sync reference time is selected, the synchronization point for the cycle selected by the current program step shall be computed using the present time, sync reference time, and cycle length. The synchronization point shall occur whenever the present time is such that an even number of cycle length periods has occurred since the sync reference time.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H	Detectors		
2H1	<u>Detector Functions</u>		

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2H1	The controller shall provide a minimum of 64 vehicle detector inputs. Each input shall be assignable to any phase and be programmable as to detector function. Extend and delay timing shall be provided for each detector. Each detector shall be capable of operating in a lock or non-lock mode. The controller shall also be capable of providing 16 pedestrian detector inputs. Each pedestrian detector shall be assignable to any phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H2	<u>Detector Cross Switching</u>		
2H2	The controller shall provide detector cross switching, which permits all vehicle detectors to alternately place calls on their assigned phases and their assigned cross switch phases. If the assigned phase is not green and the cross-switch phase is green, the detector shall place calls on the cross switch phase. If the assigned phase is omitted for any reason, the detector shall place calls on the cross switch phase.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H3	<u>Detector Types</u>		

**SECTION ONE
SPECIFICATIONS**

CITY OF GLENDALE
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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2H3	<p>Each vehicle detector shall be user-programmable to operate as one of the following 3 detector types:</p> <ul style="list-style-type: none"> • Type 0 (zero): supports all NTCIP or standard detector functionality. • Type 1: (GREEN DELAY) The first detection received when the phase goes green is recognized immediately, whether the detector is active when green starts or is activated after the green is timing. Detections received before the first timeout of the extension interval are also recognized immediately. Once the detector extension interval (not the phase extension interval) times out, all further detector inputs are recognized only if continuously present for a period equal to the programmed delay time AND the delayed signal is NOT extended. The first detection received when the phase goes green, whether present when green starts or received later, is recognized immediately. Detections received before the first timeout of the extension interval are also recognized immediately. Once the detector extension interval (not the phase extension interval) times out, all further detector inputs are recognized only if continuously present for a period equal to the programmed delay time AND the delayed signal is NOT extended. • Type 2: (STOP BAR WITH EXTEND TIME AND RESET) The detector input must be true when assigned phase green starts else the detector is disconnected for the balance of phase green. If the detector input is true when phase green starts the extension timer is reset while the input remains true. When the detector input is removed the extension timer begins running. If another detector input is received before extension time expires, the extension timer is reset for the duration of the input and once again begins timing when the input goes false. This action is repeated until the extension timer times out, at which time it is disconnected for the balance of phase green. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2H4	<u>System Detectors</u>		
2H4.1	Each detector input shall be capable of functioning as one of 16 system detectors.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2H4.2	Vehicle detectors shall be capable of being assigned to a minimum of 16 speed detectors. Speed shall be detected using both one and two detector configurations. Speed shall be computed using a keyboard entered average vehicle length and loop length for a one-detector configuration. When using two detectors, speed shall be calculated using a keyboard entered distance between detectors and travel time between detectors.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I	System Communications		
2I1	<u>On-Street Master Communications</u>		
2I1	The controller shall be capable of communicating with an on-street system master. This capability shall be provided by a separate telemetry module, which shall be included in the controller when required by the plans and specifications. The telemetry module shall receive system master commands and data transmissions. In addition, it shall transmit the controller status, data base and system detector information to the system master.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I2	<u>System Commands</u>		
2I2.1	The telemetry module shall allow the controller to receive, as a minimum, the following commands: <ul style="list-style-type: none"> • Cycle, offset, and split (coordination pattern) • System sync • Special function commands (minimum of four) • Free and flash mode commands • Time and date • Request for local status • Recall to Max 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I2.2	All commands must occur more than once in any three-second period in order to be recognized.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I2.3	All mode and special function commands shall be cleared after 20 minutes of loss of communication between controller and system master.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2I2.4	Status Data – The status of each of the following functions shall be transmitted to the system master in response to a local status request: <ul style="list-style-type: none"> • Green and yellow status for all phases and overlaps • Walk and pedestrian clearance status for all phases • Vehicle and pedestrian detector status • Phase termination status • Local time • Coordination status • Command source • Sync or transitioning status of coordinator • Conflict flash status • Local flash status • Preempt activity and calls • Volume and occupancy data from a minimum of 16 system detectors • Speed data from a minimum of two speed detectors • Maintenance required (cabinet door open) status • Status of two user-defined alarms 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I2.5	Split Reporting – The status of each of the following parameters shall be calculated on a per-cycle basis and transmitted to the system master: <ul style="list-style-type: none"> • Actual time spent in each phase • Time of day at end of cycle • Phases forced off during cycle • Type of coordination operation • Whether transitioning to new offset • Cycle, offset, and split in effect during last cycle • Flash status if operation is Free 	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2I2.6	Upload/Download Capability – The telemetry module shall provide the capability to upload/download the entire intersection database. Phase assignments for overlaps and preemptors shall not be downloaded to preclude unsafe controller operation. It shall be possible to inhibit downloading of phases in use and left-turn head control. Data transfer shall not require the intersection to be in flash.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I3	<u>Telemetry</u>		
2I3.1	Telemetry shall utilize TDM/FSK data transmission from 1200 baud to 9600 baud over two pairs of wires. These may be leased lines (Type 3002, voice grade, unconditioned) or dedicated cable. Optional fiber optic communications capability shall also be available.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I3.2	The nominal transmitter output level shall be 0 dbm into a 600-ohm load. The receiver sensitivity shall be -34 dbm and shall be adjustable from -40 to +6 dbm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I3.3	Parity and error checking shall be employed to assure transmission and reception of valid data. Indicators shall be provided on the telemetry module to show telemetry activity as follows: transmit, receive carrier, and valid data.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I3.4	In the event of a telemetry failure, the controller shall revert to the non-interconnected coordination mode after it has self-synchronized for a number of cycles, which shall be selectable from 0-255.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I4	<u>Communications Protocols</u>		
2I4.1	The controller shall have the capability of supporting communications with traffic management systems using industry standard protocols with the installation of appropriate optional software.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2I4.2	At a minimum the controller shall have optional software to support the following protocol: NTCIP Level 2 as defined by Section 3.3.6 of NEMA TS2- 2003. NTCIP v02.06 capabilities shall include for all NTCIP mandatory and optional objects. The controller vendor shall provide access to all controller data via vendor specific objects. These and all other objects supported by the controller shall be defined in a standard MIB file.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I5	<u>Ethernet Communications</u>		
2I5	The controller shall have the capability of supporting communications through Ethernet. This communications shall be using internal circuitry.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I6	<u>External Clock</u>		
2I6	The controller shall have the capability of communicating with an external clock like a GPS or WWV clock in order to set its internal time of day clock.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I7	<u>Communications Ports</u>		
2I7.1	The controller shall as a minimum have the following internal communications ports: <ul style="list-style-type: none"> • Port 1 SDLC for communications to other devices in the cabinet • Port 2 Terminal port for communications with a computer for the purposes of uploading, downloading or upgrading the controller software • Port 3 Systems communications port. This port shall be provided to either communicate to an on-street master or a central computer system • An option circuit board shall be available to expand communications by adding two additional serial communications ports 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2I7.2	Serial communications shall operate at 1200 to 115.2 K baud	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J	<u>Diagnostics</u>		

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2J1	<u>General Diagnostic Features</u>		
2J1.1	The controller shall include both automatic and operator-initiated diagnostics. This capability shall be a standard feature and shall not require additional modules or software.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J1.2	Automatic diagnostics shall verify memory, MMU compatibility programming, and microprocessor operation each time power is reapplied to the controller. After power has been applied, diagnostics shall continually verify the operation of essential elements of the controller including at a minimum: PROM, EEPROM, communications, and the microprocessor.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J1.3	Operator initiated diagnostics shall allow the operator to verify proper operation of all controller input, output, communications, keyboard, and display functions. Both manual and automatic test modes shall be provided.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J2	<u>Detector Diagnostics</u>		
2J2.1	Time-of-day controlled detector diagnostics shall be provided that allow testing vehicle and pedestrian detectors for no activity, maximum presence, and erratic output.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J2.2	A minimum of eight detector diagnostic plans shall be provided. These plans shall be selectable on a time-of-day basis. This shall allow varying the detector diagnostic intervals to correspond with changes in detector activity.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J2.3	If a detector is diagnosed as failed, the associated phase shall be placed in one of the following keyboard selectable modes: <ul style="list-style-type: none"> • Detector fail recall from 1 to 255 seconds • Maximum Recall • Disable the detector from calling or extending 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2J2.4	Diagnostics for NEMA TS2 detectors connected to the controller using a Bus Interface.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K	<u>Logging</u>		
2K1	<u>Detector Logging</u>		

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2K1.1	The controller shall include a detector log buffer capable of logging volume, occupancy and average speed for selected vehicle and speed detectors.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K1.2	The detector-logging interval shall be keyboard selectable as 5, 15, 30, or 60 minutes.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K1.3	Detector logging shall be capable of being enabled or disabled by time-of-day.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K2	<u>Detector Failure Logging</u>		
2K2.1	The controller shall include a detector failure log buffer capable of storing a minimum of 100 time and date-stamped detector failure events. Once logged, detector failure events shall remain in the log until cleared or the log buffer capacity is exceeded at which time the oldest detector failure events shall be overwritten.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K2.2	All detector diagnostic failures shall be recorded in the detector failure log including: no activity, maximum presence, erratic output, watchdog failure, open loop, shorted loop, and excessive inductance change. If a detector recovers after a diagnostic failure, a detector on-line event shall be stored in the detector failure log.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2K2.3	Detector failure logging shall be capable of being disabled.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K3	<u>Event Logging</u>		
2K3.1	The controller shall include an event log buffer capable of storing a minimum of 200 time and date-stamped events or alarms. Once logged, events shall remain in the buffer until cleared or the log buffer capacity is exceeded at which time the oldest events shall be overwritten.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K3.2	At a minimum the following events shall be logged: communication failures, coordination faults, MMU and local flash status, preempt, power ON/OFF, low battery, and status of a minimum of two alarm inputs. An on-line event shall be logged when an event or alarm returns to normal status.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	COMPLY	
		YES	NO
2K3.3	If security is enabled, an event shall be logged when a user enters a data change. This event shall include the user's ID. It is necessary to log the first change only and not every change. Also an entry shall be recorded when a user logs in and out of the controller.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K3.4	Event logging shall be capable of being enabled or disabled for each category of event or alarm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2K4	<u>MOE Logging</u>		
2K4.1	The controller shall accumulate phase utilization data, phase termination data and detector data for a number of cycles selectable by the operator.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2K4.2	The MOE log shall include the number of gap outs, force offs and max outs per phase.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2K4.3	The MOE log shall include the mode of operation and phase utilization. If the controller is operating under coordination, the log shall include the pattern in effect and the average phase split for each period. If the controller is operating free, the log shall include the timing plan (1 – 4), the maximum in effect and the average phase maximum for each period.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2K4.4	Each logged period shall include the volume, number of stops and the delay per phase.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2K4.5	Each log period shall record the number of times a phase was skipped and the number of times walk was served per phase.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2L	<u>Warranty</u>		
2L	The traffic signal controller shall be warranted by the manufacturer against mechanical and electrical defects for a period of 2 years from date of shipment. The manufacturer's warranty shall be supplied in writing with each controller. Second party extended warranties are not acceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2M	<u>Replacement Coverage</u>		

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		COMPLY	
Item No. 1.4-	Specification – <u>TRAFFIC SIGNAL CONTROLLERS</u>	YES	NO
2M	If a malfunction occurs during the warranty period, the supplier shall, within two (2) weeks after notification furnish a like unit, module, or auxiliary equipment, for use while the warranted unit is being repaired.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2N	Reliability Clause		
2N.1	While under warranty, the isolation and repair of any unit malfunction shall be the responsibility of the supplier. Any unit experiencing a total of three failures that has twice been returned to the supplier for repair shall be replaced with a new unit of the same type at no charge to the City. The replacement unit's warranty shall be that of a new unit.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2N.2	Malfunctions do not include damage caused by lightning, power surges, negligence, acts of God, or use of equipment in a manner not originally intended by its manufacturer.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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1.5 SPECIFICATIONS AND COMPLIANCE – MALFUNCTION MANAGEMENT UNITS (MMUs)

The bidder shall check the YES or NO boxes for each specification on each page of SECTION ONE. If the bidder checks the NO box for any specification, the bidder must provide an explanation in accordance with Paragraph 2.4 of SECTION TWO, the SPECIAL TERMS AND CONDITIONS.

		COMPLY	
Item No. 1.5-	Specification – <u>MALFUNCTION MANAGEMENT UNITS</u>	YES	NO
1	Description		
1	Malfunction Management Unit (MMU) shall meet or exceed all specifications outlined in Section 4 (Malfunction Management Unit) of the National Electrical Manufacturers Association (NEMA) <i>Standards Publication TS2-2003 v02.06, Traffic Controller Assemblies With NTCIP Requirements.</i>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.3	The MMU shall include: <ul style="list-style-type: none"> • A display that continuously show full RYG(W) intersection status. • A 10/100 Mbps Ethernet communications port • Provide a time-stamped nonvolatile event log recording the complete intersection status as well as the AC line events, configuration changes, monitor resets, temperature and true RMS voltages • Supports the MUTCD flashing yellow arrow PPLT operation with two different mode for either TS-2 or TS-1 cabinet configurations. 	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Additional Requirements		
3A	<u>Warranty</u>		
3A	The MMU shall be warranted by the manufacturer against mechanical and electrical defects for a period of 2 years from date of shipment. The manufacturer's warranty shall be supplied in writing with MMU. Second party extended warranties are not acceptable.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3B	<u>Replacement Coverage</u>		
3B	If a malfunction occurs during the warranty period, the supplier shall, within two (2) weeks after notification furnish a like unit for use while the warranted unit is being repaired.	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3C	<u>Reliability Clause</u>		

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		COMPLY	
Item No. 1.5-	Specification – <u>MALFUNCTION MANAGEMENT UNITS</u>	YES	NO
3C	While under warranty, the isolation and repair of any unit malfunction shall be the responsibility of the supplier. Any unit experiencing a total of three failures that has twice been returned to the supplier for repair shall be replaced with a new unit of the same type at no charge to the City. The replacement unit's warranty shall be that of a new unit. Malfunctions do not include damage caused by lightning, power surges, negligence, acts of God, or use of equipment in a manner not originally intended by its manufacturer.	<input checked="" type="checkbox"/>	<input type="checkbox"/>

SECTION TWO
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2.1 INCORPORATION BY REFERENCE All responses shall incorporate by reference the Scope/Specifications, Special Terms and Conditions, Standard Terms and Conditions, and any attachments. The "Standard Terms and Conditions" applicable to this solicitation are posted on the Internet. They are available for review and download at the City of Glendale's, Materials Management Internet home page, www.glendaleaz.com/purchasing. Offerors are advised to review all provisions of the Standard Terms and Conditions for this solicitation.

2.2 RETURN OF OFFER *One CD-ROM containing the entire solicitation, contractor's response to solicitation (Offer) and an originally signed "Offer Sheet" (Section 3.0) and "Price Sheet" (Section Four). With exception to the signed Offer Sheet, a copy of the Price Sheet and an addendum (if issued), no Paper documents will be accepted. Response to the solicitation shall be in MS Word, Excel, PowerPoint and/or PDF format. Offers submitted in a format (paper or electronic) different than specified herein, may be rejected at the discretion of the City. If the offeror does not have this capability, companies such as Kinkos or Alphagraphics can provide this service at a nominal charge.*

The offeror shall complete all sections of the solicitation in the format given (i.e., Specifications, Offer Sheet and Price Sheet) in the space provided. If additional space is needed than what is given, enter "See Attachment A for detail".

Submittal of the CD-ROM by the offeror in response to this solicitation shall be construed as the offeror's intent to be bound by any resultant contract.

2.3 PREPARATION OF BID PACKAGE Only the following items shall be completed and returned. Failure to include all the items may result in a bid being rejected. Bid packages shall be submitted in the following order:

- 2.3.1 OFFER SHEET**, Section Three
- 2.3.2 PRICE SHEET**, Section Four
- 2.3.3 ADDENDUM**, Return all addenda
- 2.3.4 SPECIFICATIONS**, Information requested in Section One and Two (On CD-ROM only)

2.4 ALTERNATE OFFERS/EXCEPTIONS Offers submitted as alternates, or on the basis of exceptions to specific conditions of purchase and/or required specifications, must be submitted as an attachment referencing the specific paragraph number(s) and adequately defining the alternate or exception submitted. Detailed product brochures and/or technical literature, suitable for evaluation, must be submitted with the bid. If no exceptions are taken, City will expect and require complete compliance with the specifications and all Conditions of Purchase.

SECTION TWO
SPECIAL TERMS AND CONDITIONS

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- 2.5 PRICE** All prices quoted shall be firm and fixed for the specified contract period.
- 2.6 FOB POINT** Prices quoted shall be FOB destination to: CITY OF GLENDALE, ARIZONA.
- 2.7 TERM OF AGREEMENT** The term of agreement for this Bid shall be for a one year initial period.
- 2.8 OPTION TO EXTEND** The City may, at it's option and with the approval of the contractor, extend the term of this agreement an additional five (5) year(s), renewable on an annual basis. Contractor shall be notified in writing by the City Materials Manager of the City's intention to extend the contract period at least thirty (30) calendar days prior to the expiration of the original contract period. Price adjustments will only be reviewed during contract renewal.
- 2.9 REFERENCES** Provide with the bid, three letters of reference from companies for whom contractor has provided similar products/services in the last twelve months. Also include company name, address, phone number, contract person, a description of the products/services provided with a description of any major variation to the requirements of this Bid.
- 2.10 NOTICE OF INTENT TO AWARD** Information about the recommended award for this solicitation will be posted on the Internet. The information will be available for review on the City of Glendale's, Materials Management Internet home page www.glendaleaz.com/purchasing immediately after the City has completed its evaluation process of the offers received. If you have any questions, or would like further information about an intended award, contact the buyer immediately. Any protest must be submitted to the Materials Manager no later than seven (7) calendar days from the date of posting on the Internet.
- 2.11 COOPERATIVE USE OF CONTRACT** This agreement may be extended for use by other governmental agencies and political subdivisions of the State including all members of SAVE (Strategic Alliance for Volume Expenditures). Any such usage by other entities must be in accord with the ordinances, charter, rules and regulations of the respective entity and the approval of the Contractor and City. For a list of SAVE members click on the following link: <http://www.maricopa.gov/materials/SAVE/SAVE-members.PDF>
- 2.12 ESTIMATED QUANTITIES** Quantities listed are the City's best estimate and do not obligate the City to order or accept more than City's actual requirements during the period of this agreement as determined by actual needs and availability of appropriated funds. It is expressly understood and agreed that the resulting contract is to supply the City with its complete actual requirements for the contract period, except that the estimated quantity shown for each bid item shall not be exceeded by 50% without the express written approval of the Materials Manager.

SECTION TWO
SPECIAL TERMS AND CONDITIONS

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Any demand or order made by any employee or officer of the City, other than the Materials Manager, for quantities in the excess of the estimated quantities shall be void if the written approval of the Materials Manager was not received prior to the Contractor's performance.

SECTION THREE
OFFER SHEET

CITY OF GLENDALE
Materials Management

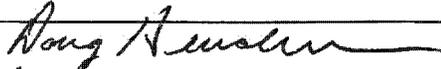
Solicitation Number: 07-86
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NOTE: In addition to completing this Section electronically and including it in the CD-ROM submittal, a printed version with original signature shall be submitted with CD-ROM at the time of Offer due date and time.

3.1 OFFER Proposer certifies that they have read, understand, and will fully and faithfully comply with this solicitation, its attachments and any referenced documents. Proposer also certifies that the prices offered were independently developed without consultation with any of the other proposers or potential proposers.

Date: 1-29-2008

Authorized Signature



Printed Name: Doug Henderson

Title: Western Regional Sales Manager

Authorized Signature E-mail Address: dhenderson@econolite.com

Company's Legal Name: Econolite

Address: 3360 East La Palma Ave.

City, State & Zip Code: Anaheim, CA 92806

Company E-mail Address: sales@econolite.com

Telephone Number(s): 714-630-3700

FAX Number: 714-630-5120

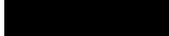
For questions regarding this offer: (If different from above)

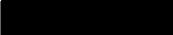
Contact Name: Lori MacIntyre

Phone Number: 714-630-3700

Fax Number: 714-630-5120

Email Address: lmacintyre@econolite.com

FEDERAL TAXPAYER ID NUMBER: 

Arizona Sales Tax Number: 

Tax Rate: 8.3%

Proposer certifies it is a: Proprietorship Partnership Corporation

Minority or woman owned business: Yes No

**SECTION FOUR
PRICE SHEET**

CITY OF GLENDALE
Materials Management

**Solicitation Number: 07-86
Traffic Signal Cabinets, Controllers and MMUs**

NOTE: In addition to completing this Section electronically and including it in the CD-ROM submittal, a printed version shall be submitted with CD-ROM at the time of Offer due date and time.

Company (Offeror's) Name: Econolite

Offeror may bid on 4.1, 4.2 or 4.3 below, or the offeror may bid on all three requirements. The City of Glendale reserves the right to make multiple awards, if that is in the best interest of the City.

4.1 Traffic Signal Cabinet

Mfg./Model: Econolite TS2 Type 1 Cabinet

4.1.1 Unit Price	Estimated Annual Quantity	4.1.2 Total Price
<u>\$13,355.00</u>	10	<u>\$133,550.00</u>

4.2 Traffic Signal Controller

Mfg./Model: Econolite P/N ASC3210111100000

4.2.1 Unit Price	Estimated Annual Quantity	4.2.2 Total Price
<u>\$2,350.00</u>	20	<u>\$47,000.00</u>

4.3 Malfunction Management Unit (MMU)

Mfg./Model: EDI MMU16-LE Econolite P/N 1133-017

4.3.1 Unit Price	Estimated Annual Quantity	4.3.2 Total Price
<u>\$1,025.00</u>	10	<u>\$10,250.00</u>

**SECTION FOUR
PRICE SHEET**

CITY OF GLENDALE
Materials Management

Solicitation Number: 07-86
Traffic Signal Cabinets, Controllers and MMUs

4.5 **DELIVERY** Bidder states that any items ordered against the requirements contract during the contract period will be delivered within 60 calendar days after receipt of the order.

4.6 **DISCOUNT/PAYMENT TERMS: Net 30**