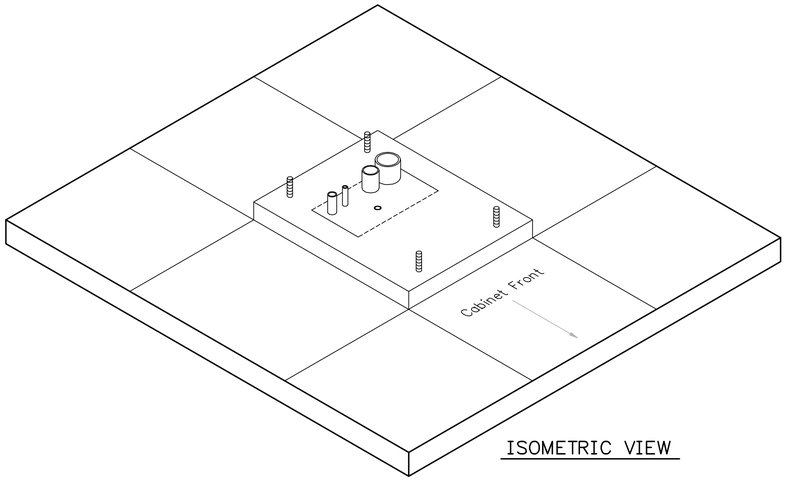
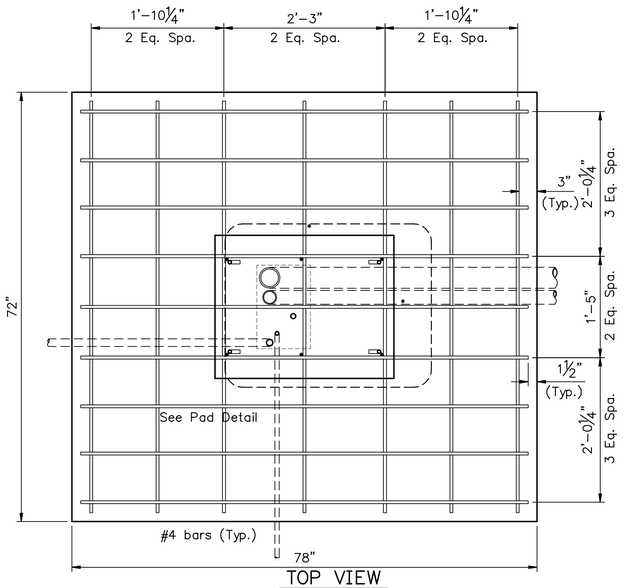
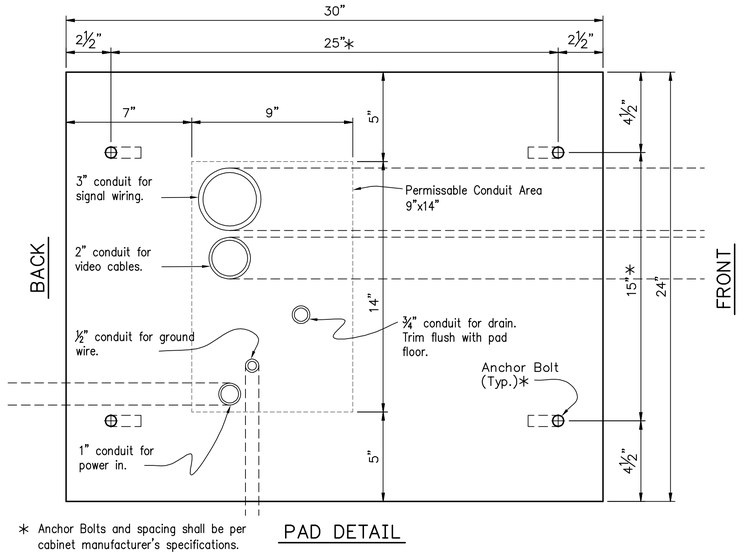
COUNTY	STATE	PROJECT NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SEDGWICK	KANSAS	####	####	####	####



ISOMETRIC VIEW

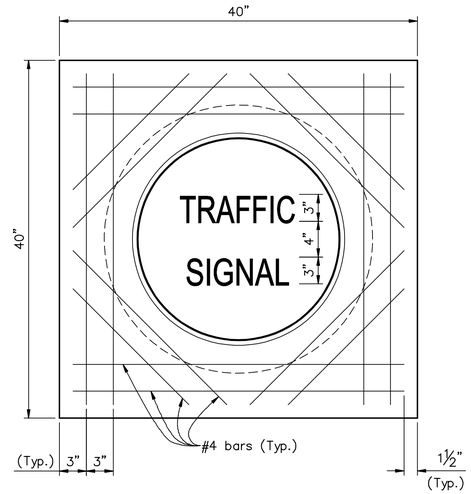


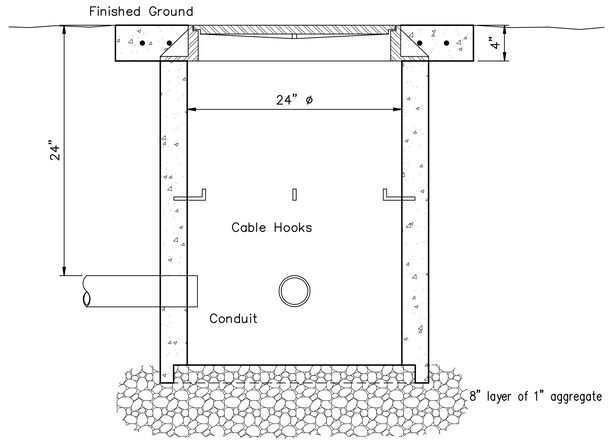
TOP VIEW



* Anchor Bolts and spacing shall be per cabinet manufacturer's specifications.

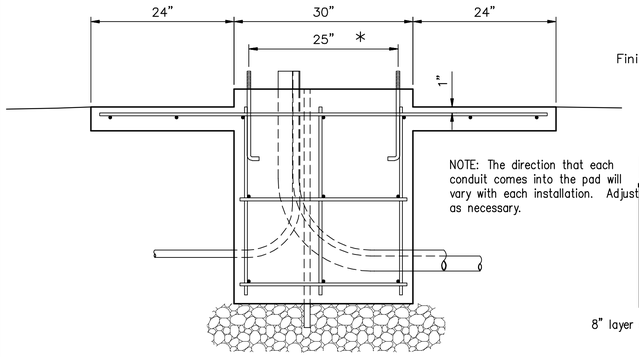
PAD DETAIL





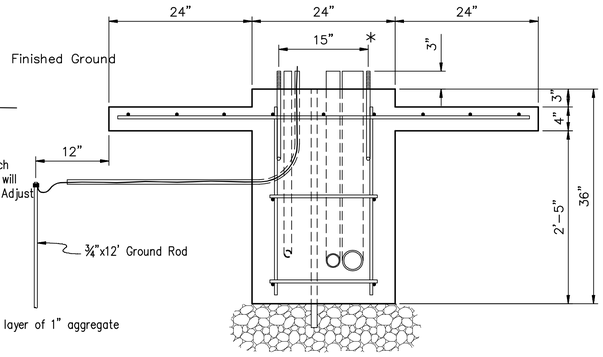
SERVICE BOX DETAIL

Service box ring and cover shall be cast iron unless otherwise noted.



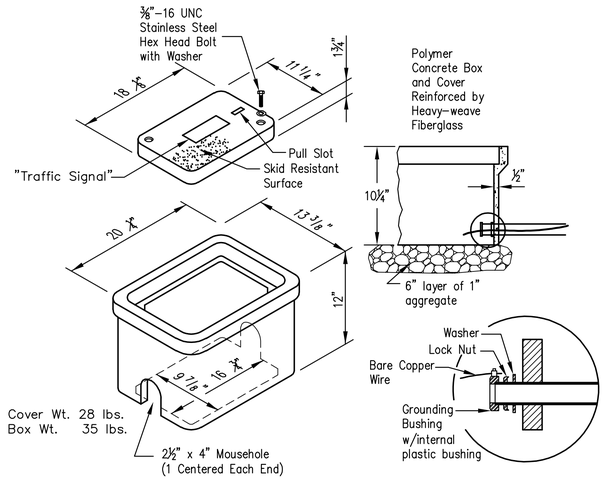
LEFT VIEW

NOTE: All conduits shall be electronically bonded by a grounding bushing and #6 bare copper wire.



FRONT VIEW

CONTROLLER PAD DETAILS



JUNCTION BOX DETAIL

Date	Description	By /Chk
8/2007	Update Conduit locations on Pad Details	DRS/MRB

####

TRAFFIC SIGNAL INSTALLATION DETAILS

CONTROLLER PAD & SERVICE BOX

TS 1-0

PREPARED BY
SEDGWICK COUNTY PUBLIC WORKS
HIGHWAY DEPARTMENT

LYNN T. PACKER, P.E. — DIRECTOR/COUNTY ENGINEER

SCALE	DESIGNED	DRAWN	CHECKED	SHEET NO.
NONE	M.R.B.	D.R.S.	M.R.B.	####
DATE	2/2006	2/2006	2/2006	

DWG: TS 1-0 thru 6-0

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NOTES for Pole/Pedestal/Power standard

The Engineer shall approve all locations for traffic signal poles and pedestals to be installed.

The final positions and pointing of signal faces shall be determined in the field.

All traffic signal heads and polycarbonate brackets shall be traffic yellow. Doors and visors shall be black.

The controller cabinet shall be brushed aluminum.

Vertical bracket and pedestal mounted signal heads shall have a standard mounting height of 10'–0" from the near edge of the pavement extended to the pole base up to the bottom of the signal head unless otherwise specified.

Mast arm mounted signal heads shall have a mounting height of 15' to 19' above the pavement surface.

Each signal head and pushbutton shall have a separate run of signal cable from the hand hole terminal or terminal block in the pole/pedestal base to the signal head/pushbutton.

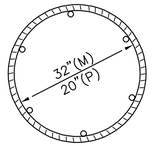
All mast arm mounted signal heads shall be fitted with 5" backplates.

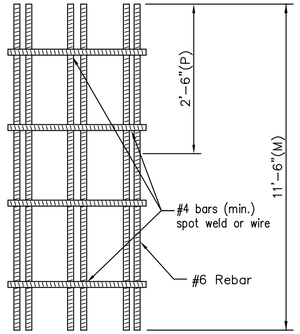
All signal heads shall have individual 12" sections unless otherwise noted.

All wiring shall conform to the National Electrical Code and local ordinances and requirements.

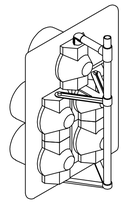
The meter and disconnect shall be installed at a location approved by the local power company. The installation shall conform to the power company's requirements including any standoff brackets required.

All anchor bolts shall be galvanized for a minimum length of 12" including threads.

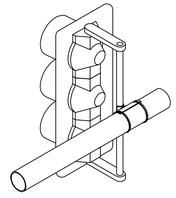




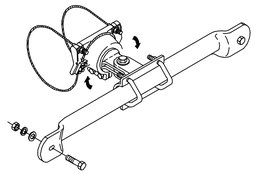
REBAR CAGE



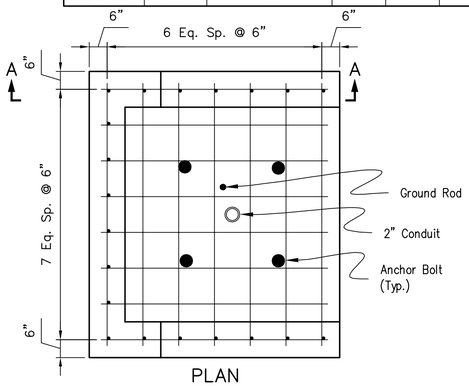
FIVE SECTION
ARM MOUNT DETAIL



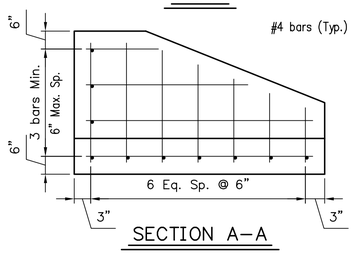
THREE SECTION
ARM MOUNT DETAIL



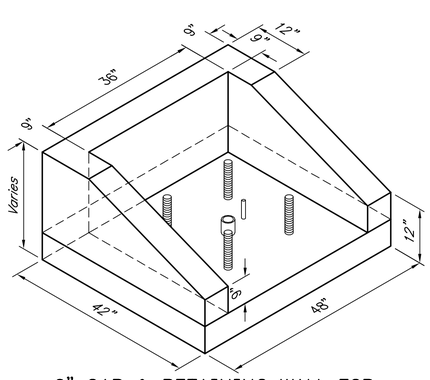
SIGN BRACKET DETAIL



PLAN

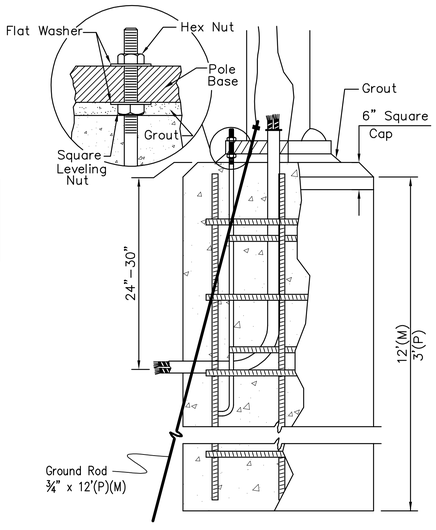


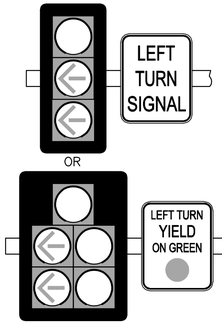
SECTION A–A

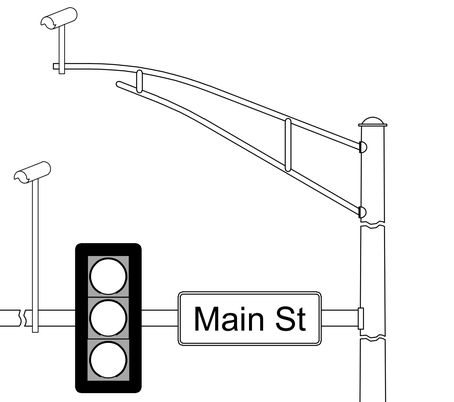


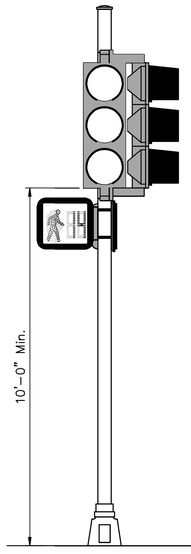
6" CAP & RETAINING WALL FOR
SIGNAL BASE IN DITCH SLOPE

This base to be used as directed by the Engineer. Some dimensions may vary.

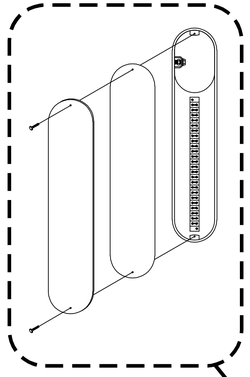




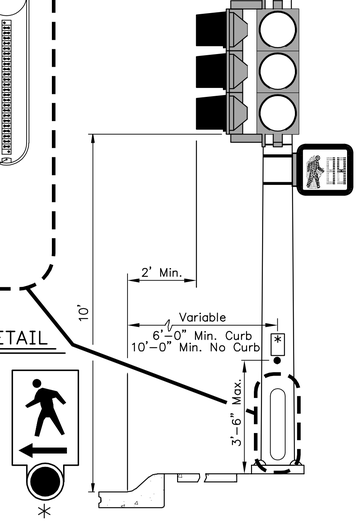




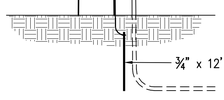
SIGNAL PEDESTAL



HAND HOLE &
TERMINAL BLOCK DETAIL



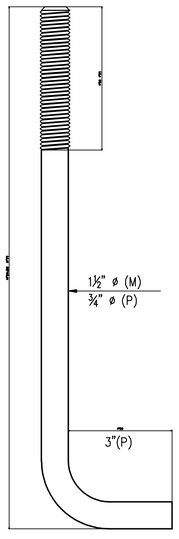
SIGNAL POLE w/ MASTARM

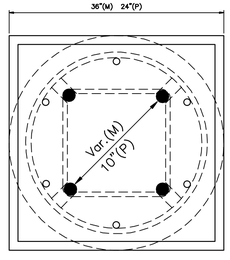


POWER SERVICE DETAIL

(M) = Mastarm (P) = Pedestal

Dimensions shown are typical ONLY. Actual dimensions shall be supplied by the manufacturer.





ANCHOR BOLT DETAILS

COUNTY	STATE	PROJECT NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SEDGWICK	KANSAS	####	####	####	##

Date	Description	By /Chk
2/2010	Add Pole Base in Ditch Slope Details	DRS/MRB
8/2007	Add ground to service/Update Mastarm–Add signs	DRS/MRB
2/2007	Pole base depth/rebar size and length	DRS/MRB

############
TRAFFIC SIGNAL INSTALLATION DETAILS

POLES, PEDESTALS, & SERVICE

TS 2–0

PREPARED BY
SEDGWICK COUNTY PUBLIC WORKS
HIGHWAY DEPARTMENT

LYNN T. PACKER, P.E. DIRECTOR/COUNTY ENGINEER

SCALE	DESIGNED	DRAWN	CHECKED	SHEET NO.
NONE	M.R.B.	D.R.S.	M.R.B.	####
DATE	2/2006	2/2006	2/2006	

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BILL OF MATERIALS

ITEM	UNIT	QUANTITY
Pad Mounted Controller & Cabinet	Each	
Pole Mounted Controller & Cabinet	Each	
Traffic Signal Head (see chart A) w/Mounting Hardware	Each	
Traffic Signal Pole (see chart B), Steel	Each	
Traffic Signal Pedestal, Aluminum 15'	Each	
Traffic Signal Pedestal, Aluminum 4'	Each	
Luminaire Arm	Each	
Concrete Controller Pad	Each	
Concrete Footing – Pole	Each	
Concrete Footing – Pedestal	Each	
Cap & Retaining Wall for Signal Base in Ditch Slope	Each	
Backplate 5" 3 Section	Each	
Backplate 5" 5 Section	Each	
Terminal Block	Each	
Service Box	Each	
Ground Rod (12') & Clamp	Each	
LED Traffic Signal Lens	Each	
Entrance Head	Each	
Circuit Breaker & Box 50 AMP	Each	
Surge Arrestor – Controller	Each	
Pedestrian Pushbutton w/Sign	Each	
Conduit 1"	Lin.Ft.	
Conduit 2"	Lin.Ft.	
Conduit 3"	Lin.Ft.	
Conduit Elbow 90°	Each	
Conduit Elbow 90°	Each	
Conduit Grounding Bushing	Each	
Multi–Conductor Cable No.14 A.W.G. 3/c	Lin.Ft.	
Multi–Conductor Cable No.14 A.W.G. 5/c	Lin.Ft.	
Multi–Conductor Cable No.14 A.W.G. 7/c	Lin.Ft.	
Multi–Conductor Cable No.14 A.W.G. 9/c	Lin.Ft.	
Multi–Conductor Cable No.14 A.W.G. 12/c	Lin.Ft.	
Multi–Conductor Cable No.14 A.W.G. 19/c	Lin.Ft.	
Power Lead–in Cable No.6 A.W.G. 1/c	Lin.Ft.	
Common Ground Wire No.6 A.W.G. 1/c	Lin.Ft.	
Sign	Each	
Overhead Street name Sign	Each	
Uninterruptible Power Supply	L.S.	Lump Sum
Video Detection System	L.S.	Lump Sum
--- Quantities For Information Only ---		

Chart "A" Signal Heads

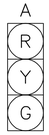
Number of Sections	Signal Face Arrangement	Mounting Type	Quantity
		Rigid Mast Arm	
		Rigid Mast Arm	
		Vertical Bracket	
		Vertical Bracket	
		Span Wire	
		Span Wire	

Chart "B" Traffic Signal Poles

Pole No.	Pole Height	Arm Height	Arm Length	No. of Signals on Arm	Signal Spacing	Luminare Mounting Height

COUNTY	STATE	PROJECT NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SEDGWICK	KANSAS	###########	####	####	##

A



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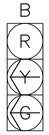

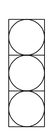

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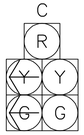

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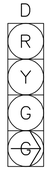

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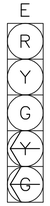

F

X

R10–12
24"x30"

L

R10–10L
24"x30"

NOTE: The contractor shall supply and install all necessary materials and equipment for the complete installation and operation of the traffic signal system whether specifically mentioned or not.

Rev.Date	Description	By /Chk
2/06	Removed Detector Chart/Update BOM	DRS/MRB

SUMMARY OF TRAFFIC SIGNAL QUANTITIES

TS 3–0

PREPARED BY
SEDGWICK COUNTY PUBLIC WORKS
HIGHWAY DEPARTMENT
LYNN T. PACKER, P.E. DIRECTOR/COUNTY ENGINEER

SCALE	DESIGNED	DRAWN	CHECKED	SHEET NO.
NONE	M.R.B.	D.R.S.	M.R.B.	####
DATE	11/1995	11/95	2/2006	

DWG: TS 1–0 thru 6–0

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TRAFFIC SIGNAL INSTALLATION

DESCRIPTION

This work shall consist of furnishing and installing all necessary equipment and materials to complete a traffic signal installation with video detection in accordance with this Special Provision and as shown on the Plans or established by the Engineer.

BID ITEM:

Traffic Signal Installation	LUMP SUM
Video Detection	LUMP SUM
Uninterruptible Power Supply	LUMP SUM

SECTION 1: INSTALLATION

1.0 GENERAL: This specification is intended to describe the method and construction requirements for the installation of a traffic signal. The installation shall include all poles, bases, cabinets, controllers, cables, conduits, service boxes, wiring, signal heads, video detection systems and such other miscellaneous parts or materials as shown on the plans or as otherwise required or specified.

The Contractor shall be responsible to furnish and install all equipment and materials necessary for the complete and satisfactory operation of the traffic signal, whether said equipment is specifically mentioned or not.

The Contractor shall contact any and all local agencies having jurisdiction over such installations and acquire any permits or licenses that may be required. Copies of any permits or licenses shall be supplied to the engineer prior to beginning any construction or installation. The Contractor shall comply with all local ordinances or applicable building codes.

The Contractor shall notify the appropriate power company prior to any service connection to determine the proper type and method of hook–up for the particular locale. The cost of any initial hook–up charge shall be borne by the Contractor. This shall include, but not be limited to, the cost of power supplied for all testing until the signal installation is accepted.

In so far as practicable, major items of electronic equipment such as the traffic signal controller and video detection systems provided and installed under this contract shall be of one type and consist of products from the same supplier in order to secure uniformity, single responsibility, and most satisfactory service.

The Contractor shall arrange for the supplier of the major items of electronic equipment to have a representative at the site prior to turning on the signal.

The Contractor shall notify any utility companies that may have facilities in the work area. Adjustments in elevation of service boxes shall be the responsibility of the Contractor.

2.0 CONSTRUCTION SEQUENCE: The construction sequence for traffic signal installation shall be as listed below unless otherwise directed by the Engineer.

The contractor may submit written request(s) for modifications to this sequence to the Engineer for consideration of approval. No modifications shall take place until approval is granted by the Engineer.

Construction Sequence

(1) Install conduit and service boxes.
(2) Install pole bases and controller pad.
(3) Install controller cabinet and poles. Poles shall be installed without signal heads and video detection units if more than 15 days will elapse prior to the signal being turned on.
(4) Pull all wire.
(5) Terminate wiring and install signal heads if not done in step three.
(6) Turn on signal. Supplier representative shall be present.

When signals are being installed or modified in conjunction with major road construction or geometric improvements, no signal work shall be performed prior to the completion of all dirt work or paving except as noted in the plans.

3.0 CONDUIT: All conductors shall be run between bases and service boxes in rigid conduit conforming to the provisions of Section 2 of these specifications. The sizes of the conduit used shall be of the sizes shown on the plans except that the Contractor may, at his own expense, use a larger size of conduit if desired. Where larger size conduit is used, it shall be for the entire run from outlet to outlet. No reducing couplings will be permitted.

The ends of all conduits shall be well reamed to remove burrs and rough edges. Field cuts shall be made square and true so that the ends will butt or come together for the full diameter thereof. Slip joints, compression joints, set screws or running threads will not be permitted for coupling conduit. When a standard coupling cannot be used, an approved threaded union conduit shall be used. The threads on all conduits shall be painted with a good quality of lead or rust preventative paint before couplings are made. All couplings shall be fitted and tightened until the ends of the conduits are brought together. Where coating on conduit has been injured in handling, or installing, such injured places shall be thoroughly painted with rust preventative paint.

All conduit ends shall be threaded and capped with standard pipe caps until wiring is started. When caps are removed, the threaded ends shall be provided with approved insulated grounding bushings.

Conduit bends, except factory bends, shall have a radius of not less than six (6) times the inside diameter of the conduit. Where factory bends are not used, conduit bends shall be made without crimping or flattening, using the longest radius practicable.

Conduit set in bases shall extend two (2) to three (3) inches vertically above the top of the base. An insulated grounding conduit bushing shall be installed on the end of all conduits terminating within a base. Conduit entering concrete service boxes shall not extend more than 5" inside of service box. Conduit should be sloped to drain as directed by the Engineer. At all outlets, conduits shall enter from the direction of the run.

Whenever possible, the conduit shall be installed by trenching, and trenches shall run in straight lines between pull boxes and bases. The location of the conduit shall be as shown on the plans, except that where physical obstructions dictate, the location shall be determined by the engineer. Conduit shall be installed to a depth of at least twenty–four (24) inches below finish grade. This requirement may be waived by the engineer where physical conditions or obstructions warrant.

Trenches shall be backfilled with material free of rock and compacted in lifts by hand tamping or with mechanical tampers to the density noted on the plans. If a density is not specified on the plans, trench backfill shall be compacted until, in the opinion of the Engineer, no significant future settlement will occur.

Existing underground conduit to be incorporated into a new system shall be cleaned with a mandrel and blown out with compressed air.

Conduit runs shown on the plans are for bidding purposes only, and may be changed with permission of the Engineer to avoid underground obstructions. Any additional conduit lengths resulting from approved relocations shall be supplied and installed at Contractor expense.

Conduit placed under existing pavement or sidewalk shall be installed by an approved boring or drilling method. Hydro boring will not be allowed. The existing pavement shall not be disturbed unless otherwise noted on the plans or approved by the Engineer.

4.0 CONCRETE BASE FOR POLES, PEDESTALS AND CONTROLLER CABINET: Bases for poles, pedestals, and cabinets shall be reinforced concrete as detailed on the plans. The concrete shall be Commercial Grade. The reinforcing steel shall be free of rust and dirt and shall be of the size, number and dimensions shown on the plans.

Anchor bolts shall be of the size and design recommended by the manufacturer of the particular pole to be installed. They shall extend uniformly above the top of the concrete base a height equal to the manufacturers recommendations.

A ¾" x 12'–0" copper–clad steel ground rod shall be installed in each pole base as shown on the plans,
and a ¾" x 10'–0" copper–clad steel ground rod shall be installed by each cabinet base, pedestal
base and electrical service.

The Contractor shall design an anchor bolt assembly which shall be welded to the rebar cage and the resulting unit inserted in the form for the concrete base. The unit shall be designed and constructed such that, after insertion in the form, it can be checked for proper orientation, elevation and verticality. "Stabbing" of anchor bolts or ground rods will not be permitted.

The location of the bases shall be as shown on the plans. Any variation from the plan location shall be only with the approval of the Engineer.

Traffic signal pole bases shall be constructed in two pours. The initial concrete placement shall end six (6) inches below finish grade. A six (6) inch thick square concrete cap shall be poured when the pole has been erected and plumbed. The top of the base shall be slightly (¼" to ½") higher than the adjacent curb and gutter, or finish grade if no curb and gutter exists.

5.0 WIRING: Wiring shall conform to the appropriate articles of the National Electric Code or subsequent revisions. The conductor from the terminal block in the controller to the signal base shall be a continuous run. All wire ends shall terminate at approved terminal facilities as noted below. No splices of cable shall be permitted at any time unless approved by the Engineer.

When conductors and cables are pulled into the conduit, all ends shall be taped to exclude moisture, and shall be so kept until insulated crimp–on fork terminals are attached and the terminations are made. Ends of spare conductors shall remain taped.

When pulling conductors through conduits, a powdered soapstone, talc or other approved lubricant shall be used.

A minimum of six (6) feet of slack or excess cable, as applicable, shall be left in each service box for traffic signal cable and video detection cable.

Terminations of all signal conductor cables shall be made only at terminal facilities in the cabinet, pole bases or signal heads. A minimum of two (2) feet of slack shall be left for each cable at each termination on both sides of the termination in the pole bases. When terminating ends of cables at all terminal facilities, the facilities shall be screw terminal blocks.

6.0 TRAFFIC SIGNAL HEADS: Traffic signal heads mounted on the side of poles or on pedestals shall be ten feet (10') from the near edge of the pavement extended to the pole base up to the bottom of the signal head.

Traffic signal heads mounted on mast arms or span wire shall be no less than fifteen (15) feet and no more than nineteen (19) feet from the pavement to the bottom of the signal head. In some instances the Engineer may require the signal to be mounted above fifteen (15) feet for better visibility. Under no circumstances shall the bottom of the signal be more than nineteen (19) feet above the pavement.

The Engineer shall direct the final positioning of the signal heads. Signal heads shall not be installed at any intersection until all other signal equipment, including the controller, is in place and ready for operation at that intersection. As an exception, and only with the prior approval of the Engineer, the signal heads may be mounted if the faces are not directed toward traffic or if the faces are covered.

7.0 POLE INSTALLATION: When installed, the traffic signal poles shall be back raked according to the manufacturer's recommendation to allow for deflection such that the pole will be plumb when loaded.

8.0 GROUNDING: All traffic signal poles, strain poles, pedestals, controller cabinets, and power sources shall be grounded by means of a No. 6 AWG solid bare copper wire bolted to the inside of these devices with a ½" internal ground lug. All ground wires shall be attached by means of a ground clamp to a copper–clad steel ground rod unless otherwise shown on the plans. The ground rod shall have a ¾" diameter and a length as specified in Section 1, sub–section 4.0.

COUNTY	STATE	PROJECT NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SEDGWICK	KANSAS	####	####	####	####

SECTION 2: EQUIPMENT

1.0 2070 CONTROLLER SYSTEM: Each 2070L controller supplied shall meet the requirements of the CalTrans Transportation Electrical Equipment Specifications (TEES), 2002 (latest revision). The controller manufacturer shall have been tested and pre–approved by the CalTrans Electrical Testing Branch, and pre–approval certifications shall be provided to the Engineer.

A. CONTROLLER UNIT: The 2070L controller(s) supplied shall meet requirements outlined in CalTrans TEES 2002 (latest revision), and the following requirements:

(1) The 2070L controller(s) shall have a 19" EIA rack mountable chassis.
(2) 2070–1B CPU module with RJ–45 Ethernet port.
(3) 2070–2A C1 field I/O module for compatibility with CalTrans style C1 connector.
(4) 2070–3B 8x40 front panel module with LCD display
(5) 2070–4A 10 amp power supply.
(6) 2070–7A asynchronous serial communications module (RS–232).
(7) Each 2070L controller shall be compatible with and pre–installed with the Siemens SEPAC software package to be completely compatible with Sedgwick County's existing signal system.
(8) Any unused slot positions shall have a cover plate.

B. CONFLICT MONITOR:

The Conflict Monitor(s) supplied shall be a 2010 conflict monitor and it shall meet requirements outlined in CalTrans TEES 2002 (latest revision).

C. VIDEO DETECTION SYSTEM:

The video detection supplied shall be the Iteris Advantage Edge system or an approved equal. Cameras shall be mounted either on the mast arms or luminaire arms as depicted on the plans.

The contractor shall supply all necessary equipment and materials to assure the proper function of the video detection system.

D. CONTROLLER CABINET:

The controller and all associated equipment shall be furnished completely housed in a sturdy 332 aluminum cabinet. The cabinet shall be of clean cut design and appearance having no sharp edges, corners or projections. The size of the cabinet shall be such as to provide ample space for housing the controller and all associated electrical and auxiliary devices. A hinged door on the front and on the back of the cabinet shall be provided permitting complete access to the interior of the cabinet. The cabinet is to be weatherproof and dust tight. The door shall be provided with a strong lock and two sets of keys. The door hinges and pins shall be of a non–corroding material.

The cabinet shall contain strong racks or other suitable supports for the controller and associated equipment.

A solid–state two–circuit jack mounted flasher with a rated load of 10 amps per circuit shall be supplied. Where additional load is required, more than one flasher will be provided. The flasher shall flash at the rate of 50 to 60 flashes per minute and be filtered. If required to prevent radio interference, the transfer from the controller to the flasher shall commence at the beginning of the major street green indication.

####
TRAFFIC SIGNAL SPECIFICATIONS
REVISED 2–20–2007

PREPARED BY TS 4–0
SEDGWICK COUNTY PUBLIC WORKS
HIGHWAY DEPARTMENT
LYNN T. PACKER, P.E. DIRECTOR/COUNTY ENGINEER

SCALE	DESIGNED	DRAWN	CHECKED	SHEET NO.
NONE	M.R.B.	D.R.S.	M.R.B.	####
DATE	2/2006	2/2006	2/2006	
DWG: TS 1–0 thru 6–0				

Device: PDF–XChange For AcroPlot Pro (temporary).pc3 Page Setup: ---- By: Rhein, Jessica J.
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COUNTY	STATE	PROJECT NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SEDGWICK	KANSAS	####	####	####	####

The cabinet shall contain a ventilating fan controlled by a thermostat and suitable dust filters for the capacity of the ventilating system. The filters shall be of the dry type and easily replaced.

In addition to the main doors of the controller cabinet, there shall be an auxiliary door provided on one side of the cabinet a lock and standardized police key. The panel behind the auxiliary door shall contain two (2) switches to accomplish signal on/off and flash/auto operations.

A convenience outlet and a fluorescent light with cold weather ballast shall be furnished in each cabinet.

The controller must be furnished with an externally installed lightning arrestor inside the controller cabinet on the power supply side. The lightning arrestor shall be of the hybrid type rated at 20,000 amps and capable of clamping such a surge to a peak of not greater than 340 volts without regard for the rise time of the surge. The arrestor shall be totally of solid state design, with no gas tube type devices of any kind and shall be a two stage unit providing separate protection for the controller and monitor unit. A minimum 200 microhenry inductor shall be incorporated between the "equipment line in" and "equipment line out" terminals. The arrestor shall be epoxy encapsulated with a flame–retardant material.

E. UNINTERRUPTIBLE POWER SUPPLY:

The traffic signal installation shall include backup power provisions. Referred to as an uninterruptible power supply (UPS) to maintain traffic signal operations in the event the AC power is disrupted. The UPS supplied shall be the Novus 1000 TP system, or approved equal. The UPS shall include a controller unit with a 19" EIA rack mountable chassis, manual bypass switch, and four (4) 100AH batteries designed specifically for standby power in an outdoor environment.

All components except the batteries shall be housed in the traffic signal controller cabinet. The batteries shall be housed in a separate brushed aluminum cabinet designed for and sized to house the batteries that shall be attached to the side of the traffic signal cabinet. The battery cabinet shall be vented, include a traffic lock, and the connection with the traffic signal cabinet shall be made weatherproof.

The UPS shall be connected to the special events input on the traffic signal controller and both be programmed to log AC power disruption as an event on the controller log. The UPS shall maintain normal traffic signal operations until the batteries reach 40 percent of their normal capacity, at which time the traffic signals shall be transferred to flashing operation.

All materials and equipment necessary for a complete and operable UPS shall be provided and installed.

2.0 LED TRAFFIC SIGNAL LENS: The lens shall be a self–contained, sealed unit designed to fit in a regular 12 inch traffic signal housing. Each lens shall meet all requirements of the ITE standard for LED Lenses. The lens shall provide a light beam spread of 30 degrees on all sides of its center axis. The center axis shall be designed to provide a 7 degree downward angle.

The lens shall be made of UV stabilized acrylic or impact resistant polycarbonate. The housing shall be ABS or other approved material sealed to the lens to create a vandal–resistant and weather–tight enclosure.

The self–contained, regulated power supply shall allow the unit to operate over an input voltage range between 85 and 135 volts AC. The lens shall be driven at between 20 and 23 milliamps, and consume not more than 20 watts of power +/– 2 watts at 120 volts AC. The light output shall meet ITE specifications for a 12–inch lens illuminated by a 150–watt incandescent A21 clear traffic signal lamp. The operating temperature range shall be between –30 degrees Celsius and +85 degrees Celsius.

The unit shall be warranted against defects in workmanship and materials for a period of 5 years from date of receipt by Sedgwick County or installation by the Contractor.

3.0 BACK PLATES: Where shown on the plans, 5" back plates shall be furnished and attached to the signal faces to provide a dark background for signal indications. Back plates shall be constructed of durable plastic capable of withstanding a 100 M.P.H. wind.

Where a back plate consists of two or more sections, the sections shall be fastened with stainless steel allen–head machine screws with self locking stainless steel nuts to prevent loosening after assembly. A flat washer shall be between the back plate and each locking nut, and a flat washer shall be between the signal head housing and each screw head.

Three–section back plates shall be used for all 5–section "dog house" signal heads.

4.0 ALUMINUM TRAFFIC SIGNAL PEDESTALS: Unless otherwise specified on the plans, the following specifications shall govern the design of aluminum traffic signal pedestals.

A. SHAFT:
The shaft shall be a one–piece tube of 6063–T6 aluminum alloy with a minimum wall thickness of 0.237". The shaft shall be of uniform diameter throughout its length. The shaft outside diameter at the top shall be approximately 4.5". Overall height of the shaft and base shall be as indicated on the plans. The shaft shall have a satin brush finish. The shaft shall be threaded with a nominal 4" pipe thread and be threaded into the base. The base and shaft are to be taped and fitted with a ⅜" set screw.

B. BASE:
The base shall be equipped with a handhold and door for access to the interior of the base. The handhold shall have a minimum dimension of 7 ¾" by 8". The door shall be fastened in place by a single bolt, which shall have an allenhead to discourage unauthorized personnel from gaining access to the wiring compartment in the pedestal base. The pedestal base shall be mounted to a poured concrete pad by means of four anchor rods set in a bolt circle of 13 ½" diameter. There shall be a provision in the base for the attachment of a ground rod.

C. HARDWARE:
Anchor bolts shall be ¾" diameter by 27" long plated, and they shall be supplied with nuts, lock washers and flat washers. The pedestal shaft shall be secured to the base by a collar at the top of the base to stabilize the pedestal shaft against torsion and moment forces.

D. GENERAL:
The pedestal and base shall be designed to support two one–way, three–section 12" polycarbonate traffic signal heads and two sets of 12" polycarbonate pedestrian signal heads. The shaft shall be wrapped with protective paper for shipment. Large scratches or gouges in the aluminum material shall be cause for rejection.

5.0 AC SERVICE INPUT: Each service disconnect must be furnished with an installed lightning arrestor on the AC service input.

The lightning arrestor shall be of the hybrid type rated at 20,000 amps and capable of clamping such a surge to a peak of not greater than 340 volts without regard for the rise time of the surge. The arrestor shall be totally of solid state design, with no gas tube type devices of any kind and shall be a two stage unit providing separate protection for the controller and monitor unit. A minimum 200 microhenry inductor shall be incorporated between the "equipment line in" and "equipment line out" terminals. The arrestor shall be epoxy encapsulated with a flame–retardant material.

6.0 ELECTRICAL WIRE AND CABLE: All wire and cable supplied under this specification shall be approved based upon catalog cuts submitted to the engineer. In addition, the Engineer shall visually inspect all wire and cable. Any apparent defect that may shorten the service life of the wire or cable shall be cause for rejection.

A. MULTI–CONDUCTOR CABLE: All conductor cable for intersection signalization and intersection interconnection shall be multi–conductor cable of the size specified on the plans for operation on a 600V maximum and suitable for use at conductor temperatures not exceeding 75 degrees Celsius. Material, construction and tests shall be in accordance with the applicable requirements of the Insulated Cable Engineers Association standard S–61–402 "Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

Conductors shall be stranded, annealed, uncoated copper or annealed, coated copper. Copper wire before insulating or stranding shall meet the requirements of the latest edition of ASTM B–33 (for coated wire) or ASTM B–3 (for uncoated wire). Stranding shall be class B in accordance with the latest edition of ASTM B–8.

Insulation for the individual conductors shall consist of a 20 mil thickness of polyethylene, and an insulation covering of a polyvinyl chloride compound with a 10 mil thickness.

The polyethylene insulation shall meet the requirements of paragraph 3.9 of ICEA Standard S–61–402 before application to the conductor, and paragraph 3.9.1 after application to the conductor.

The polyvinyl chloride insulation covering shall meet the requirements of paragraph 4.3.1 of ICEA Standard S–61–402, and it shall be color coded in accordance with method 1, part 5 of ICEA Standard S–61–402.

The overall cable jacket shall consist of a polyvinyl chloride compound, which will provide a tough, heat, moisture, ozone, and flame resistant covering meeting the requirements of paragraph 4.3.1 of ICEA Standard S–61–402. The overall jacket thickness shall be in accordance with Table 18, Part 4, ICEA Standard S–61–402. Conductor cable used for the signal control circuits shall be #14 AWG multi–conductor cable meeting the above requirements. Conductor cable used for intersection interconnection shall be #12 AWG multi–conductor cable meeting the above requirements.

B. POWER SUPPLY WIRE: Intersection signalization power supply wire shall be single conductor wire for operation on a 600V maximum, and it shall be suitable for use at conductor temperatures not exceeding 75 degrees Celsius. Material, construction and tests shall be in accordance with the applicable requirements of the ICEA Standard S–66–524 "Cross–Linked–Thermosetting–Polyethylene–Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy."

Conductors shall be stranded, annealed coated copper. Copper wire before insulating or stranding, shall meet the requirements of the latest edition of ASTM B–33 (for coated wire). Stranding shall be Class B, in accordance with the latest edition of ASTM B–8. Refer to drawings for size and type of wire required.

7.0 STEEL MAST ARM TYPE TRAFFIC SIGNAL STANDARDS: The following specification shall govern the design of steel mast arms with poles and bases unless otherwise specified on the plans. The manufacturer shall provide an information sheet showing design details of the mast arm, pole, anchor bolts, flange construction, orientation of anchor bolts to mast arm and pole, and any other pertinent installation instruction.

A. COMPLETE ASSEMBLY:

All items for complete assembly shall be furnished including, but not limited to:
(1) Arm with support shaft and base
(2) Flange plates and bolts for attachment of mast arm to shaft
(3) Anchor bolts with nuts and washers and covers
(4) Cap for top of pole

B. DESIGN:

The complete assembly shall be designed to support standard one–way, multi–section signals rigidly mounted in the specified locations. All traffic Signal Poles shall conform to latest edition of AASHTO "Standard Specification for Structural Support for Highway Signs, Luminaries and Traffic Signals" Handbook with a wind load of 80 MPH and 1.3 gust factor.

The shaft and mast arm shall each be made of only one length of best grade hot rolled, basic open hearth steel of not less than #7 manufacturer's steel gauge. Only one longitudinal weld, and no transverse welds shall be permitted in the fabrication of the shaft and mast arms. After being formed and welded, the shaft shall then be longitudinally cold rolled under sufficient pressure to flatten the weld, form a round tapered tube and increase its physical characteristics so the metal will have a guaranteed minimum yield strength of 50,000 psi. The shaft and arms shall have a uniform taper of 0.14 inches of diameter change per foot of length. As an alternate, mast arms in excess of 38 feet in length may be made in two pieces, which shall assemble by the outer piece telescoping over the inner piece with a firm tapered fit. The joint shall be secured against movement with a through bolt or stud and lock nuts.

C. ANCHOR BOLTS:

Four high–strength steel anchor bolts, each fitted with two nuts and two washers shall be furnished with each pole. Each anchor bolt shall have an "L" bend at the bottom end and shall be threaded at the top end. Only the top ten inches on the threaded ends of the anchor bolts need be galvanized. The manufacturer shall properly machine or otherwise ensure that the nuts and washers shall easily fit the anchor bolts after the galvanizing process. The bolts, nuts and washers shall be delivered soon after receipt of order.

D. ANCHOR BASE:

A one–piece steel anchor base with 16" bolt circle except where otherwise noted of adequate strength, shape and size shall be inserted and centered into the rebar cage and shall be suspended by methods approved by the Engineer to assure proper alignment during pole base construction.

E. POLE SHAFT:

A hand hole with a minimum area of 25 square inches shall be cut into the shaft. The bottom of the hand hole shall be two feet above the pole base plate. The terminal block shall be mounted outside and above the hand hole as shown in the plans. The entire hand hole/terminal facility area shall be encompassed by a raised flange welded to the pole shaft. A cover shall completely cover the handhold and the terminal facility area and be sealed with an appropriate rubber gasket supplied by the pole manufacturer.

Pole top caps shall be provided and shall be secured in place with set screws or other suitable fasteners. A "J–hook" wire support shall be provided in each pole shaft.

Provision shall be made for a grounding attachment.

F. MAST ARM:

The mast arm shall have a horizontal length as called for on the plans. A 1 ½" hole shall be drilled in the bottom of the arm at the location of each signal head or other required fixture. The hole shall be well reamed and fitted with a wiring grommet to prevent the chafing of cables.

G. MAST ARM ATTACHMENT:

Arm and pole mounting plates shall be provided. The mast arm plate shall telescope the mast arm and be circumferentially welded inside and out. The pole plates shall be attached to the shaft by welded gusset plate to bottom and sides. Four fully threaded high–strength bolts meeting ASTM A–325 shall be furnished to attach the arm to the shaft. The bolts shall be of sufficient length to pass through the matching face plates on the arm and front of the pole as well as through a saddle plate on the back side of the pole to provide for adequate tightening. Smooth holes shall be provided in the two plates to allow the signal cable to go from the shaft to the arm without exposure to the outside weather.

H. IDENTIFICATION:

The manufacturer shall permanently mark each mast arm and bolt to identify them with their corresponding Traffic Signal Pole Summary item number.

####
TRAFFIC SIGNAL SPECIFICATIONS
REVISED 2–23–2006

TS 5–0

PREPARED BY
SEDGWICK COUNTY PUBLIC WORKS
HIGHWAY DEPARTMENT

LYNN T. PACKER, P.E. DIRECTOR/COUNTY ENGINEER

SCALE	DESIGNED	DRAWN	CHECKED	SHEET NO.
NONE	M.R.B.	D.R.S.	M.R.B.	####
DATE	2/2006	2/2006	2/2006	

DWG: TS 1–0 thru 6–0

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I. FINISH:

All members and hardware shall be hot–dipped galvanized according to ASTM A153 for hardware.

J. JOINT USE:

When a joint–use pole is specified, the length shall be a minimum of 35 feet. In addition to the mast arm(s), it shall be designed to support truss–type luminaire arms with a five–foot upsweep (40–foot mounting height) with each arm supporting a 70 pound luminaire with 3.2 square feet of wind load area. Two simplex–type fittings shall be provided for each luminaire arm. The distance between the bolt holes on the simplex fittings shall be 27 9/16". The directional alignment of the luminaire arm(s) shall be as shown on the plans.

K. STREET NAME SIGNS: When specified, the complete assembly shall also be designed to support a rigid mounted reflective street name sign mounted as shown on the plans. The sign will be mounted to the mast arm in such a manner that torsion or torque forces acting on the mast arm shall be held to a minimum. The sign blanks shall be 0.080" aluminum meeting the requirements of Sedgwick County Public Works for sign blanks. The sheeting shall be prismatic high intensity sheeting meeting the requirements of Sedgwick County for sign sheeting. The signs shall be located between the pole and the signal head or other device closest to the pole. Signs shall be installed level.

8.0 SERVICE BOXES: Installation of service boxes shall be at the locations shown on the plans and at additional points as the Contractor may desire, at his own expense.

The service boxes shall be cylindrical in shape and have minimum dimensions of three (3) feet deep, two and one–half (2–1/2) feet outside diameter, two (2) feet inside diameter and three (3) inch wall thickness.

A minimum eight (8) inch layer of one (1) inch aggregate shall be laid as a drainage bed for each service box.

A 40" x 40" square pre–cast top with the cast iron ring and cover imbedded shall be placed on top of the service box. The ring and cover shall be capable of withstanding normal traffic loads.

9.0 12" POLYCARBONATE VEHICLE SIGNAL HEADS:

A. The signal housing shall be screw injection molded of polycarbonate resin and shall be of sectional construction to permit the installation of the number of sections as specified on the bid document and to allow the installation of additional sections for future needs. The top and bottom of each section shall include mounting holes sized to accommodate standard 1 1/2 inch signal mounting hardware. Each mounting hole shall be surrounded with molded in serrations to provide a positive lock between the individual sections of the signal and between the signal head assembly and the mounting bracketry. The serrations shall provide 5–degree increments of adjustment to allow proper aiming of the signal. Signal sections shall be joined together with a minimum of four bolts and locknuts located in a manner so as to distribute stress equally over the body ends. The inside surface of each body end shall be essentially smooth and flat. Any webbing or other protrusions which prevent the use of standard signal mounting hardware or which obstruct the use of normal installation tools shall be cause for rejection.

B. The signal doors shall be screw injection molded of polycarbonate resin. The doors shall be hinged to the body section on the left side via stainless steel hinge pins and shall be equipped with a substantial screw or wing nut type fastener of stainless steel material on the right side to provide a secure closure means. Both the hinge and closure device shall be internal to the signal body and shall not protrude from the body side in any way. Both the hinge pins and the closing fasteners shall be held captive to the door for ease of maintenance. In the closed position, the hinge pins shall be positively locked in place to preclude their falling out due to vibration.

C. Each door shall be fitted with a tunnel type visor, which shall uniformly surround the upper portion of the lens. All visors shall be of polycarbonate resin and shall be molded with tabs for mounting to the outer face of the door via screws. Signal head assemblies shall be supplied with all visors attached.

D. Refer to Section 2, Part 2.0 – "LED Traffic Signal Lens" for the LED lens requirements.

E. The optical portion of the signal head shall be designed as a unit to prevent sun phantom.

F. Each signal head shall be equipped with one or more terminal blocks to facilitate the electrical hookup. All terminal blocks shall be separate and removable components, which shall provide minimum 8 – 32 screws for all wiring connections. No "fast–on" terminals shall be permitted. Signal head assemblies of three or fewer sections shall include one terminal block; four and five section signals shall include two terminal blocks.

G. All internal signal head wiring shall be color coded appropriately to indicate the function of each lead without the need to individually trace each.

H. The housing shall be yellow with signal doors and visors a flat black. No painting shall be permitted. Color must be molded completely through the polycarbonate material and shall not require painting in future years.

I. All signals shall be shipped assembled with visors attached. Visors shall be tunnel design for all signal heads.

J. The front of each signal section shall be square in appearance to provide maximum target value.

10.0 12" POLYCARBONATE PEDESTRIAN SIGNAL HEADS:

A. A pedestrian signal shall consist of one section containing a combined HAND/MAN LED lens with countdown.

B. The signal housing shall be screw injection molded of polycarbonate resin and shall be of sectional construction. The top and bottom of each section shall include mounting holes sized to accommodate standard 1 ½" signal mounting hardware. Each mounting hole shall be surrounded with molded–in serrations to provide a positive lock between the individual sections of the signal and between the signal head assembly and the mounting bracketry. The serrations shall provide 5 degree increments of adjustment to allow proper aiming of the signal. Signal sections shall be joined together with a minimum of four bolts and locknuts located in a manner so as to distribute stress equally over the body ends. The inside surface of each section end shall be essentially smooth and flat. Any webbing or other protrusions which prevent the use of standard signal mounting hardware or which obstruct the operation of normal installation tools shall be cause of rejection.

C. The signal doors shall be screw injection molded of polycarbonate resin. The doors shall be hinged to the body section on the left side via stainless steel hinge pins and shall be equipped with a substantial screw or wing nut type fastener of stainless steel material on the right side to provide a secure closure means. Both the hinge and closure device shall be internal to the signal body and shall not protrude from the body side in any way. Both the hinge pins and the closing fasteners shall be held captive to the door for ease of maintenance. In the closed position, the hinge pins shall be positively locked in place to preclude their falling out due to vibration. Each door shall be equipped to accommodate a visor in such a way as to prevent any possibility of light escaping between the door and the visor.

D. All housings and doors shall be interchangeable.

E. The housings shall be yellow with signal doors and visors a flat black. No painting shall be permitted. Color shall be molded completely through the polycarbonate material to eliminate any future painting.

F. Each door shall be fitted with a tunnel type visor which shall uniformly surround the top and sides of the lens. All visors shall be molded of polycarbonate resin and shall be fastened securely to the door in such a fashion as to permit their easy removal or replacement. Signal head assemblies shall be supplied with all visors attached. The visor shall be a minimum of 8" out from the face and shall be square in appearance. All signals shall be shipped assembled with visors attached.

G. All gaskets shall be rubber.

H. The optical unit shall provide for anti–sun phantom with the lenses having black opaque backgrounds.

I. Each signal head shall be equipped with a terminal block to facilitate the electrical hookup. All terminal blocks shall be separate and removable components, which shall provide minimum 8 – 32 screws for all wiring connections. No "fast–on" terminals shall be permitted. All internal signal head wiring shall be color coded appropriately to indicate the function of each lead without the need to individually trace each.

11.0 BRACKETS AND MOUNTING ATTACHMENTS: Brackets, clamps, etc., shall be furnished in accordance with the details on the plans or items listed in the bill of materials. The contractor shall be responsible to advise the supplier of the exact intent of the plans with regard to proposed signal mounting combinations and their corresponding signal orientations and signal head types as well as the requirements for other appurtenances such as cabinets or signs. In this manner, it is intended that all fittings, spacers, bolts, clamps, etc., shall be furnished in sufficient quantity to effect complete mounting of the signal head(s) or other appurtenances whether or not each individual element is delineated or itemized on the plans.

A. BRACKET ASSEMBLIES: Bracket assemblies shall conform to the following provision unless otherwise noted on the plans.

(1) Construction shall be approved polycarbonate or cast aluminum materials. The polycarbonate brackets shall be screw–injection molded polycarbonate resin.

(2) Provisions shall be made for accepting and directing wire feeds coming from inside the signal support pole.

(3) Bracket color shall be federal yellow. Color must be molded completely through the polycarbonate material and shall not require painting in future years.

B. POLE MOUNTED FITTINGS: Pole mounted fittings shall be approved polycarbonate materials meeting the requirements in sub–section A above.

C. BANDING MATERIAL: Banding materials shall be stainless steel of a width as recommended by the supplier (generally ¾" minimum) with stainless steel buckles.

12.0 PEDESTRIAN PUSHBUTTON WITH SIGN: The pedestrian pushbutton with sign assembly shall be supplied as a complete single unit. All steel parts shall be coated to prevent rust. The following requirements shall also be met:

(1) The unit shall be weatherproof and dustproof.

(2) The electrical contacts shall be rated at a minimum of 35 amps at 12 volts.

(3) The "walking man" symbol and appropriate directional arrow shall be cast into the face of the cast aluminum plaque.

(4) Banding brackets built in at the top and bottom of the unit.

(5) The back of the unit shall be curved with a four (4) inch radius.

(6) The pushbutton shall meet all ADA requirements, and it shall have audible/tactile functionality.

13.0 RIGID GALVANIZED STEEL CONDUIT: All conduit and fittings shall be hot dipped galvanized rigid steel conduit, UL approved, and meet federal specifications WWC–581–D or American Standard #C80–1. All conduit runs shall be electrically bonded by insulated grounding bushings and a #6 solid bare copper wire.

14.0 STREET NAME SIGNS: Materials and manufacture of street name signs shall meet the requirements given on the "Summary of Traffic Signal Quantities" sheet.

15.0 NUTS AND BOLTS: When used in a mast arm attachment to the pole or in anchoring the pole to concrete base, the nuts and bolts shall be rated high strength and conform to section 1613, Type II of the Standard Specification, Edition 1990. An anti–seize compound shall be used on all bolts, screws, etc.

COUNTY	STATE	PROJECT NUMBER	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
SEDGWICK	KANSAS	####	####	####	####

SECTION 3: CONTRACTOR REQUIREMENTS

1.0 ELECTRICAL CONTRACTORS AND SUB–CONTRACTORS: Electrical contractors and sub–contractors shall be pre–approved by Sedgwick County, Kansas, prior to performing electrical work of any kind on the project. Electrical work includes, but is not limited to, any wiring, lighting, electronic traffic control devices, trenching or conduit placement for electrical wiring.

Pre–approval by Sedgwick County requires:

A. The electrical contractor or sub–contractor shall have on his payroll an electrician holding a master electrician license recognized and accepted by the Sedgwick County Code Enforcement Department.

B. The electrical contractor or sub–contractor shall have on his payroll an electrician capable of working on any specialized electronic equipment called for in the plans or specifications. In the case of traffic signals, proof of having attended and completed school(s) on the Type 2070 controller(s) specified in the plans or specifications shall be required at or before the time that bids are opened for the project. Certification(s) of completion must be on file with Sedgwick County Public Works.

C. All traffic signal installation work shall be performed only when the contractor or sub–contractor provides on site an employee holding a Level II certification as a traffic signal electrician or technician as granted by the International Municipal Signal Association (IMSA). A copy of the necessary current certification(s) indicating expiration date(s) must be on file with Sedgwick County Public Works. Certification(s) must be kept current by meeting any continuing education requirements of the IMSA.

D. The electrical contractor or sub–contractor shall meet any other applicable requirements to perform work as required by Sedgwick County, Kansas, Department of Planning and Code Enforcement.

E. Prior to the date that bids are opened for the project, the electrical contractor or sub–contractor shall be on the Kansas Department of Transportation's list of pre–approved contractors for electrical work as detailed in the plans or specifications. A copy of the KDOT certification letter must be on file with Sedgwick County Public Works.

Any electrical contractor or sub–contractor that does not meet the requirements as stated above shall not be allowed to perform work on the project.

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TRAFFIC SIGNAL SPECIFICATIONS
REVISED 2–23–2006

TS 6–0

PREPARED BY
SEDGWICK COUNTY PUBLIC WORKS
HIGHWAY DEPARTMENT

LYNN T. PACKER, P.E. DIRECTOR/COUNTY ENGINEER

SCALE	DESIGNED	DRAWN	CHECKED	SHEET NO.
NONE	M.R.B.	D.R.S.	M.R.B.	####
DATE	2/2006	2/2006	2/2006	

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