



**SPECIAL PROVISIONS
FOR
TRAFFIC SIGNALIZATION AND TEMPORARY TRAFFIC SIGNALS**

**Pottawattamie County
STBG-SWAP-1642(686)--SG-78**

**Effective Date
December 20, 2022**

THE STANDARD SPECIFICATIONS, SERIES 2015, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

154064.01 DESCRIPTION.

This special provision describes various materials, equipment, and procedures for complete installation of traffic signals for the project.

This special provision amends Section 2525 and Article 2528.03, G, 2 of the Standard Specifications.

154064.02 CONSTRUCTION AND MATERIALS.

A. PEDESTRIAN DETECTION SYSTEM

The pedestrian detection system shall be: POLARA iN2 – iNavigator 2 wire push button stations with the POLARA iCCU-S – iNtelligent Central Control unit or most current model. Equivalent pedestrian detection systems may also be approved by the Engineer.

B. GROUNDING SYSTEM

An equipment grounding conductor (EGC) shall be installed to electrically bond together all non-current carrying conductive materials, including cabinets, poles, pull boxes and raceways, to form an effective ground-fault current path to the overcurrent protective device (breaker) at the service location, as per NEC section 250.4(A)(5). The earth shall not be used as the sole equipment grounding conductor or effective ground-fault path. The EGC shall be electrically isolated from A.C. Neutral in the controller cabinet.

The EGC shall be copper XHHW insulated wire sized per NEC section 250.122. Stainless steel fasteners and copper compression lugs shall be used. Use a specification grade bonding bushings, with stainless steel and hot dip galvanized construction. Use a listed copper conductive compound on all threads and conductors.

The grounding system at the service disconnect shall consist of four 5/8 inch by 10 foot copper clad ground

rods placed 15 feet in opposite directions away from the utility pole. The ground rods shall be connected using connectors to No. 2/0 copper cable. Bolt type clamps shall not be used. A common No. 2/0 copper cable may be connected into the disconnect equipment with the four cables being spliced at the base of the pole.

The Controller cabinet shall be grounded via a No. 6 copper wire to a 5/8 inch by 10 foot copper clad ground rod located in a handhole a minimum distance of 15 feet away from the Controller cabinet. No ground rods may be installed within the cabinet.

A 5/8 inch by 10 foot copper clad ground rod shall be installed at each lighting standard and traffic signal pole. These rods shall be bonded to the EGC. The rod shall be offset below grade to extend into earth and be centered in base in top end of concrete and extend approximately 6 inches above concrete.

All loop detector lead-in cables shall have the drain shield wire grounded at the point where the loop wires are connected to the lead-in cables. The drain shield wire shall be removed and covered at the cabinet. The loop lead-in grounding system shall not be connected to or come in contact with any portion of the remainder of the AC grounding system.

C. CONTRACTOR COORDINATION

The Contractor is required to coordinate with the various utilities in order to obtain clearances required for the installation of conduit and other accessories required to install the complete signal system. All costs incurred in the obtaining of space, marking, defining and coordination are considered incidental to the installation of the signal.

D. GUARANTEE

The equipment furnished under this specification shall be new, of the latest model, fabricated in a first-class workmanship manner from good quality material.

The entire Controller unit shall be warranted to be free from defects in workmanship and materials for a minimum of 1 year from date of acceptance. Any part(s) found to be defective, upon concurrence of the defect by the manufacturer, shall be replaced or repaired free of charge.

The Contracting Authority shall be furnished with a certification from the equipment manufacturer stating that the equipment furnished under this specification complies with all provisions of this specification. If there are any items, which do not comply with this specification, then a list of those exceptions must be detailed on the certification and on the equipment submittals for the project. Failure to submit a list of exceptions on either the equipment submittals or the certification shall be deemed to be compliance with all issued specifications. Should deviations from the specification be determined from either the review of the equipment submittals or the installation of the hardware into the complete system, the Contractor shall be provided 30 days to correct the deviation(s) before rejection of the project and removal of the equipment.

E. TRAFFIC SIGNAL HEADS

1. VEHICULAR SIGNAL HEADS

All vehicular signal heads shall be constructed with 12 inch diameter lens openings. All components of the vehicular signal heads furnished under this specification shall comply with the latest version of the ITE Standard(s) for Adjustable Face Vehicle Traffic Control Signal Heads.

Lenses shall be 12 inches in diameter and shall be polycarbonate. Glass lenses are not acceptable. The lenses shall have an optimal curvature to allow maximization of heat dissipation within the signal (reflector to lens) and reduce the possibility of lens burning.

Visors shall be tunnel type and at least 9 1/2 inches long. Reflectors shall be Alzak treated aluminum or

glass. All external signal hardware and fasteners of the signal shall be stainless steel, including hinge pins and latching mechanisms.

The optical unit of the signal shall be of a design to permit the opening of the signal face for relamping of the signal without the removal of the lamp socket from the reflector assembly.

The color of all polycarbonate signal heads, except door fronts and inside and outside of visors, shall be federal yellow. Door fronts and inside and outside of visors shall be black in their entirety. The color of the material shall be an integral part of the materials composition.

All signal head assemblies shall be rigid mounted utilizing a suitable assembly consisting of both top and bottom brackets assemblies shall be aluminum.

Side of pole signal mounting hardware shall be polycarbonate yellow saddle brackets. Brackets shall be secured to the pole by using minimum 5/8 inch wide stainless steel banding material

All signal heads placed on mast arms shall be provided with backplates. Backplates shall be of 5 inch borders and be attached to the signal heads in accordance to city standards. Backplates shall be constructed of one-piece vacuum formed durable black plastic capable of withstanding a 100 mph wind, excluding five section signal displays. The outer edge of the backplate shall utilize a stabilizer formed from the same material as the backplate. The backplates shall be attached to the signal heads utilizing appropriate machine screws, fender washers and locking nuts as per details.

All vehicle signal indications (red, yellow and green) shall be LED 12 inch display or an approved equal. The unit shall be mounted and appear as a normal indication within the signal head. All standard arrows shall utilize LED technology signal displays.

All LED Ball Signal Modules shall be fully compliant to the ITE VTCSH LED Circular Supplement specifications dated and adopted June 27, 2005.

All LED Arrow Signal Modules shall be fully compliant to the "Omni-directional" specifications of the ITE VTCSH -LED Vehicle Arrow Traffic Signal Supplement adopted July 1, 2007.

The on-board circuitry of all LED traffic signal modules shall include voltage surge protection, to withstand high-repetition noise transients and low-repetition high-energy transients as stated in Section 2.1.8, NEMA Standard TS 2-2003. In addition, the module shall comply with the following standards: IEC 1000-4-5 at 3kV with a 2 ohm source impedance, ANSI/IEEE C62, 41-2002; IEC 61000-4-12 (6kV, 200A, 100kHz ring wave).

2. PEDESTRIAN SIGNAL HEADS

2.1 Overview

2.1.1 Purpose

The purpose of this specification is to provide the minimum performance requirements for a 16 by 18 LED pedestrian signal module with a countdown timer (hereafter called module) with "walking person", "upraised hand", and "countdown digit" icons. This specification refers to definitions and practices described in Pedestrian Traffic Control Signal Indicators - Light Emitting Diode (LED) Signal Modules Version August 04, 2010 and the 2009 MUTCD and contains additional requirements to ensure optimum long term reliability and performance. Product supplied to this specification shall comply with the latest version of the ITE PTCSI LED signal specification and the additional requirements listed herein.

2.1.2 Manufacturers Requirements and Approvals

2.1.2.1 Manufacturers supplying products to this specification must be a registered participant and have

the part numbers being provided listed on the Intertek-ETL LED Traffic Signal Modules Certification Program approved products website. Products shall be manufactured in a facility certified to the Intertek-ETL program requirements.

2.1.2.2 Must be fully compliant to the ITE PTCSI LED Spec Version Aug 4, 2010. In addition the product must also meet the additional specifications and requirements outlined in the sections below.

2.2 Physical & Mechanical Requirements

2.2.1 General

2.2.1.1 Installation requirements: Installation of a module into existing pedestrian signal housings shall only require the removal of the existing optical unit components, i.e., lens, lamp module, gaskets, and reflector; shall be weather tight and fit securely in the housing; and shall connect directly to existing electrical wiring. Installation shall not require special tools.

2.2.2 The LED Signal Module

2.2.2.1 The lens shall have a textured outer surface to reduce glare. No screws shall be used to attach the lens to the housing.

2.2.2.2 Hand, Person, or Digit icons that are not illuminated shall not be readily visible to the pedestrian at the far end of the crosswalk that the pedestrian signal head indication controls. The Engineer reserves the right to accept or reject the unit based on the physical appearance of the unit at their sole discretion.

2.2.2.3 All icons and numbers shall have a uniform incandescent, non-pixelated appearance.

2.2.2.4 All LED utilized to illuminate the Hand and Person icons, shall be LED that have been manufactured utilizing materials that have industry acceptance as being suitable for uses in outdoor applications.

2.2.2.5 The countdown signal shall display the time remaining in seconds, beginning with the start of the pedestrian clearance interval and ending at the end of the pedestrian clearance interval. Countdown displays should not be used during the walk interval. Upon termination of the countdown sequence the countdown shall remain blank until the beginning of the next pedestrian change interval.

2.2.2.6 The countdown shall be capable of counting down from 99 to 0. There shall be no leading zeroes for numbers less than 10. The display of the "1" digit in the tens position shall be in the right hand portion of the digit.

2.2.2.7 The configurations of the walking person icon, upraised hand icon and countdown digits are illustrated in Figure 1, Figure 2, and Figure 3 respectively.

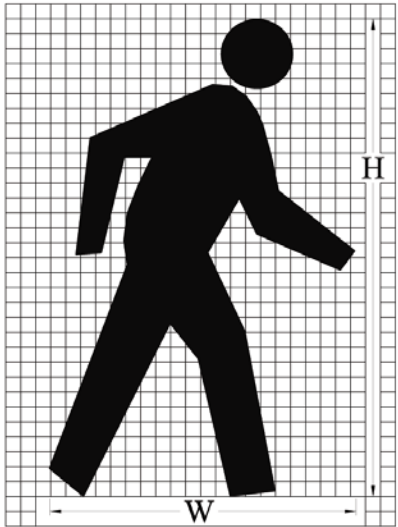


Figure 1—Walking Person icon

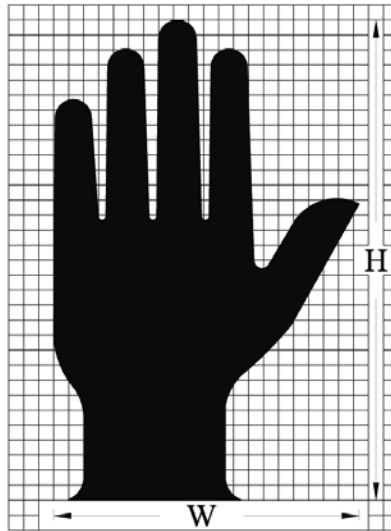


Figure 2— Upraised Hand icon

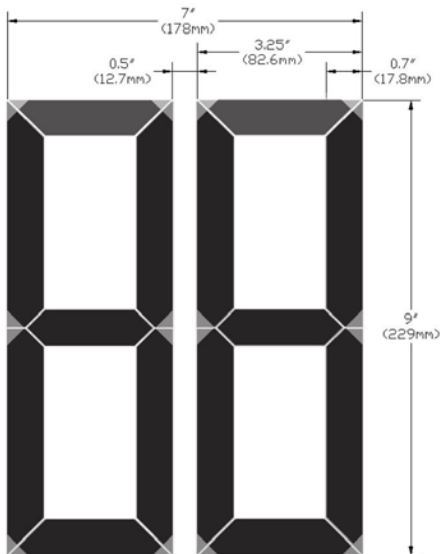


Figure 3—Countdown Display

2.2.3 Module Identification

2.2.3.1 In addition to the labeling requirements of the ITE specification, all modules must be labeled with the ETL Verified label shown in Figure 4. This label designates the compliance and listing with the Intertek-ETL Traffic Signal Certification Program.

2.3 Electrical

2.3.1 General

2.3.1.1 The following color scheme shall be used for the module's AC power leads: Orange for the upraised hand, Blue for the walking person, and White for common.

2.3.1.2 The AC power leads shall exit the module via a rubber grommetted strain relief, and shall be terminated with insulated female quick connect terminals with spade / tab adapters. The leads shall be

separate at the point at which they leave the module.

2.3.1.2.1 All external wiring utilized in the modules shall be anti-capillary type wire to prevent the wicking of moisture to the interior of the module.

2.3.1.3 In order to minimize the possibility of the incorrect icon being illuminated, the Hand, Person, and Countdown Icons shall utilize three separate power supplies. The countdown module shall be internally wired to the incoming AC power from the hand / person AC signal lines. All power supplies shall be located inside the signal module.

2.3.1.3.1 All power supplies shall be conformal coated for additional protection.

2.3.1.4. Typical Power at 77°F for the Pedestrian Signal Modules shall be 11 watts for the hand, 10 watts for the person and 8 watts for the digits when the number "88" is displayed.

2.4.0 Countdown Module

2.4.1 Countdown Drive Circuitry

2.4.1.1 The countdown portion of the signal shall have a high off-state input impedance so as not to provide a load indication to conflict monitors and interfere with the monitoring of the pedestrian signal. The input impedance of the countdown circuitry shall be sufficiently high enough to allow for up to eight units connected on the same channel.

2.4.1.2 It shall be impossible for the display to countdown during a solid Hand indication.

2.4.2 Countdown Functionality

2.4.2.1 Per MUTCD Manual 2009 edition, "Countdown displays should ONLY be used during the "Clearance Cycle". They should NOT be used during the walk interval or during the yellow change interval of a concurrent vehicular phase". A countdown pedestrian signal is required for all crossing with a pedestrian clearance interval of 7 seconds or greater.

2.4.2.2 The countdown timer module shall have a micro-processor capable of recording the pedestrian crossing timing when connected to a traffic controller. It shall be capable of displaying the digits 0 through 99.

2.4.2.3 When connected, the module shall blank out the display during the one learning cycle only while it records the countdown time using the Walk (Person) & Don't Walk (Flashing Hand) signal indications. The hand and person icons shall be displayed as normal during this cycle.

2.4.2.4 The countdown timer module shall continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically if needed.

2.4.2.5 The countdown module shall register the time for the walk and change intervals individually and shall begin counting down at the beginning of the pedestrian change interval. The countdown module shall display the numerals in a continuous display and shall not flash during the countdown.

2.4.2.6 When the flashing Hand becomes solid, the module shall display 0 for one second and then blank-out. The display shall remain dark until the beginning of the next countdown.

2.4.2.7 In the event of a pre-emption sequence during the pedestrian change interval, the countdown module shall skip the pre-empted change time and reach "0" at the same time as the flashing Hand becomes solid and then remain dark until the next cycle.

2.4.2.8 In the cycle following a pre-emption call, the signal shall display the correct time and not be

affected by the reduced previous cycle. The countdown shall remain synchronized with the signal indications and always reach 0 at the same time as the flashing Hand becomes solid.

2.4.2.9 The countdown timer shall be capable of displaying two consecutive complete Pedestrian Phases outputted by the traffic controller (no steady Hand signal between cycles). NOTE: When a controller is programmed with the option to serve a second consecutive pedestrian phase (walk followed by flashing don't walk) if a pedestrian activates a pedestrian button during the change interval, and the controller is set to allow a second consecutive phase, the countdown will blank out during the walk, and restart counting down the correct time during the flashing don't walk, just as in a regular PED phase.

2.4.2.10 The countdown module shall not display an erroneous or conflicting time when subjected to defective load switches. Should there be a short power interruption during the PED change interval or if voltage is applied to both the hand and person simultaneously, the display will go to "0" then blank.

2.4.2.11 The countdown module shall have accessible dip-switches for the user selectable options. The unit shall have a removable plug on the rear allowing easy access to control the user selectable functions. The unit shall be shipped from the factory with all switches in the default "off" position. With the exception of the test mode, these dip switch selectable functions would typically be set at the initial installation of the Pedestrian signal.

2.4.2.11.1 Dip Switch 1. Dark Cycle following a timing change

2.4.2.11.1.1 Default Operation: In the default position this function is disabled. With this function disabled the countdown module will operate as follows:

If the clearance mode is shortened for a single cycle, for example for an emergency vehicle preemption, the countdown will return to normal operation on the following cycle using the learned timing.

If the countdown module detects two consecutive shortened pedestrian clearance modes of identical length the countdown timer will display the new shorter time on the following cycle without the need for new blank learning cycle.

If the countdown module detects a longer cycle, for example a programmed timing change, it will automatically display the lengthened time on the next cycle without the need for a new blank learning cycle.

2.4.2.11.1.2 Optional Operation: With Dip switch 1 in the "on" position the countdown module will operate as follow:

Any time the countdown module detects a timing change, either shorter or longer the countdown will run a new "learning" cycle. It will be blank for one cycle. After this blank cycle the unit will return to normal operation on the following cycle and display the new clearance timing learned.

2.4.2.11.2 Dip Switch 2. Disable auto-sync mode.

2.4.2.11.2.1 Default Operation: In the default "off" position the auto-sync is enabled. With this function enabled the countdown module will operate as follows:

Countdown start with the start of the "Flashing Hand" clearance mode.

If in the "learning cycle" the countdown module detects a lag between the end of the walk mode and the start of the clearance mode the lag time will be measured and reduced from the first second in order to synchronize the end of the countdown "0" with the start of the solid hand signal.

2.4.2.11.2.2 Optional Operation: With Dip switch 2 in the "on" position the auto-sync is disabled. With this function disable the countdown will operate as follows:

Countdown starts at the end of the walk signal and disregards any lag time in the start of the flashing

hand signal.

If clearance interval is not in full seconds then the final second of the countdown may be truncated as the hand signal becomes solid.

If there is a brief power loss to the hand signal, < 1 sec, the unit may start counting for up to 2 seconds before it detects the power loss and goes blank.

2.4.2.11.3 Dip Switch 3. Disables countdown operation.

2.4.2.11.3.1 Default operation: In the default position the countdown timer is enabled. With this function enabled the countdown will operate as follows:

Countdown will function normally following either the default operation mode or if set, the selected dip switch options.

2.4.2.11.3.2 Optional Operation: With Dip switch 3 in the "on" mode the countdown timer module is disabled. With this function disabled the countdown will operate as follows:

No countdown will be displayed but the hand / person portion of the pedestrian signal will operate as normal.

2.4.2.11.4 Dip Switch 4. Memory Mode

2.4.2.11.4.1 Default operation: In the default position the memory, in the event of a power loss, is disabled. With the memory disabled the countdown will operate as follows:

Countdown will maintain the learned clearance timing in memory.

In the event of a power loss to the unit of 2 seconds or more in duration the memory will be lost and the timer will need to enter a new "learning" cycle upon the restoration of power.

2.4.2.11.4.2 Optional operation: With Dip switch 4 in the "on" position the memory is enabled. With this function enabled the countdown will operate as follows:

Countdown will store the information from the "learning" cycle in memory for use in case of power loss.

Upon returning from a power loss the countdown will use the timing stored in memory and not require the need for a new "learning" cycle.

2.4.2.11.5 Dip Switch 5. Diagnostic Test sequence

2.4.2.11.5.1 Default Operation: With this function in the "off" position the countdown will operate as follows:

Countdown will function normally following either the default operation mode or if set, the selected dip switch options.

2.4.2.11.5.2 Optional operation: With Dip switch 5 in the "on" position the diagnostic test mode is enabled. With this function enabled the countdown will function as follows:

Countdown mode is disabled, to allow for diagnostic testing.

Upon application of power to either icon the countdown module will sequentially test the individual segments of the digits.

Upon also turning on Dip switch 4 the countdown will light up all segments to display the digit "88".

2.5.0 Warranty Requirements

2.5.1 Warranty

2.5.1.1 Manufacturers shall provide a detailed written warranty issued by the factory located in the country of module origin with the following minimum provisions:

2.5.1.2 Modules shall, at the manufacturer's option, be repaired or replaced if the module fails to function as intended due to workmanship or material defects within the first 60 months from the date of delivery.

2.5.1.3 Modules shall, at the manufacturer's option, be repaired or replaced if the module exhibit luminous intensities less than the minimum specified values within the first 60 months of the date of delivery.

2.5.1.4 Upon request, the LED lamp module manufacturer shall provide written documentation of its ability to satisfy a worst-case, catastrophic warranty claim.

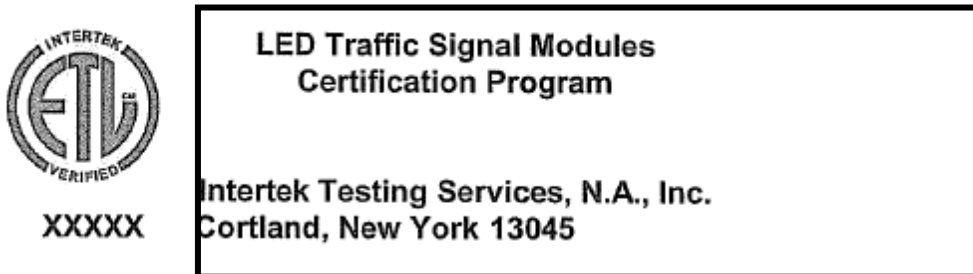
2.5.1.4.1 A current corporate annual report duly-certified by an independent auditing firm, containing financial statements illustrating sufficient cash-on-hand and net worth to satisfy a worst-case, catastrophic warranty claim is an example of suitable documentation.

2.5.1.4.2 The documentation shall clearly disclose:

- a) The country in which the factory of module origin is located.
- b) The name of the company or organization that owns the factory of module origin including any and all of its parent companies and/or organizations, and their respective country of corporate citizenship.

2.5.1.4.3 For firms with business and/or corporate citizenship in the United States of less than 7 years, the process by which the end-users/owners of the modules will be able to obtain worst-case, catastrophic warranty service in the event of bankruptcy or cessation-of-operations by the firm supplying the modules within North America, or in the event of bankruptcy or cessation-of-operations by the owner of the factory of origin, shall be clearly disclosed.

Figure 4.
Intertek- ETL Verified Label



F. POLE BASES

All concrete pole bases shall be designed as per the standard plans. When special bases are required, all calculations of all loads transmitted to the bases shall be submitted prior to fabrication. A Professional Engineer licensed in the State of Iowa shall stamp calculations. All calculations shall be submitted with drawings and shall be reviewed by the Engineer prior to fabrication. Concrete pole bases for reinstalled poles shall include new anchor bolts per the pole manufacturer's design.

Anchor bolts shall:

- Use straight full-length galvanized bolts.
- Comply with ASTM F 1554, Grade 105, S4 (-20°F).
- Threads are to comply with ANSI/ASME B1.1 for UNC thread series, Class 2A tolerance.
- The end of each anchor bolt intended to project from the concrete is to be color coded to identify the grade.
- Do not bend or weld anchor bolts.

G. CONDUIT AND CONDUIT FITTINGS

Conduit and conduit fittings for direct bury applications shall be galvanized rigid steel conforming to UL-6, UL Standard for Safety for Electrical Rigid Metal Conduit – Steel; high-density polyethylene conforming to ASTM F2160, Standard Specification for Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter (OD); or rigid polyvinyl chloride conforming to UL-651, UL Standard for Safety for Schedule 40 and 80 Rigid PVC Conduit.

Conduit and conduit fittings for boring applications shall be high density polyethylene conforming to ASTM D3035, Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter. Furnish in standard lengths with UL label.

Rigid steel conduit fittings shall be galvanized steel or galvanized malleable iron. Galvanizing shall comply with ASTM C123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. PVC conduit fittings and cement shall be compatible with the PVC conduit. Transitions between HDPE and PVC conduits shall conform to the manufacturer's recommendations. Conduit size shall be the minimum trade size permitted for the application and shall have a constant circular cross sectional area. Conduit installed for above ground risers shall be galvanized rigid steel conduit.

H. ELECTRICAL CABLE

1.0 GENERAL

Electrical cable for intersection signalization shall be rated 600 volts minimum and be IMSA specification cable where applicable.

The number of conductors and size of all electrical cable shall be as shown on the plans.

All wire shall be plainly marked on the outside of the sheath with the manufacturer's name and identification of the type of the cable.

All conductors used in the Controller cabinet shall be a minimum of No. 22 AWG (or larger, if required by the amperage requirements of the particular circuit), tinned copper conductors with a minimum of 19 strands, and shall conform to Federal Specifications IL-W-16878D, Type B or D, Vinyl-Nylon Jacket, 600 volts, 105°C., equal or better. Conductors used in the Controller cabinet shall conform to the NEC color codes:

A. C. Neutral	White
A. C. Line	Black
Chassis, Safety Ground	Green
Control	Any color not listed above

2.0 POWER LEAD-IN CABLE

Power lead-in cable shall be of the sizes as shown on the plans.

Power lead-in cable shall be 600 volt, single conductor, stranded copper, Type USE, and UL approved.

3.0 SIGNAL CABLE

Signal cable shall be 600 volt, multi-conductor, with copper conductor of the number and size as shown on the plans.

Signal cable shall meet the requirements of the International Municipal Signal Association (IMSA) specification 19-1, latest revision thereof for polyethylene insulated, polyvinyl chloride jacketed signal cable. All conductors shall be No. 14 AWG unless otherwise specified on the plans.

4.0 LOOP DETECTOR WIRE (WITH PLASTIC TUBING)

The loop wire shall meet the requirements of the IMSA specification 51-5, latest revision thereof for a nylon or cross-linked polyethylene jacketed conductor, loosely encased in a polyethylene tube loop detector wire. The conductor shall be No. 16 AWG unless otherwise specified on the plans.

5.0 DETECTOR LEAD-IN CABLE

Detector lead-in cable shall meet the requirements of IMSA specification 50-2, latest revision thereof for polyethylene insulated, polyethylene jacketed loop detector lead-in cable. All conductors shall be No. 14 AWG unless otherwise specified on the plans.

6.0 ETHERNET CABLE

Ethernet cable for exterior signal devices shall have No. 24 AWG Bonded-Pairs, solid bare copper conductors, polyolefin insulation, polymer gel waterblocked, with a sun resistant LLPE jacket. Cable will have sequential marking at 2 foot intervals.

Cable shall be Belden 7934a or equivalent.

7.0 TRACER CABLE AND LOCATE BOX

A tracer cable shall be installed in all conduits with signal cables, detector lead-in cables, or fiber optic communication cables.

The tracer cable shall be a single conductor, stranded copper, No. 12 AWG, Type THHN, with UL approval and an orange colored jacket.

The tracer cable shall be identified in the controller cabinet, handholes, and poles by means of identification tags.

The Contractor shall provide a Locate Box outdoor-rated station protector on the outside of traffic controller cabinets. The Contractor shall run a ground wire to the main ground breaker of the traffic controller and run the fiber locate wires to the pedestals in the station protector. All tracer wires shall be interconnected to the ground post. The box shall be mounted to the exterior of the signal cabinet. A ground wire shall be attached to a lug within the box from the signal cabinet.

8.0 GROUNDING CABLES

The EGC shall be copper XHHW insulated wire sized per NEC section 250.122. Stainless steel fasteners and copper compression lugs shall be used. Use a specification grade bonding bushings, with stainless steel and hot dip galvanized construction. Use a listed copper conductive compound on all threads and conductors.

Grounding conductors within lighting standards and traffic signal poles shall be a No. 6 copper cable.

All grounding conductors that connect bonding bushings to grounding systems shall be a No. 6 copper cable.

All grounding conductors between terminal strip support plates and the cabinet grounding bus shall be a minimum of a No. 10 copper cable or a braided copper cable with equal cross sectional area.

I. WIRE SPLICING

No below grade splicing of any traffic signal wiring, except loop to loop lead-in cable, shall be allowed. All splices shall be made in signal pole bases or approved above grade enclosures.

Wires being spliced shall be twisted in a clockwise direction in order that solderless connectors can be forced onto the splice.

Solderless connectors and splice cap covers shall be secured and made water tight with either vinyl electrical tape or a liquid insulating sealant equivalent to Scotchkote electrical coating.

All exposed single layer insulation, splice cap covers, and solderless connectors shall be encapsulated in rubber electrical tape. This is to provide a cushion to the single layer of insulation.

The rubber tape shall be encapsulated in a layer of vinyl electrical tape. All portions of the tape are to be smooth and well secured.

All splices shall be oriented with the splice above the spliced wire to avoid water collecting in the splice.

Two nylon tie straps shall then be secured approximately 2 inches beyond the wire splice at 1 inch increments to act as a strain relief to the splice.

J. SIGNING

The Contractor shall furnish and install all regulatory and information signs as per project plans. The signs shall meet current MUTCD specifications in relation to size and message standards. The signs shall use urban rated prismatic reflective sheeting. The City of Council Bluffs Traffic Maintenance Division shall supply the mast arm street name signs, which shall be installed by the Contractor. Any required brackets and/or supports for the mast arm signs shall be furnished by the Contractor.

K. SIGNAL HEAD COVERS

During construction all signal heads shall be covered with black vinyl covers specifically designed for this purpose. The covers shall be fastened to the heads with nylon straps utilizing a cam lock mechanism to secure the straps. Plastic bags, cardboard, burlap and other similar materials are not acceptable covers.

L. SIGNAL DOWNTIME

The existing traffic signals shall remain in operation during this project until the new permanent signal is in operation and the new ramp intersection is open to traffic. Any signal downtime shall not occur during peak hours. The peak hours are Monday - Friday, 6:00 A.M to 9:00 A.M and 2:00 P.M to 6:00 P.M.

The Contractor at all times shall conduct the operation in such a manner as to insure the safety of the motorist, the pedestrian, and its own employees. The Contractor shall perform work in such a manner and sequence as to maintain vehicular and pedestrian traffic at all times and to maintain access to adjacent private properties, unless otherwise specified in the plans.

The Contractor shall furnish, install, and maintain all devices for directing, warning and rerouting traffic

flow, including warning lights, barricades, and other devices necessary to adequately inform the motorist of unusual or unsafe conditions and guide them safely through the Project work area.

All required barricades and signs shall be in accordance with Part VI of the MUTCD.

M. TEMPORARY TRAFFIC SIGNALS

The work shall consist of furnishing labor, materials and performing all work necessary to install, maintain, operate and remove temporary traffic control signals at locations shown in the Plans and as specified in these Special Provisions and contract documents. The temporary traffic signal shall consist of separate temporary signals utilized during the various stages of roadway construction. The Contractor will make all necessary revisions to the temporary traffic signals to make the temporary signal operational when the transition occurs from one stage of construction to another stage of construction.

The Contractor shall be solely responsible for the maintenance, repair (if necessary) and removal of the temporary traffic signal installation during the time period the temporary traffic signal is activated and is operating. This shall include all costs to maintain, operate and repair (if necessary) the temporary traffic signal installation. The City shall be responsible for cabinet software, including traffic signal controller, signal timing, MMU and communications switch.

The City shall be responsible for traffic signal controller programming. The Contractor shall provide at least 5 working days' notice to the City that a temporary signal will be ready for turn-on.

During the operation of the temporary traffic signal, if it's determined by the Engineer that subsequent signal timing modifications are necessary; the City will make all necessary programming changes. The Contractor shall contact the City at least 5 days prior to a transition from one stage of construction to another stage of construction to request a review and/or modification of the signal timings.

Vehicle Detection shall be maintained on all intersection approaches at all times, unless noted in the plans. Radar presence detection shall be utilized and adjusted during the transition from one stage of construction to the next stage of construction to account for different traffic configurations.

N. SCHEDULE OF UNIT PRICES

Prior to the preconstruction meeting the traffic signal contractor shall forward to the Engineer a list of unit costs for the individual traffic signal items. The sum of costs for each item shall equal the total Contract Lump Sum price for the temporary traffic signal installation. The total cost shall not be unreasonably distributed among the individual unit items.

O. CONTRACTOR QUALIFICATIONS & RESPONSIBILITIES

The Contractor must be licensed as an Electrical Contractor as required by Iowa law and shall have a licensed master electrician on staff.

The Contractor is responsible for arranging and successful inspection by the City Electrical Inspector. The Contractor shall be responsible for resolving all deficiencies identified by the City Electrical Inspector.

During construction of the project, it may be necessary for the Contractor or the City to respond to a traffic signal operation malfunction. In the event of a traffic signal operations issue, the following will outline the roles and responsibilities for responding to and troubleshooting issues that arise:

- The City will respond to and diagnose traffic signal operational issue.
 - If issue related to internal signal controller, the City will correct the issues
 - If issue related to hardware/construction, the City will contact the Contractor, or traffic signal subcontractor, to correct the issue.
- The Contractor shall be responsible for all new intersection hardware and all existing hardware modified as part of this project.

- The City will be responsible for existing intersection hardware, except those modified by the Contractor.
- The Contractor shall be responsible for electrical locates installed as part of the project.
- The Contractor shall be responsible for moving detectors and reprogramming detection zones based on the needs of the project.

154064.03 METHOD OF MEASUREMENT.

A. Traffic Signalization.

Traffic Signalization will be a lump sum item; no measurement will be made.

B. Temporary Traffic Signal.

Measurement for Temporary Traffic Signals will be by count for each group installation of temporary traffic signals operated by a common control unit.

154064.04 BASIS OF PAYMENT.

A. Traffic Signalization.

Payment will be at the lump sum price for Traffic Signalization. Partial payment will be made according to the approved schedule of unit prices for those materials installed.

B. Temporary Traffic Signal.

Payment for Temporary Traffic Signals will be at the contract unit price per each, for individual group installations operated by a common control unit, normally four signal heads at the same traffic control area.

Payment is full compensation for relocating existing signal equipment and furnishing, installing, maintaining and servicing wood poles, span wire, signal heads, signs, and all associated wiring.