

CITY OF COUNCIL BLUFFS

TRAFFIC SIGNAL

SPECIFICATIONS

APRIL 2020

TRAFFIC SIGNAL SPECIFICATIONS

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A. TRAFFIC SIGNAL CONTROLLER UNIT

1.0 GENERAL

The Actuated Controller, Cabinet, and all auxiliary equipment shall be in full compliance with the **NEMA Standards Publication No. TS2-2003** including **NEMA TS-2 Amendment #4-2012 (for Flashing Yellow Arrow)** or latest.

The local intersection controller shall be the most current version of the Cubic|Trafficware Commander Advanced Traffic Controller or an equivalent approved by the City Traffic Engineer. The controller shall include the data key option or similar function. The local intersection Controller shall be fully compatible with the City of Council Bluffs' existing ATMS.now Advanced Traffic Management System manufactured by Cubic|Trafficware. The Controller shall be capable of 10/100 BASE-T Ethernet network communication. The City Traffic Engineer may specify alternate or additional communications capabilities as needed.

All auxiliary equipment supplied in the signal cabinet not produced by the primary Controller manufacturer shall have service information and parts availability information supplied including, model number, serial number, and/or part number, and the address of the manufacturer included on the cabinet layout and master parts list. The same manufacturer of the Controller timing unit shall also manufacture the traffic control cabinet and all terminal facilities unless otherwise approved by the City of Council Bluffs Traffic Engineer. All other equipment may be multi-source as long as it meets the latest NEMA TS2 specification and is approved by the City of Council Bluffs Traffic Engineer.

B. MALFUNCTION MANAGEMENT UNIT (MMU)

1.0 GENERAL

The MMU shall be the most current version of the EDI MMU2-16LEip with all supplemental equipment. Equivalent MMU hardware may be approved by the City Traffic Engineer. The MMU shall be fully compatible with **NEMA TS2-2003** specification including flashing yellow arrow (FYA) operation. See the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** for the requirements of a shelf-mountable, sixteen channel, solid-state MMU with Ethernet capability. Where differences occur, the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** shall govern.

C. TS2 TYPE 1 CABINET ASSEMBLY

1.0 GENERAL

This specification sets forth the minimum requirements for a TS2 Type 1 traffic control cabinet assembly. The P cabinet (26" D x 44" W x 54 or 56" H) is to be used unless a specific cabinet size is called out on the plans. Cabinet vendor and manufacturer are not specified by the City of Council Bluffs, however each cabinet must be approved by the City's Traffic Engineer. The cabinet assembly shall meet or exceed all applicable sections of the **NEMA Standard Publication No. TS2-2003**. See the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** for the technical requirements on:

- Cabinet design and construction
- Terminals and facilities/main panel design and construction
- Power panel design and construction
- Auxiliary cabinet equipment
- Vehicle detection
- Cabinet test switches and police panel
- Switches – general
- Combined preempt interface and SDLC panel
- Auxiliary devices
- Testing and Warranty

Where differences occur, the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** shall govern.

D. ELECTRICAL DESIGN

1.0 GENERAL

The distribution of the 117 VAC throughout the cabinet shall not occur until the AC+ has first passed through the power protection devices. The cabinet shall be provided with power protection devices, which include the main AC+ power circuit breakers, radio interference suppressers, and lightning and surge protectors. The cabinet shall be provided with surge protection and radio interference (RFI) filters and lightning protection. These functions may be combined into one or more devices. Combining of devices shall be supported by manufacturer's printed literature stating specific compliance to standard industry levels, such as EDCO Model ACP 340 or equivalent surge protectors. Surge protectors shall provide a general cabinet protection as a parallel device. Additional protection shall be provided to all electronic devices such as the traffic Controller and conflict monitor via a series surge protector working in conjunction with the general cabinet protection. Surge protection, RFI's, etc. shall be rated at the ampacity of the breaker protection. Main cabinet circuit breakers shall be a minimum of 30 amps. A minimum of three circuit breakers shall be provided. The main cabinet breaker shall service all Controller and terminal facilities. The auxiliary breaker shall provide service to the cabinet detectors, masters, and other electronic equipment. The service breaker shall provide service to the fan, thermostat, etc. Duplex outlets, which are provided for equipment such as modems and other low current auxiliary equipment, shall be provided with series-parallel lightning protection. Such outlets will be clearly identified to denote that they are specifically to be used for low current auxiliary electronic equipment only. The surge protector shall be capable of a peak current of 20,000 amps in an eight by twenty microsecond wave shape; have a life test with a maximum of a five percent change; have a clamp voltage not to exceed 280 volts @ 20 KA; have a response time to insure that the maximum voltage never exceeds 280 volts; is rated for 10 amps continuous service; and can operate from -40C to +85C degrees. Load switches and other high current devices shall require only parallel lightning protection devices. An MOV shall be installed on the radio interference suppressor between both the AC+ line to ground and the AC+ load to ground. The protection devices shall be mounted on a panel that is securely fastened to an interior wall of the cabinet.

Each signalized location shall utilize a standard 2 pole, weather tight circuit breaker type disconnect. The unit shall be rated a minimum of 60 amps and grounded as per NEC standards.

The controller shall contain a connector enabling outgoing and incoming electrical circuits to be connected or disconnected easily without the necessity of installing or removing individual wires. The connector may be a multiple pin jack; a spring connected mounting, or approved equivalent mounting.

In the event of a power interruption, the controller shall be capable of automatic reorientation upon power resumption and shall require no manual initiation or switching.

Electrical connections from the controller and auxiliary devices to outgoing and incoming circuits shall be made in such a manner that the controller or auxiliary device can be replaced with a similar unit, without the necessity of disconnecting and reconnecting the individual wires. This may be accomplished by means of a multiple plug; a spring connected mounting or approved equivalent arrangement.

All cabinet wiring shall be neatly trained throughout the cabinet and attached to the interior panels using nonconductive clamps or tie-wraps. Bundles of cables shall be laced or tied or enclosed in a sheathing material. The cabinet wiring shall not interfere with the entrance, training, or connection of the incoming or outgoing field conductors.

Except where terminated by direct soldering, all wires shall be provided with terminal lugs for attachment to terminal blocks using screws. All wires shall be identified and labeled in accordance with the cabinet wiring prints.

All wire insulation shall have a minimum rating of 600 volts.

An AC+ convenience outlet with a 3-wire grounding type receptacle shall be provided and be easily accessible. This receptacle and the LED lamp shall be separately protected from the main AC+ circuit breaker. The outlet shall be provided with ground fault protection.

The cabinet duct fan shall be separately protected and wired after the main AC+ circuit breaker.

The outgoing signal circuits shall be of the same polarity as the line (+) side of the power service. The incoming signal indication conductors shall be common and of the same polarity as the grounded (-) side of the power

service. The neutral (-) side of the power service shall be connected to the cabinet in an approved manner to a copper ground bus located on the panel with the main AC+ circuit breaker. The cabinet shall, in turn, be connected to an earth ground through a ground rod system located outside the controller cabinet. (See grounding sections for details.) No ground rods shall be installed inside the controller cabinet.

E. TRAFFIC SIGNAL BATTERY BACKUP SYSTEM (BBS)

1.0 GENERAL

This specification is for a system to provide back-up power to fully operate a traffic signal when normal line voltage is interrupted and to maintain a useable output voltage when line voltage is outside normal levels. The BBS will be the most current version of the FXM 1100 rugged UPS module, Alphacell 195 XTV batteries (4), SE48-2216 general purpose outdoor traffic enclosure (modified with internal sliding shelves), Universal Automatic Transfer Switch, Universal Generator Transfer Switch, and all supplemental equipment. Equivalent BBS hardware may be approved by the City Traffic Engineer. The BBS shall be fully compatible with the City of Council Bluffs' existing BBS infrastructure. See the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** for the technical requirements on:

- General Overview
- Operation
- Automatic Voltage Regulation (AVR) – Buck/Boost
- Battery Charger
- User Interfaces and Displays
- Communication
- Automatic Bypass Transfer Switch
- Batteries
- Cabinet
- Remote Battery Monitoring System
- Warranty
- Vendor Support
- Quality Assurance

F. ELECTRICAL SERVICE PEDESTAL

1.0 DESCRIPTION

When a ground mounted service enclosure is specified in the plans, these specifications shall apply.

2.0 SERVICE ENCLOSURE

The service enclosure shall be TESCO class 26-100-M-A2 or equal and shall meet the requirements of UL 508, Industrial Control Equipment. Fabricate the exterior of the service enclosure using one-eighth (1/8) inch aluminum. Fabricate the interior of the service enclosure using fourteen (14) gauge, cold-rolled steel. Paint the interior of the service enclosure white. The interior dimensions of the service enclosure shall be twelve (12) inches wide, forty-three (43) inches high and seven and one-half (7 ½) inches deep. The service enclosure shall have continuously welded seams, a full-length dead front with stainless steel hinge and a pull section with a removable step.

The service enclosure shall have a fully framed, side-hinged, swaged outer door, flush fitted with top drip lip and closed cell neoprene flange-compressed gaskets. The service enclosure shall have a hinged dead front with a one-fourth (1/4) turn latch and knurled knobs. Hinge the dead front door on the same side as the exterior door. The dead front door shall open a minimum of one hundred (100) degrees. Mount a removable back pan on four (4) welded one –fourth (1/4) inch studs. The service enclosure shall be completely pre-wired in the factory. Bolt-on or plug-in circuit breakers are not acceptable.

3.0 WIRING SCHEMATICS

Produce wiring schematics using drafting software. Include all external equipment and connections in accordance with NEMA IIB. Enclose as-built factory drawings in clear plastic. Store drawings on the internally mounted document drawer.

Service conductors shall meet the requirements of Section 230 of the National Electric Code (NEC).

G. DETECTION SYSTEMS

1.0 GENERAL

This specification is for vehicle and pedestrian detection systems that shall be provided with each new traffic signal. The vehicle detection system shall be an Aboveground Radar System for both presence and advanced detection equivalent to the Wavetronix SmartSensor™ Matrix unless otherwise specified in the signal plans. Other vehicle detection systems that may be approved by the City Traffic Engineer include a.) Cubic|Trafficware wireless pod magnetometers b.) Video systems, and c.) Loop detectors. 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 vehicle and pedestrian detection systems may also be approved by the City Traffic Engineer. The vehicle detection system shall be fully compatible with the City of Council Bluffs' existing signalized infrastructure. See the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** for the technical requirements on:

- General Overview
- Radar Presence Detection
- Radar Advanced Detection
- General Wireless Magnetometer Detection
- Loop Detection
- Pedestrian Detection

H. EMERGENCY VEHICLE TRAFFIC SIGNAL PRIORITY CONTROL SYSTEM

The Global Traffic Technologies Opticom brand of radio activated, GPS based emergency vehicle traffic signal priority control system (Preempt System) shall be installed in all traffic signal systems. All equipment and cabling necessary for the operation of the Preempt System shall be supplied and installed by the contractor to Global Traffic Technologies specifications.

Software configuration and system testing of the Preempt System shall be completed by the City Traffic Division personnel.

This item is specified to maintain compatibility with the currently installed system.

I. FIBER OPTIC INTERCONNECT

1.0 DESCRIPTION

All designed interconnect systems shall use single-mode fiber optic, interconnect cable. This work shall consist of furnishing and installing a fiber optic network for a traffic signal system in accordance with the Traffic Signal System scope of work as herein specified. All fiber optic components (except the interconnect cable specified separately) are required to provide proper communication with the City Traffic Signal network and shall be furnished and installed as a part of this item. These items shall include but not be limited to the items below.

2.0 DISTRIBUTION ENCLOSURE

Field cable shall terminate in the Controller cabinet within a wall mount distribution enclosure. The distribution enclosure shall be dust and moisture repellent. The size of the enclosure shall be adequate for the number of fibers, proper winding area, and splices. The enclosure shall be mounted on the inside cabinet wall or other approved location, which does not interfere with the normal maintenance of the cabinet electronics. The field cable shall be secured to the enclosure in a manner that does not degrade the fiber optic cable but insures a firm and secure mount. The field cable jacket shall be removed and all protective gel shall be removed and the cables and tube areas shall be prepared in accordance with the manufacturer's recommendation. Sufficient lengths of every loose tube shall be coiled within the enclosure to provide spare distance and reach the fiber interface panel. Enclosures shall be 3M brand 8173/W4 <4 coupler> or 8173/W8 <8 coupler> or approved equal. Four fibers from each cable entering the cabinet shall be terminated. All other fibers shall be capped and sealed in accordance with manufacturer's recommendation.

3.0 CONNECTORS

SC type connectors of ceramic ferrule and Physical Contact <PC> end finish shall be used to terminate fibers to equipment. The signal design shall specify the type of connector used. Mechanical connectors shall not be used to splice cables.

4.0 SPLICES

The fiber cable shall be installed in continuous runs between Controller cabinets unless otherwise specified on the Plans. No splices shall be allowed outside the Controller cabinets. Only mechanical or fusion splices will be allowed when splices are authorized.

5.0 FIBER OPTIC CABLE

This work shall consist of furnishing and installing the fiber optic cable of the type, size, and number of fibers specified and all associated accessories. Materials and accessories shall be the standard products of a manufacturer regularly engaged in the manufacture of fiber optic products. All materials and equipment furnished shall be completely free from defects and poor workmanship. All fibers in the cable must be usable and meet specifications. The product provided shall meet the latest applicable standard specifications by American National Standards Institute <ANSI>, Electronics Industries Association <EIA>, and Telecommunications Industries Association <TIA> for the type mode cable of the size specified and the specifications herein. The specific cable used shall be specified in the project plans.

Cable terminations shall be made by a trained and qualified technician with a minimum of two years' experience in installing and terminating fiber optic cable. This function may be provided by a person other than the installing Contractor. Upon Request by the Engineer, the Contractor shall provide documentation on qualifications and experience for fiber optic equipment installations. The Engineer shall be the sole judge of the acceptability of the experience level of the proposed individual selected for this function.

6.0 TESTING

After the complete System is installed and terminated, but excluding the capping of unused fibers, an OTDR reading shall be performed on all cables to insure that each section is in compliance with the issued specification. A hard copy of OTDR signature traces for all fibers for all sections shall be provided to the Engineer. Fibers that have been terminated shall be indicated in the report. In addition to the OTDR test report, the Contractor shall provide the test results of an Attenuation Test for the installed fibers using the insertion loss test procedure and the Transmitter/Receiver Power Level Test and the

Continuity Test. The results of all testing shall be recorded along with the date of the test, the name of the person performing the test, brand name, model number and serial number of all equipment used during the test, and any other pertinent information and data. The complete documentation file of all tests conducted and factory tests shall be submitted to the Engineer.

7.0 FIBER OPTIC SLACK, BENDING, AND PULLING

The cable end shall be secured inside the Controller cabinet so that no load is applied to the exposed fiber strands. The minimum bend radius for static storage shall not be less than ten times the diameter of the cable measuring the cable on the outside, or as recommended by the manufacturer.

The minimum bend radius during installation shall not be less fifteen times the diameter of the cable measuring the cable on the outside, or as recommended by the manufacturer. Note: The Contractor should not use tie wrap devices on fiber optic cable due to the force exerted on the fiber and the ease of which this force can permanently damage the fiber.

Slack cable shall be left in each handhole or double handhole, at the top of any conduit riser, junction box, and Controller. This slack cable requirement may be deleted where existing hand holes or through points lack sufficient area to maintain the minimum bend requirements. Where slack has been deleted, extra slack equal to the amount that would have been distributed in the through points shall be equally divided between the two

Controller cabinets and shall be in addition to the slack mandated at the cabinets. Each handhold or through point shall be provided with a minimum of 30 feet of slack. Each splice handhole location shall be provided with a

minimum of 75 feet of slack. Controller cabinets shall be provided with a minimum of 10 feet of slack. Slack cable shall be coiled and the coils bound at three points around the coil perimeter and supported in their static storage position.

8.0 CABLE INSTALLATION IN CONDUITS

A suitable cable feeder guide shall be used between the cable reel and the face of the conduit. The cable feeder shall be designed to protect the cable and guide the cable directly into the conduit off the reel. During the installation, the cable jacket shall be carefully inspected for jacket defects. If defects are found the Engineer shall be notified prior to any additional cable being installed.

The Contractor shall take unusual care in the pulling of the cable to insure that the cable does not become kinked, crushed, twisted, snapped, etc. A pulling eye shall be attached to the cable and be used to pull the cable through the conduit. A pulling swivel shall be used to preclude twisting of the cable. The cable shall be lubricated prior to entering the conduit with a lubricant recommended by the manufacturer. The lubricant shall be water base type. Dynamometers or break away pulling swing shall be used to insure that the pulling tension does not exceed the specified force of 2700 N <600 lbs.> or the cable manufacture's recommendations, whichever is less. The mechanical stress on the cable shall not allow the cable to twist, stretch, become crushed, or forced around sharp turns, which exceed the bend radius or scar or damage the jacket. The pulling of the cable shall be hand assisted at each pull point.

At each hand hole or through point and at the cabinet, the cable shall be visibly marked or tagged as "CAUTION-FIBER OPTIC CABLE."

An insulated copper wire, AWG No. 12 shall be pulled in the same conduit as the fiber optic cable in order to trace the installation. The ends of the trace wire shall be insulated and terminated in the last hand hole prior to the Controller cabinet. Due to the electrical conducting characteristics of the wire, especially during electrical storms, the wire shall not enter any Controller cabinet.

J. TRAFFIC MONITORING CAMERAS

1.0 GENERAL

All new traffic signals shall have Pan-Tilt-Zoom cameras installed. Cameras shall be Axis Communications Q6125-LE. This camera is required to maintain interoperability with the City's current monitoring software. It will also maintain compatibility and continuity with the City's Intelligent Transportation System.

2.0 POWER SUPPLY

Camera shall be powered by High Power over Ethernet (IEEE 802.3at). Any devices necessary for providing power to the camera shall be included.

3.0 MOUNTING HARDWARE

A mounting bracket capable of attaching the camera to the side of a steel traffic signal pole shall be included. Mounting hardware shall be supplied by the camera manufacturer.

4.0 DECODING SOFTWARE

Decoding software shall be industry-accepted and widely available.

5.0 WARRANTY

Supplier warrants that all products supplied will be free from defects in design, workmanship and materials under normal use for a minimum period of one (1) year from the date of the original purchase.

K. GROUNDING SYSTEM (See plan details for further information)

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 (4) - 5/8 inch X 10 foot (16mm x 3m) copper clad ground rods placed fifteen feet (4.6m) in opposite directions away from the utility pole. The ground rods shall be connected using Cadweld connectors to #2/0 copper cable. Bolt type clamps shall not be used. A common #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 #6 copper wire to a 5/8 inch X 10 foot (16mm x 3m) copper clad ground rod located in a handhole a minimum distance of fifteen feet (4.6m) away from the Controller cabinet.

No ground rods may be installed within the cabinet.

A (1) -5/8 inch X 10 foot (16mm x 3m) 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" (150mm) 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.

L. CONTRACTOR COORDINATION

The Contractor shall coordinate with the City of Council Bluffs Permits & Inspections Department and the local power company for the electrical connection for the 120 VAC power source to the Controller. Conduit and wire as specified in the plans shall be furnished and installed from the point of the power source to the cabinet. The cost of furnishing and installing this conduit and wire and the termination shall be considered incidental to the project and no additional bid item is provided other than the installation of the Controller. All conduit, wiring, and power service installations shall meet or exceed current National Electrical Codes and any other applicable local codes and ordinances.

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 Controller.

M. 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 one 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 owner 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 compliant 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.

N. TRAFFIC SIGNAL HEADS

1.0 GENERAL

This specification is for traffic signal heads that shall be provided with each new signalized intersection. Neither vendor nor manufacturer are specified for traffic signal heads/supplemental equipment by the City of Council Bluffs, however each piece of equipment related to the traffic signal heads must be approved by the City's Traffic Engineer. The equipment shall meet, as a minimum, all applicable sections of the **Iowa Statewide Urban Design and Specifications (SUDAS) Specifications Manual Division 8: Traffic Control Section 8010**. See the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** for the technical requirements on:

- Vehicular signal heads
- Pedestrian signal heads

O. MAST ARMS AND POLES

All steel traffic signal mast arm pole assemblies shall be designed and detailed by the manufacturer supplying the poles. In the event special sized poles and mast arms are required for a signalization project, the Contractor shall submit from the pole manufacturer calculations of all loads transmitted to the bases prior to fabrication. Calculations shall be stamped by a registered professional engineer in the State of Iowa. All calculations shall be submitted with shop drawings and shall be reviewed by the Engineer prior to fabrication.

P. 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 registered professional engineer 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.

Q. 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.

R. 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 degrees 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

See the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** for the technical requirements on:

- Power Lead-in Cable
- Signal Cable
- Loop Detector Wire (with plastic tubing)
- Detector Lead-in Cable
- Ethernet Cable
- Tracer Cable
- Grounding Cables

S. WIRE SPLICING

1.0 GENERAL

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 two inches (50mm) beyond the wire splice at one-inch (25mm) increments to act as a strain relief to the splice.

T. STREET NAME AND REGULATORY SIGNS MOUNTED ON SIGNALS

1.0 GENERAL

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.

U. SIGNAL HEAD COVERS

1.0 GENERAL

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.

V. SCHEDULE OF UNIT PRICES

1.0 GENERAL

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 traffic signal installation. The total cost shall not be unreasonably distributed among the individual unit items.

W. CONTRACTOR QUALIFICATIONS & RESPONSIBILITIES

1.0 GENERAL

The Contractor or Subcontractor must be licensed as an Electrical Contractor as required by Iowa law and shall have a licensed master electrician on staff. The Contractor or Subcontractor also must have a minimum of five years' experience in the construction and installation of traffic signal systems. A list of qualifying projects must be attached to bid documents.

All Electrical Work and Traffic Signal Equipment installation shall be performed under the direct supervision of a licensed (Iowa Class A Master) electrician with a minimum of five years previous experience in traffic signal installations as well as related experience in the assembly and maintenance of traffic signal control equipment. Résumé(s) of electrician(s) who will perform this function shall be provided before construction begins and as requested by the project engineer.

All Electrical Work shall be performed by personnel licensed as an Apprentice Electrician in Iowa or higher Iowa electrical license. All personnel performing Electrical Work shall carry proof of their qualification on their person at all times while on the work site.

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.

The Contractor shall provide an unconditional warranty on the work done by the Contractor for a period of one year from the date of acceptance by the City of the completed installation.

X. BLANK-OUT SIGNS

1.0 GENERAL

Sign shall be capable of displaying one or multiple messages.

Each message will be displayed by applying 120 VAC to a separate input for each message.

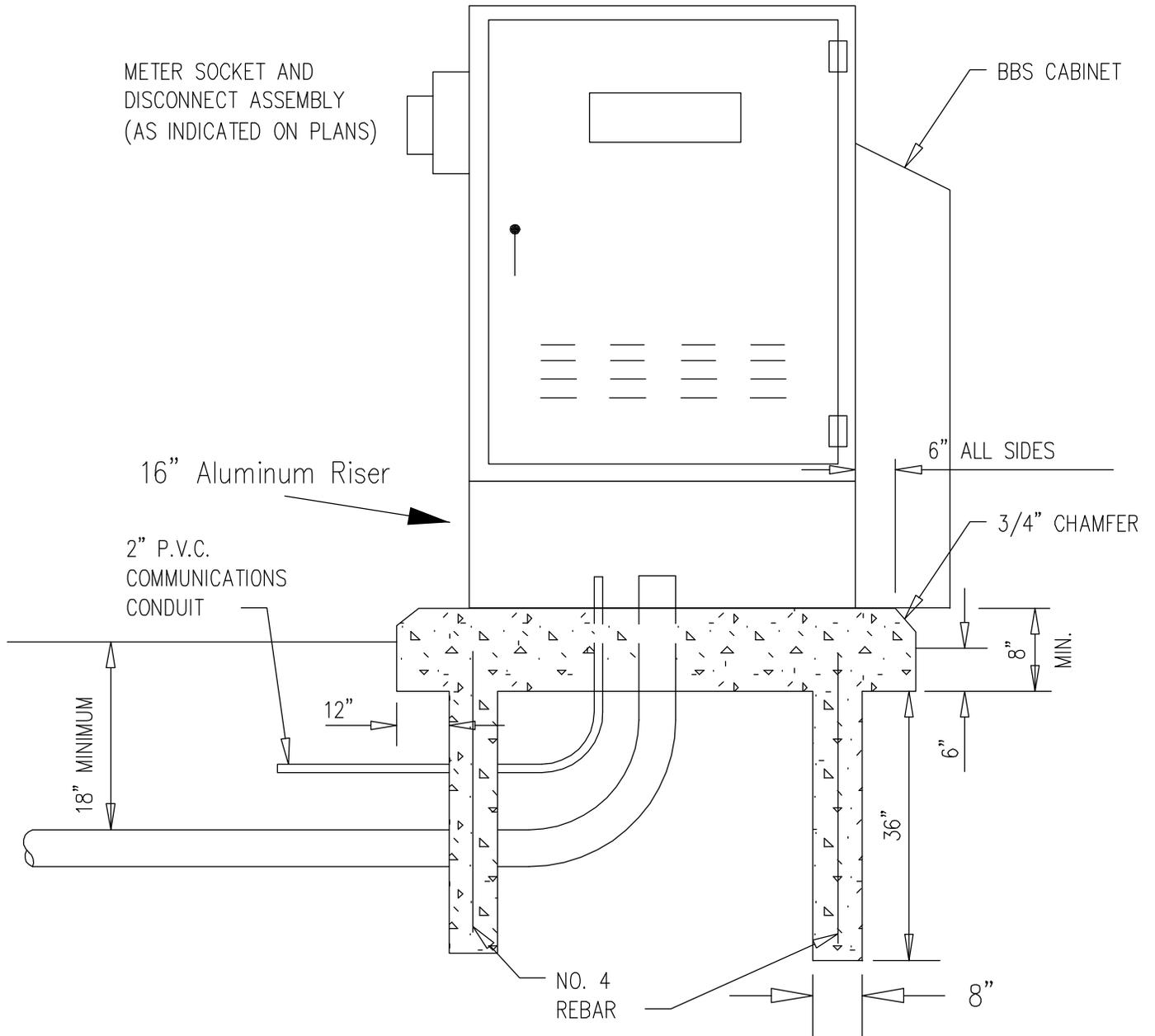
The sign shall be completely dark (blank) when no input voltage is supplied.

See the **SPECIAL PROVISIONS FOR TRAFFIC SIGNAL SPECIFICATIONS COUNCIL BLUFFS 2020** for the technical requirements on:

- Functional Description
- Aluminum Housing
- LED Message Modules
- Warranty

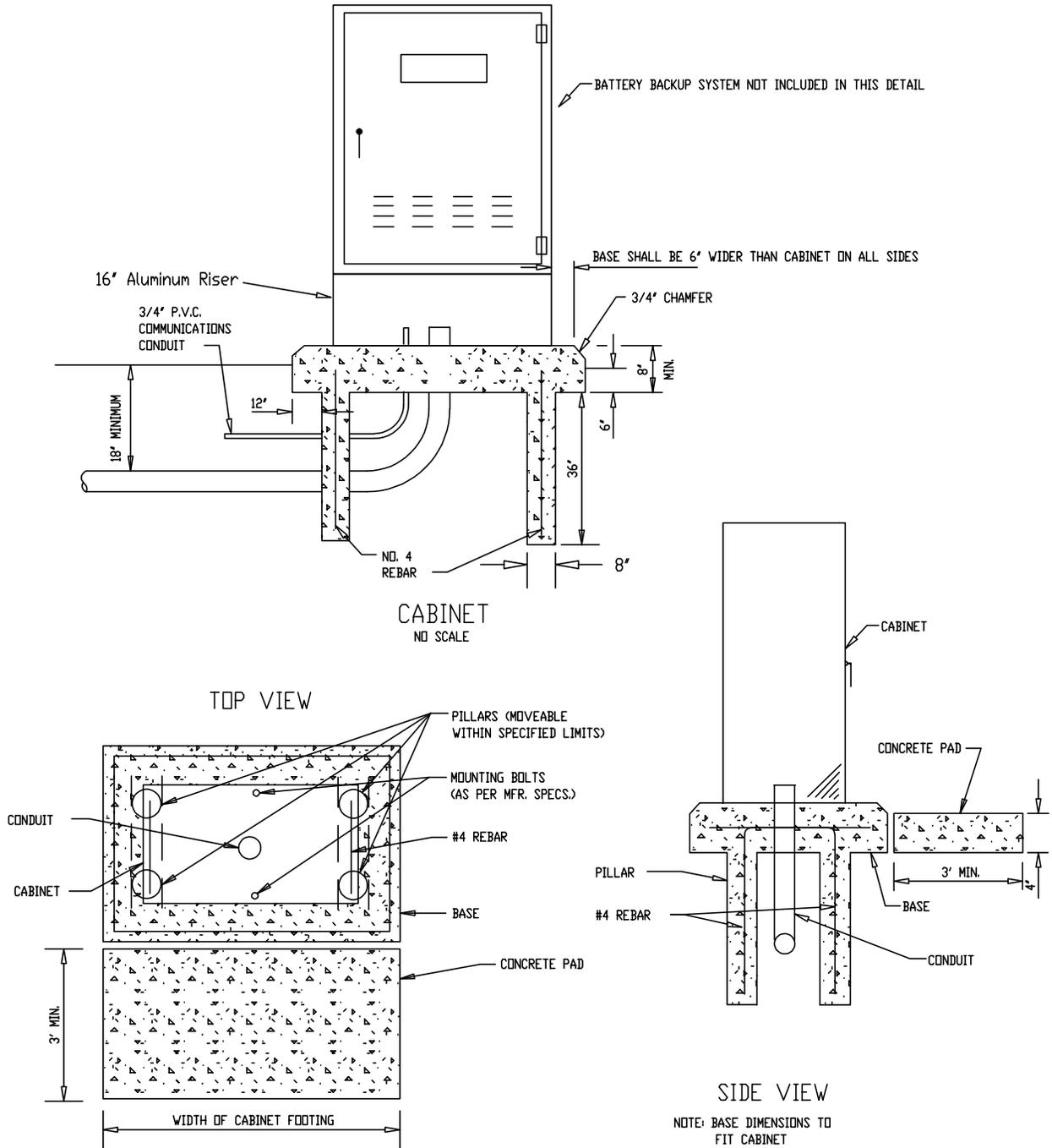
Council Bluffs Traffic Signal Standards

Cabinet shall be size 6 (P) 56"Hx44"Wx24"D
 unless noted otherwise on drawings



Standard Name: Traffic Signal Base, Cabinet, & Riser	
Detail Information:	Drawing Number: 8010.1
Revision Date: 7/26/05	Sheet: 1 of 2

Council Bluffs Traffic Signal Standards



Standard Name: Signal Cabinet Foundations

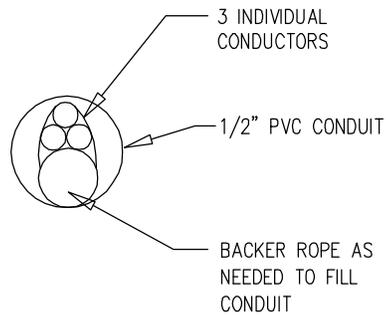
Detail Information:

Drawing Number: 8010.1

Revision Date: November 2019

Sheet: 2 of 2

Council Bluffs Traffic Signal Standards

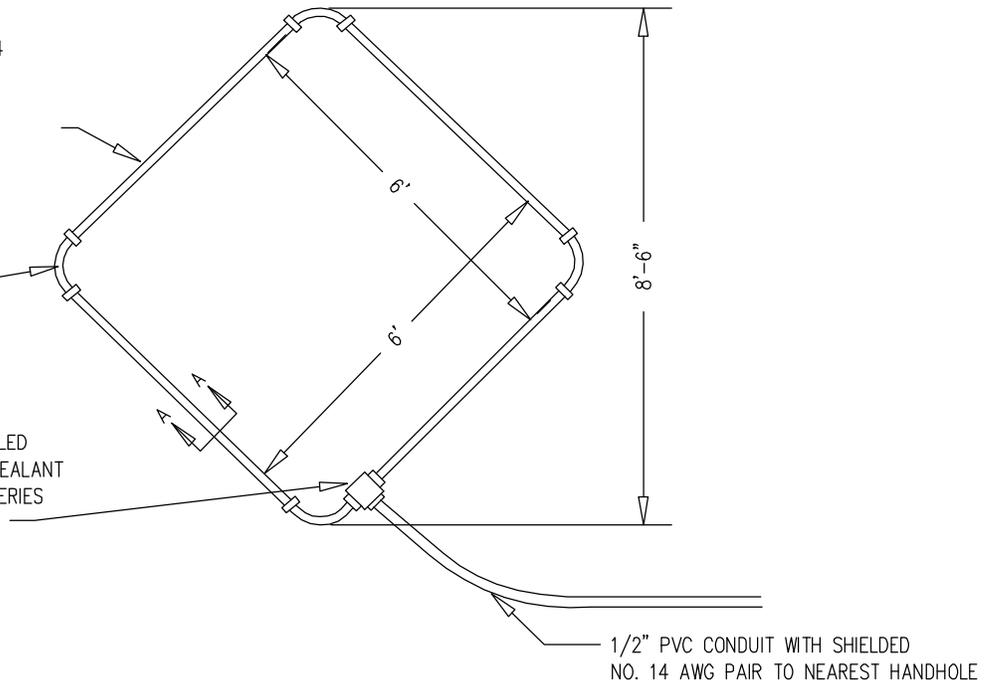


SECTION A-A
NO SCALE

1/2" PVC CONDUIT WITH THREE INDIVIDUAL NO. 14 AWG WIRES TAPED TO BACKER ROPE AND CONNECTED IN SERIES

1/2" PVC ELBOW (OPTIONAL)

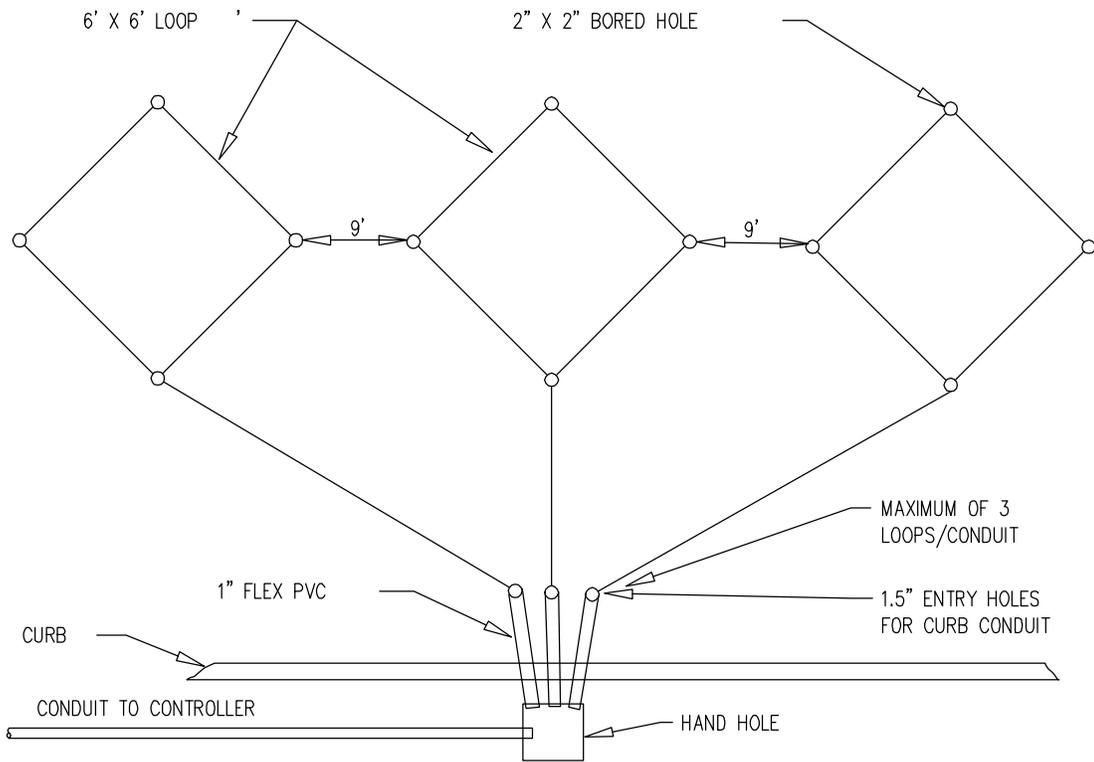
1/2" PVC CONDULET, FILLED WITH SILICONE RUBBER SEALANT (CONNECT 3 LOOPS IN SERIES TO LEAD-IN PAIR)



PREFABRICATED DETECTOR LOOP
NO SCALE

Standard Name:	Prefabricated Detector Loop	
Detail Information:	Drawing Number:	8010.5
Revision Date:	November 2001	Sheet: 1 of 4

Council Bluffs Traffic Signal Standards



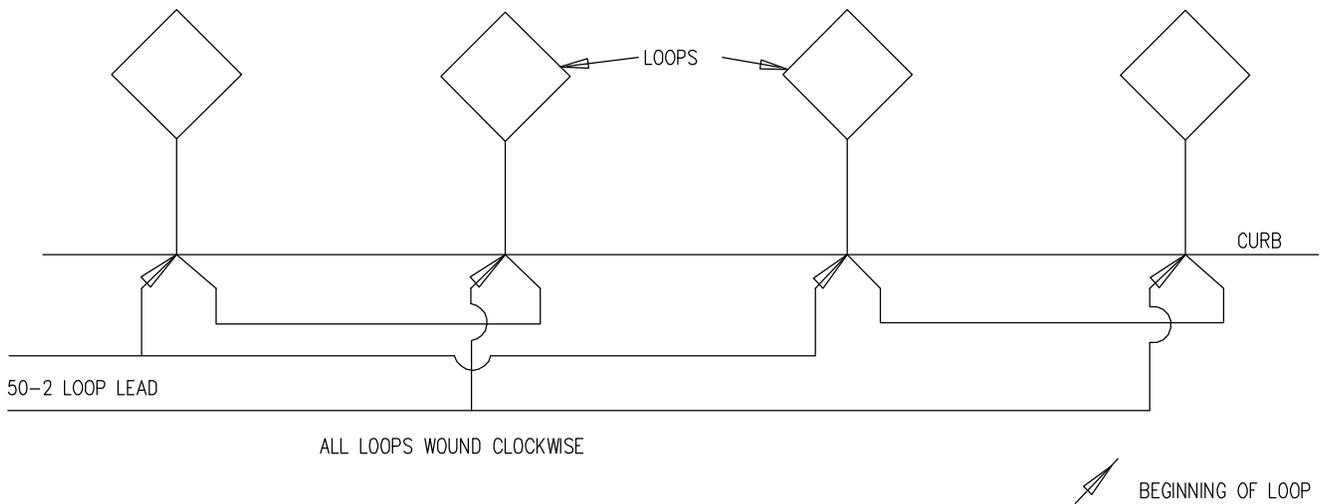
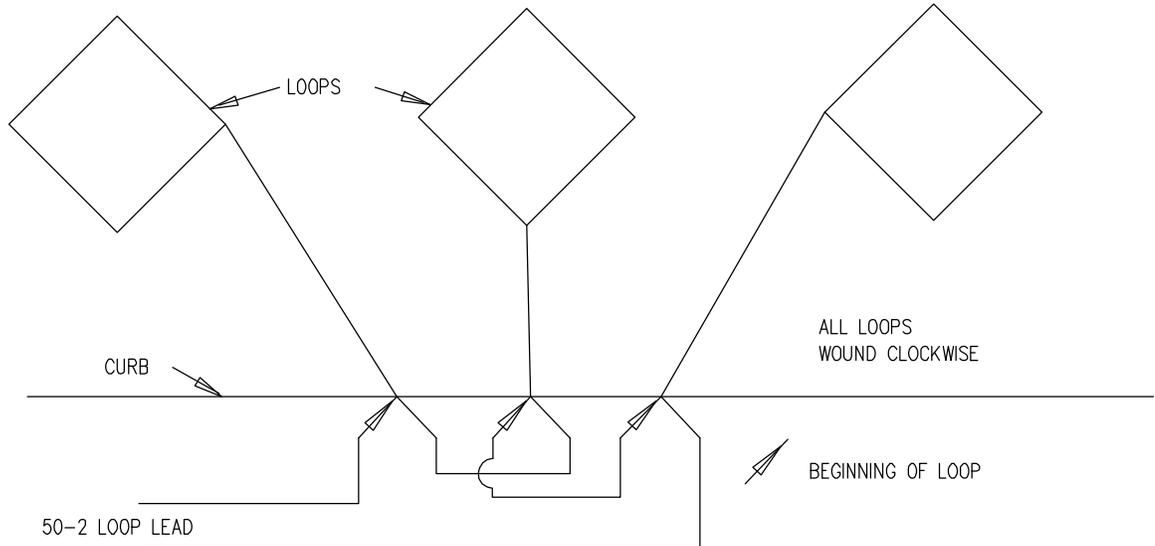
LOOP DETAIL
NO SCALE

Standard Name:	Loop Layout Detail	
Detail Information:	Drawing Number:	8010.5
Revision Date:	November 2001	Sheet: 2 of 4

Council Bluffs Traffic Signal Standards

3 LOOP PHASING DETAIL

NO SCALE



4 LOOP PHASING DETAIL

NO SCALE

Standard Name:	Traffic Signal Loop Wire Phasing		
Detail Information:			Drawing Number: 8010.5
Revision Date:	November 2001		Sheet: 3 of 4

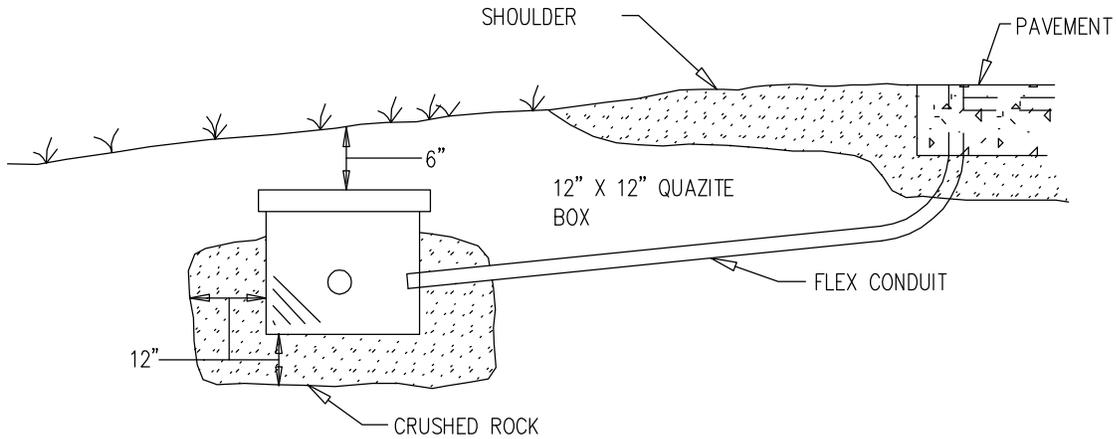
Council Bluffs Traffic Signal Standards

LOOP HAND HOLE

DETAIL

NO SCALE

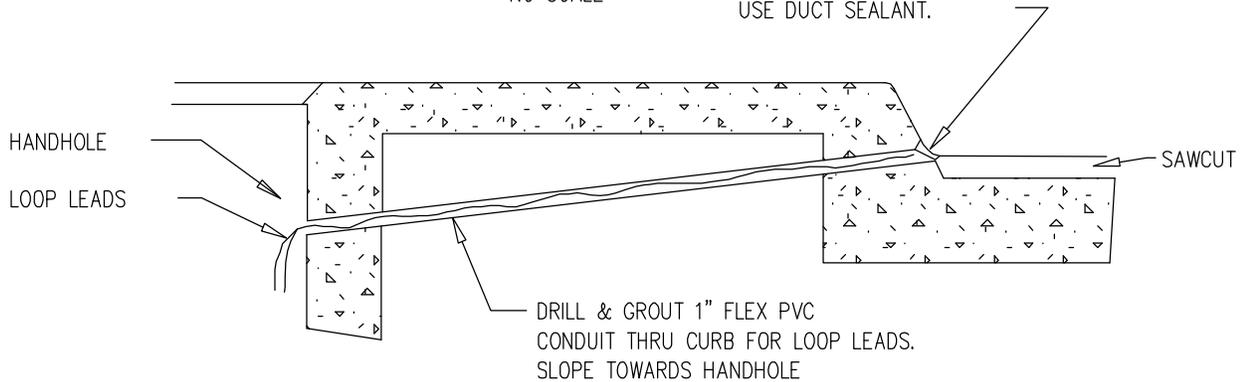
(ROADWAY WITH DITCH & NO CURB)



CURB DETAIL

NO SCALE

SEAL CONDUIT BEFORE
POURING LOOP SEALANT.
USE DUCT SEALANT.



Standard Name: Loop Lead for Curb & Shoulder Sections

Detail Information:

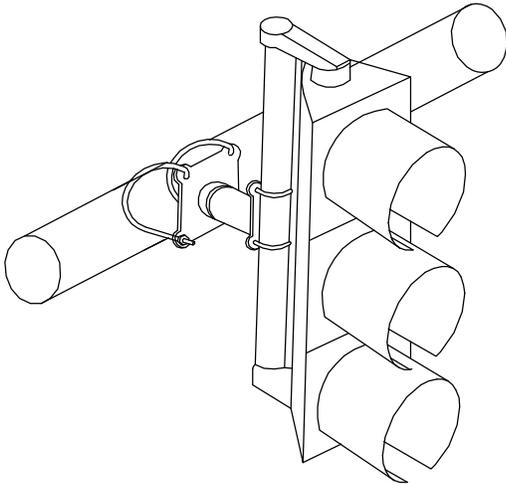
Drawing Number: 8010.5

Revision Date:

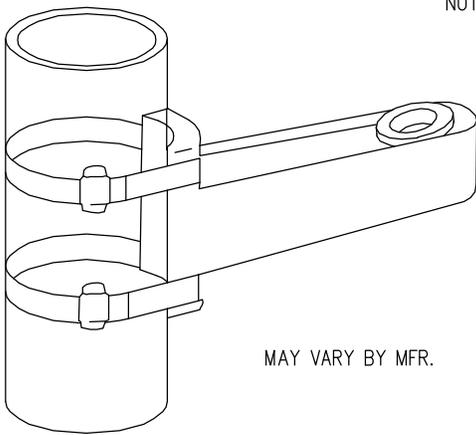
November 2001

Revision Number: 4 of 4

Council Bluffs Traffic Signal Standards



MAST ARM
MOUNTING BRACKET
NO SCALE

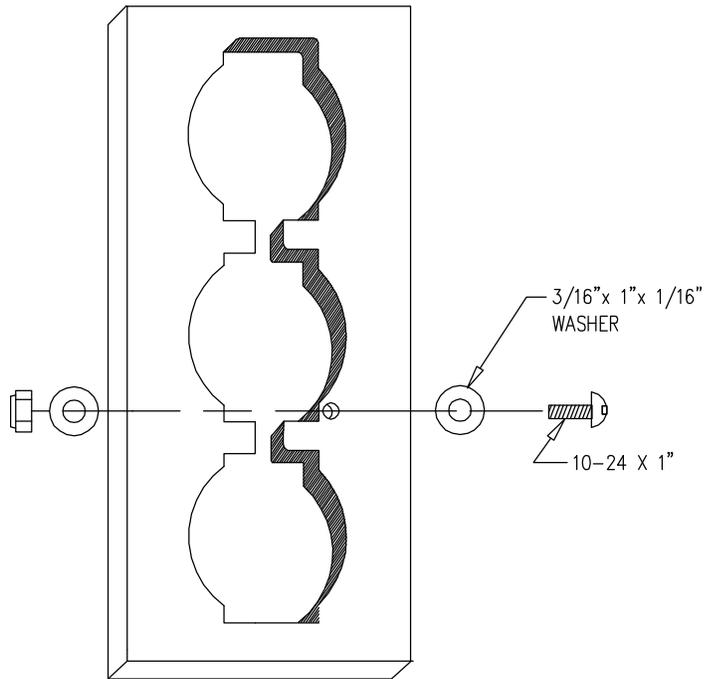


SADDLE BRACKET
POLE MOUNT HARDWARE
NO SCALE

MAY VARY BY MFR.

NOTE:
10-24
NYLON
LOCKING
NUT

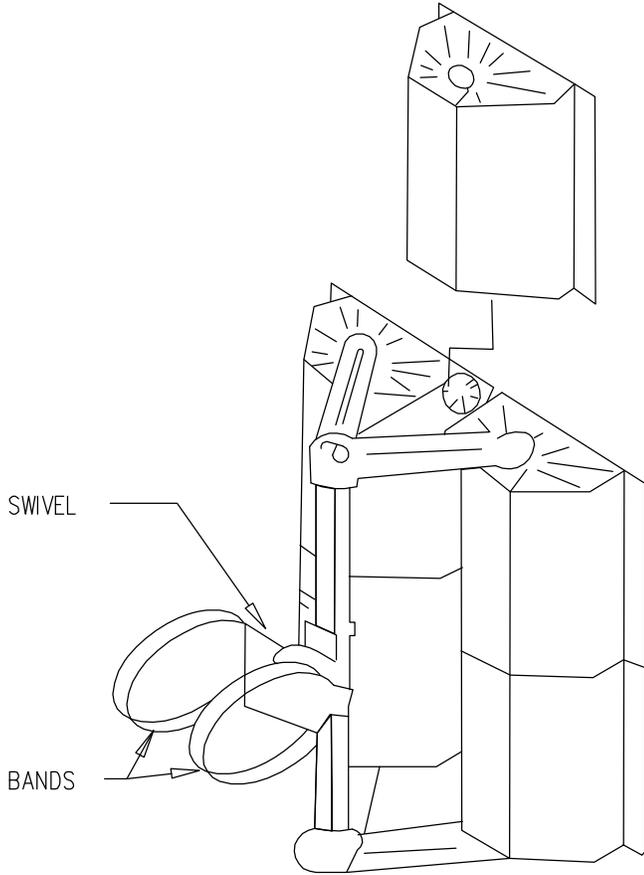
BACK PLATE
NO SCALE



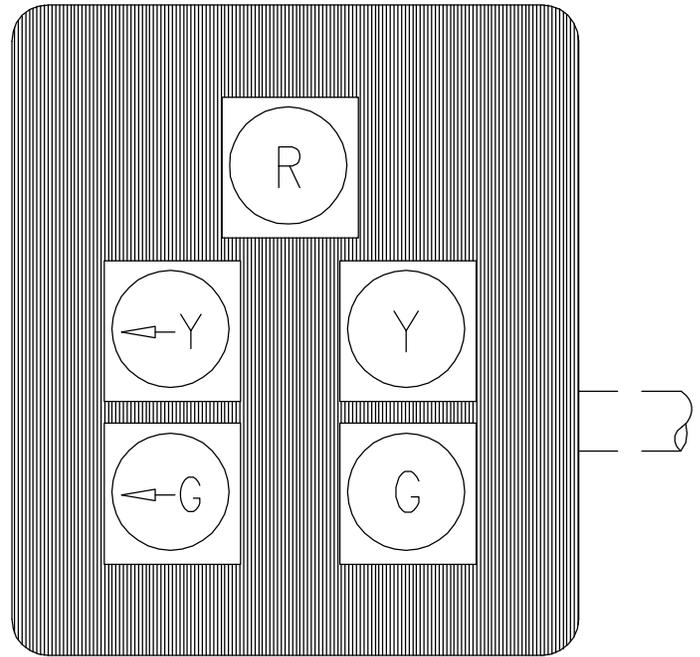
VACUUM
FORMED
ONE
PIECE

Standard Name: 3 Section Signal Head Detail	
Detail Information:	Drawing Number: 8010.8
Revision Date: November 2001	Sheet: 1 of 2

Council Bluffs Traffic Signal Standards



Typical 5 Section
Traffic Signal Head
and Support



5 Section Signal
Head Configuration

Standard Name: 5 Section Signal Head Configuration

Detail Information:

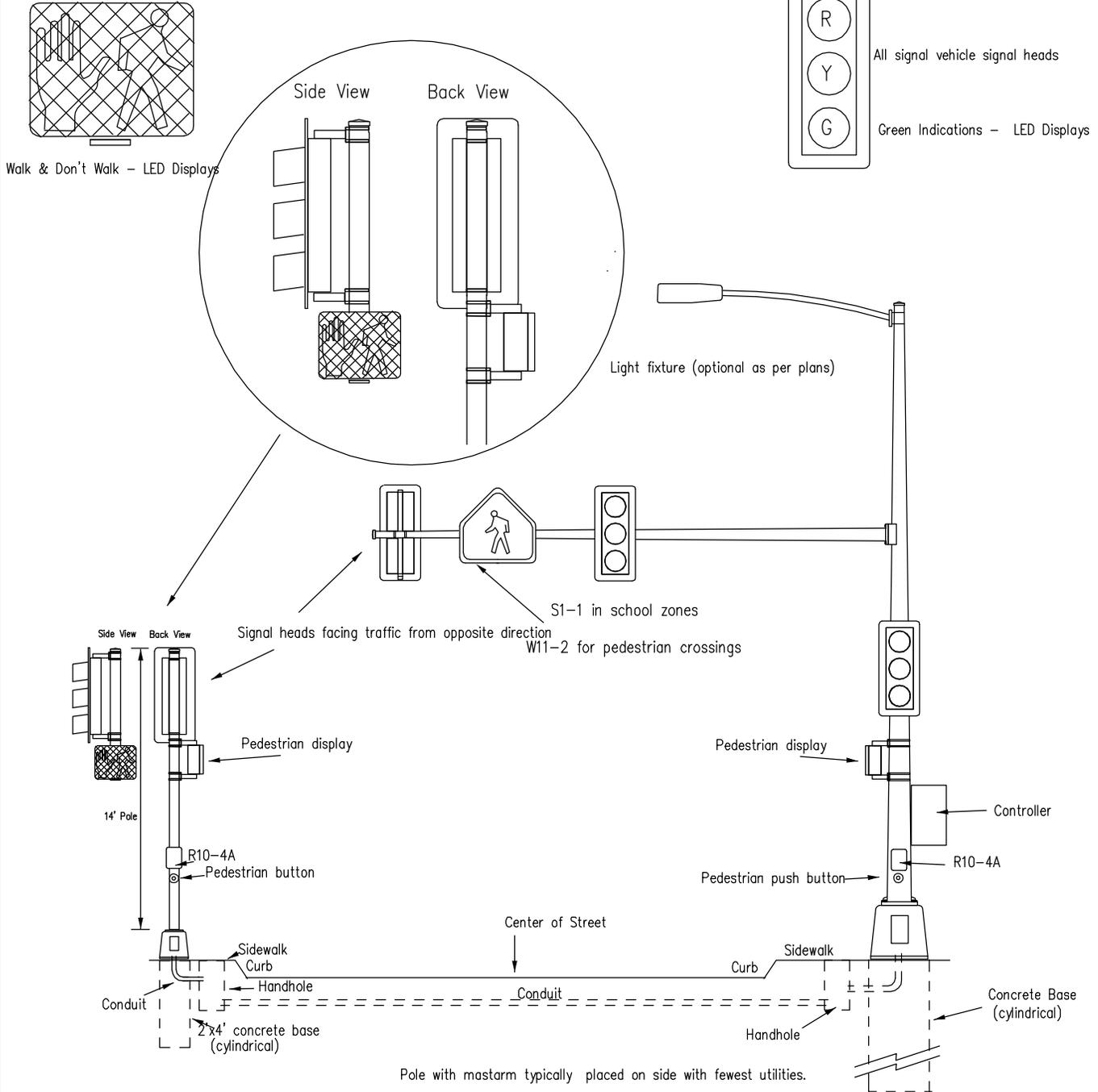
Drawing Number: 8010.8

Revision Date: November 2001

Sheet: 2 of 2

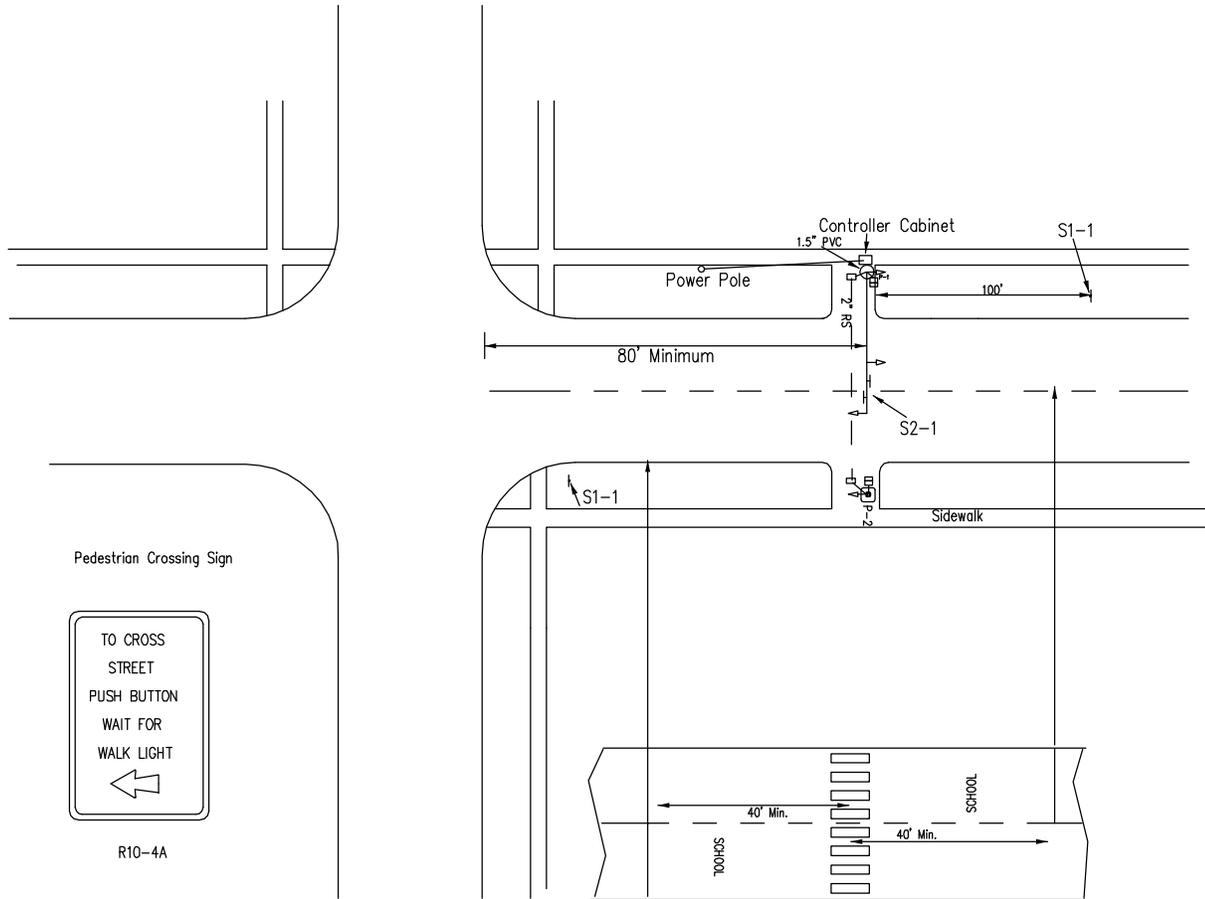
Council Bluffs Traffic Signal Standards

P-1, P-2 Standard Universal Symbol Pedestrian Heads



Standard Name: Pedestrian Crossing Signals	
Detail Information:	Drawing Number: 8010.12
Revision Date: November 2001	Sheet: 1 of 2

Council Bluffs Traffic Signal Standards



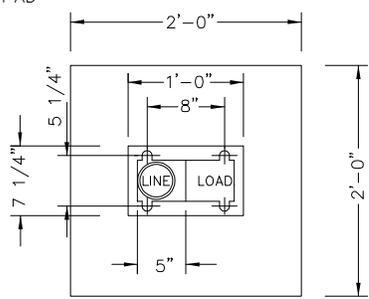
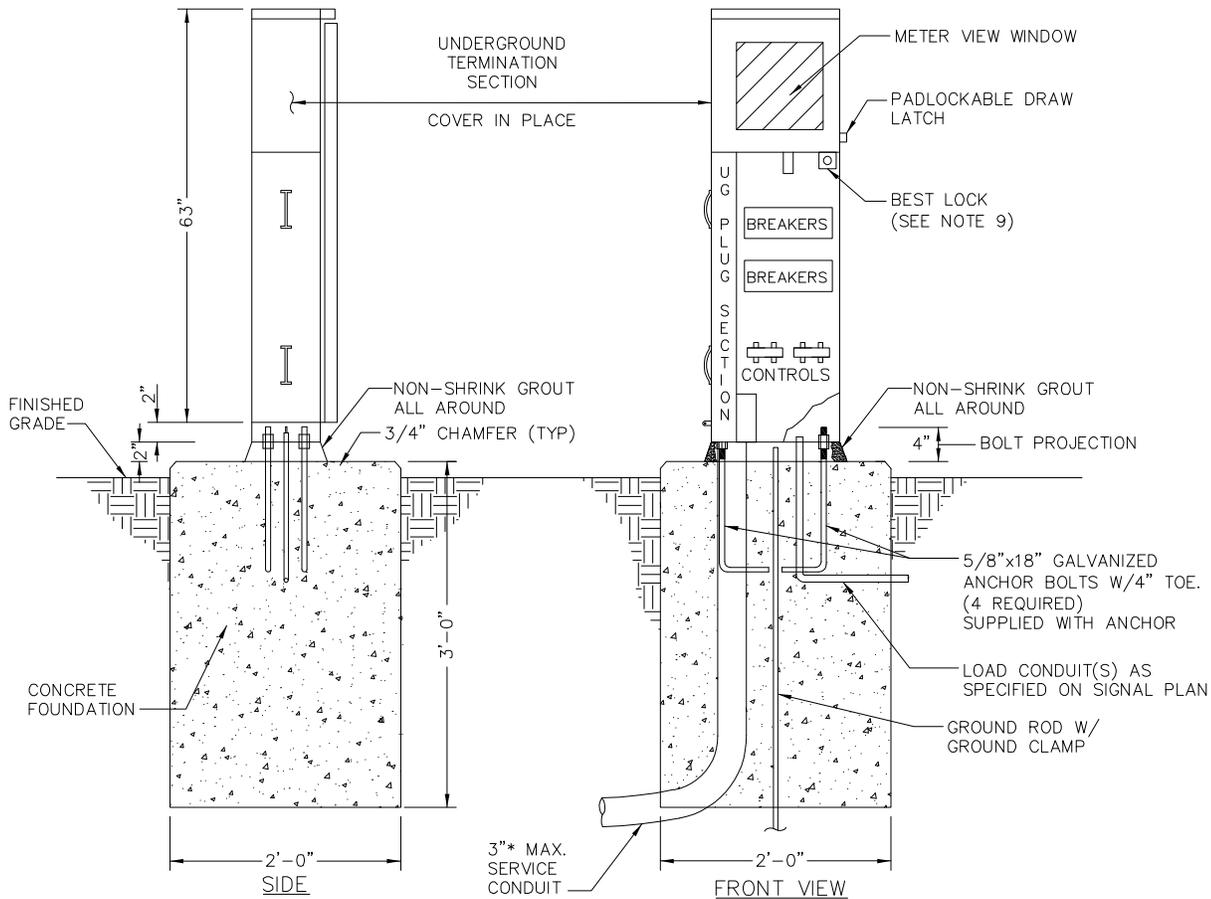
Notes

- Contractor to install pedestrian crossing equipment.
- City to supply all equipment except concrete, electrical service, and anchor bolts.
- City to supply all signs and mounting hardware.
- City to install signs located on curb area.
- City to supply and install pavement markings.
- Concrete bases and remainder of project to follow City of Council Bluffs Traffic Signal Installation Standards, latest Rev.
- All areas where grass is disturbed by the contractor will be seeded by the contractor as per City of Council Bluffs standards.

Standard Name:	Pedestrian Crossing Location & Markings	
Detail Information:	Drawing Number:	8010.12
Revision Date:	November 2001	Sheet: 2 of 2

Council Bluffs Traffic Signal Standards

Traffic Signal Electrical Service



BASE PLAN
SCALE: NONE

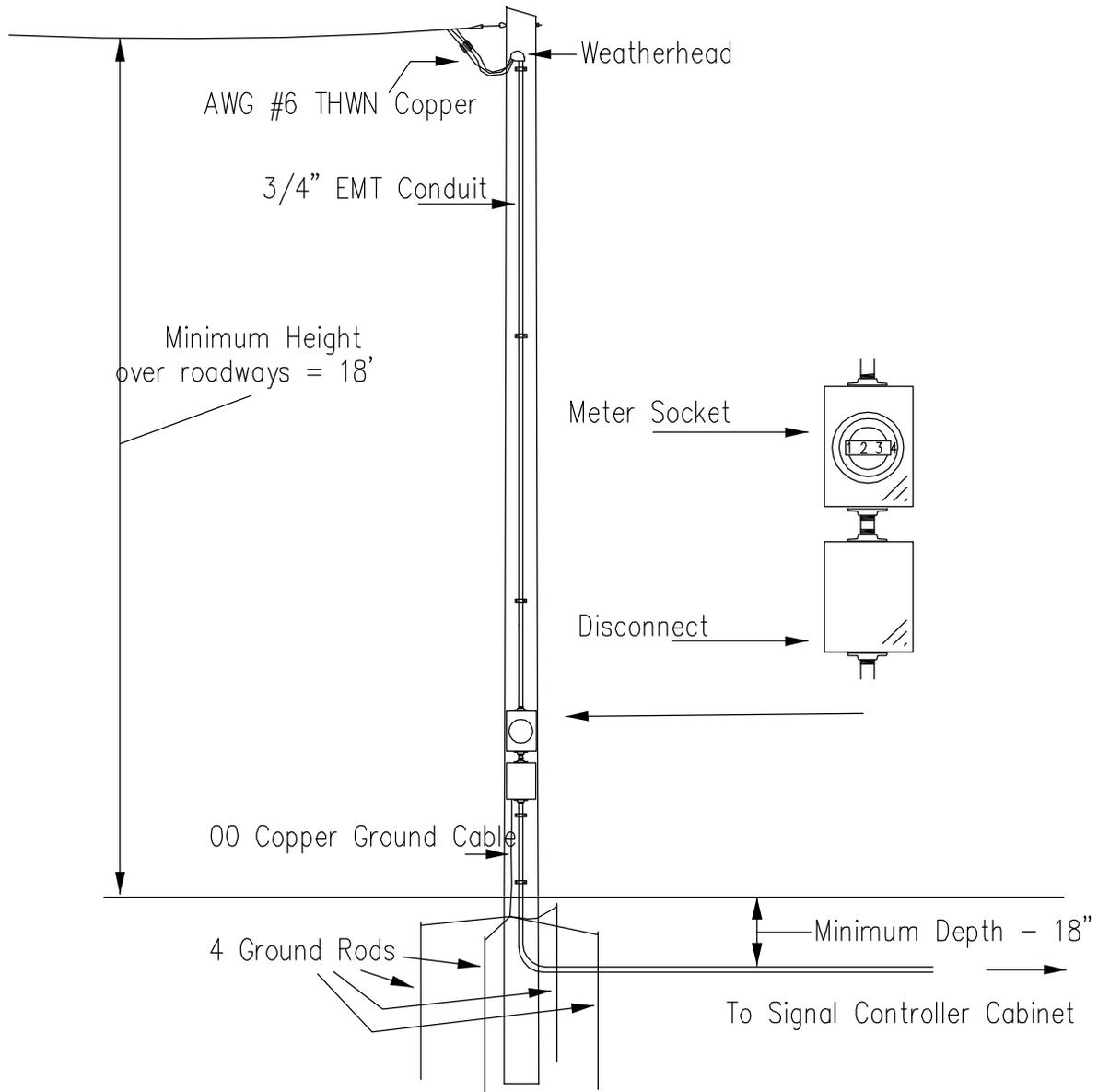
ENCLOSURE CONSTRUCTION NOTES

1. FABRICATED FROM 1/8" ALUMINUM, ELECTRICALLY WELDED AND REINFORCED WHERE REQUIRED. THE CABINET SHALL BE UNPAINTED NATURAL ALUMINUM.
2. CONSTRUCTION WILL BE NEMA 3R RAIN TIGHT.
3. ALL NUTS, BOLTS, SCREWS AND HINGES, WILL BE STAINLESS STEEL.
4. NUTS, BOLTS, AND SCREWS WILL NOT BE VISIBLE FROM OUTSIDE OF ENCLOSURE.
5. PHENOLIC NAMEPLATES WILL BE PROVIDED WHERE REQUIRED.
6. CONTROL WIRING WILL BE MARKED AT BOTH ENDS BY PERMANENT WIRE MARKERS.
7. A PLASTIC COVERED WIRING DIAGRAM WILL BE ATTACHED TO THE FRONT DOOR.
8. ENCLOSURE WILL BE FACTORY WIRED AND CONFORM TO REQUIRED NEMA STANDARDS.
9. LOCK TO MATCH CURRENT CITY COMBINATION.
10. SERVICE ENCLOSURE SHALL BE TESCO CLASS 26-100-M-A2 OR CITY APPROVED EQUAL PRIOR TO BID.
11. CONCRETE FOR FOUNDATION SHALL BE 4000 PSI.
12. ENCLOSURE SHALL BE SET PLUMB AND LEVEL.

Standard Name:	Electrical Service - Pedestal
Detail Information:	Drawing Number: 8010.15
Revision Date: December 2019	Sheet: 1 of 3

Council Bluffs Traffic Signal Standards

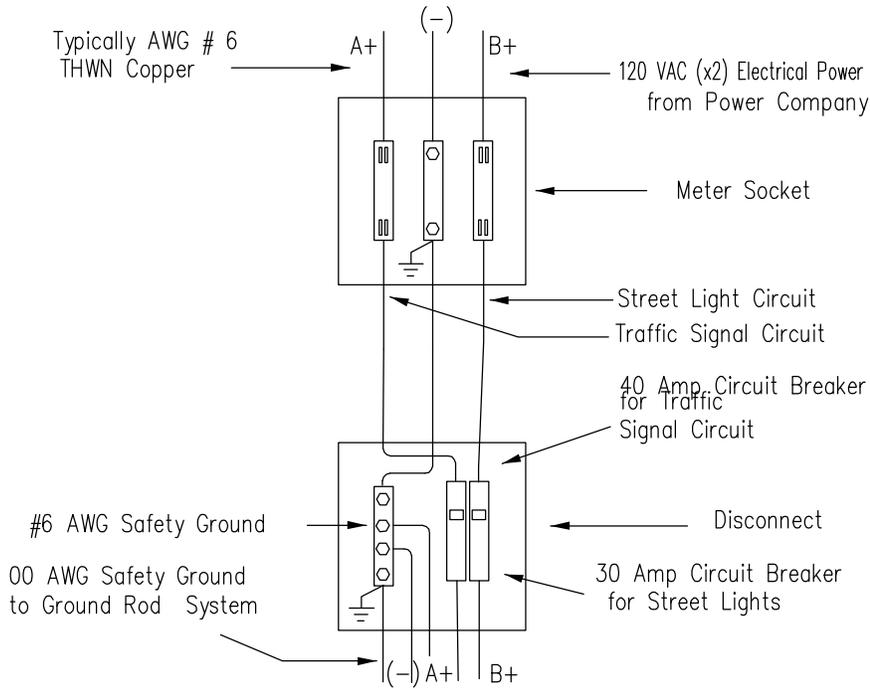
Traffic Signal Electrical Service



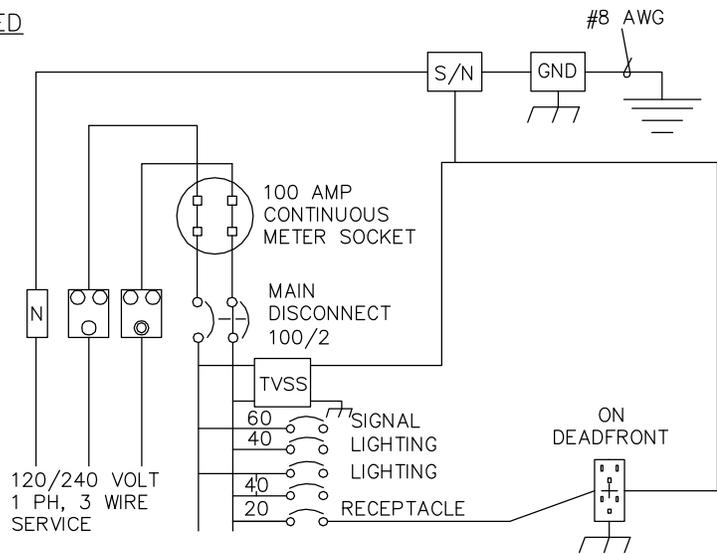
Standard Name:	Electrical Service – Pole Mounted	
Detail Information:	Drawing Number:	8010.15
Revision Date:	December 2006	Sheet: 2 of 3

Council Bluffs Traffic Signal Standards

Traffic Signal Electrical Service Schematic



WIRING DIAGRAM – POLE MOUNTED



WIRING DIAGRAM – PEDESTAL

Standard Name: Electrical Service – Electrical Schematic	
Detail Information:	Drawing Number: 8010.15
Revision Date: December 2006	Sheet: 3 of 3