

**City of Edmonton
City Operations
Transportation Operations**

**2016 Revised Traffic Signal
Construction and Maintenance Specifications**

Index

- Traffic Signal Construction and Maintenance Specifications
- Sceptacon PVC Conduit
- Loop sealant specifications
- Junction boxes specifications
- Traffic cable specifications
- 28' cantilever pole – 14" BCD
- 35' cantilever pole – 14" BCD
- 35' cantilever pole – 15.5" BCD
- 50' cantilever pole – 15.5" BCD
- 60' cantilever pole – 20" BCD
- 14' streetlight CCL pole extension
- 16' 2- piece pedestal pole 11.5" BCD
- 45' CCTV pole 16" BCD
- Pre-cast concrete base – 11.5" BCD
- Base – 16' pedestal
- Base – 28' / 35' CCL – 14" BCD
- Base – 35' / 50' CCL – 15.5" BCD
- Base – 60' CCL – 20" BCD
- DYWIDAG bolts and nuts installation standard
- M-1 traffic control cabinet pre-cast base
- Pole mounted cabinet and rigid PVC conduit
- Safety base
- Transpo – Pole-Safe Model No. 4062
- Sample Fixture Diagram
- Fixture Assembly Drawings
- Sample - Construction Completion Certificate
- Sample - Final Acceptance Certificate
- Sample – Cabinet Maintenance Form
- Sample – Equipment Replacement Form
- Sample – External Maintenance Form
- Low Priority Repair Occurrences
- High Priority Repair Occurrences
- Specifications for Repair of Anchor Rods
- Construction Specifications for Portland Cement
- Scope of Work / Specifications
- Traffic Signal Commissioning Report
- Specifications TS2 TYPE 1 Traffic Control Equipment
- BullsEye Pedestrian Button Specifications
- Polara Pedestrian Button Specifications
- City of Edmonton Enviso Package
- City of Edmonton Enviso Questionnaire

City of Edmonton Transportation Operations Traffic Signals Construction & Maintenance Specifications

1 GENERAL

The intent of the Traffic Signals Construction and Maintenance Specification is to present a guideline for all Contractors performing construction or maintenance activities on all traffic control devices used by the Transportation Operations Branch of the City of Edmonton, City Operations. The procedures for the specific traffic control devices represent the current construction and maintenance practices for the device types in use today.

1.1 Definitions

Throughout this Contract, the following terms have special meanings:

Business Day: Any day of the week excluding Saturday, Sunday and statutory holidays.

Contractor: The submitter of the successful tender for service of this Contract.

Damaged Equipment: Any piece of equipment owned or maintained by the City that is no longer capable of normal functioning as originally designed, or as since modified, or any piece of equipment that has deteriorated sufficiently in the opinion of the City, so that failure is imminent, or which safety could be a concern.

Debris Removal & Disposal: Removal of all debris, including excavated material from the site.

Emergency: A condition which is a hazard to the public, or is designated by the City to be a hazard of such severity that life and property are endangered, which requires immediate corrective action.

Normal Business Hours: The hours of work during a Business Day, typically 0700 hours to 1730 hours.

Permanent Repair: The restoration of the function of a traffic control device on a permanent basis.

Response Time: The elapsed time between receipt by the Contractor of a call for emergency service and the time of arrival on-site of qualified staff of the Contractor.

Storm: A condition determined by the City, based on weather reports issued by Environment Canada.

Temporary Repair: The restoration of the function of a traffic control device on a temporary basis.

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

Immediate Use: Available on a year round basis, on 24-hours notice from the City.

Third Party: Any individual or organization other than the City of Edmonton (“The City”), or the Contractor.

The City: The City of Edmonton, Transportation Operations.

Week: A period of seven consecutive calendar days. Any multiple of this term should mean a corresponding multiple number of calendar days.

1.2 Signal & Device Types

The following signals traffic and control device types are currently in use by the City of Edmonton.

Device Types

- On Line Signal
- On Line Bus/Ped Signal
- On Line Ped Signal
- On Line Lane Control Signal
- Local Coordinator Signal
- Local Coordinator Bus/Ped Signal
- Local Coordinator Ped Signal
- System Coordinator Signal
- System Coordinator Bus/Ped Signal
- System Coordinator Ped Signal
- Interconnected Signal
- Interconnected Bus/Ped Signal
- Interconnected Ped Signal
- Amber Flasher Crosswalk
- Four Way Stop Beacons/Warning Beacons
- Fire Hall Warning Signal
- Over Height Detector and Warning Signal
- Variable Speed Limit Sign
- Dynamic Message Sign (DMS)
- Closed Circuit Television Camera (CCTV)
- Rectangular Rapid Flash Beacon (RRFB)
- Vehicle Detection Station (VDS)

2 PRODUCTS & MATERIALS

2.1 *Equipment Specifications*

All equipment and materials utilized while carrying out construction and maintenance as part of this specification are identified throughout this specification. No substitute equipment or materials will be accepted for use without the express written consent by the City.

2.2 *Quality Assurances*

Except when otherwise instructed by the City, the Contractor shall retain in stock for immediate use all equipment and materials necessary to carry out the works or any part of the works. All such equipment and material shall be approved by the City prior to use, and shall be inspected by the Contractor to ensure compliance in all respects with any relevant specifications and safety codes.

The Contractor shall furnish, on the City's request, any information concerning components, materials and finished goods incorporated in the work. This information shall include country of origin, type of manufacturer, manufacturer's recommendations and specifications, and the degree of assembly required.

The Contractor shall maintain documentation on specifications, operations and maintenance of all materials and equipment used under this Contract.

The Contractor shall submit a Quality Control procedure to the City for approval.

2.3 *Procurement Procedures*

The Contractor shall procure equipment and materials as directed by the City. The Contractor will provide a recommendation on the procurement of equipment and materials, which will be then subject to approval by the City. The Contractor shall be required to receive, store and issue such equipment and material as the City may from time to time require. The Contractor shall visually inspect the equipment and material and prepare a written report on any material delivered in a damaged condition and forward this report to the City.

2.4 *Inventory Control Procedures*

The Contractor shall accept full responsibility for all such equipment and material while it is in the Contractor's keeping. The Contractor shall keep such equipment and material fully covered by insurance against loss by fire and theft. When materials are delivered to the Contractor's site, the Contractor shall notify the City. The Contractor must submit an Inventory Control Procedure to the City for approval.

City of Edmonton Transportation Operations

Traffic Signals Construction & Maintenance Specifications

Electronic equipment shall be stored in an indoor environment with proper humidity and temperature controls in compliance with the manufacturer's recommendations and specifications where applicable.

The Contractor shall be required to account for the disposition of all such material or equipment in writing. The Contractor shall develop an inventory control system for approval by the City.

All costs associated with the procurement and storage of equipment and materials shall be included in the Overhead charges. The inventory of equipment and materials will be subject to an annual audit by the City.

The City will specify minimum inventory levels for key device types. The Contractor will be required to maintain these minimum inventory levels at all times.

2.5 *Disposal of Damaged & Obsolete Material*

No traffic control device damaged in an accident resulting in personal injury or fatality shall be disposed, unless prior approval of the City is obtained. The traffic control device must be tagged with information on location, date and time that the device was damaged.

The Contractor shall arrange for the return of damaged, worn out, and obsolete material to the storage area, or shall arrange for disposal as directed by the City. Where equipment has been damaged, corroded or otherwise failed, the Contractor shall notify the City of any suspected hazardous waste.

The Contractor shall comply with the requirements of all Federal, Provincial, and Municipal laws, acts, ordinances, regulations, and by-laws, which could in any way pertain to the work outlined in the Contract, and be responsible to ensure that disposal of hazardous waste shall not contravene all applicable laws.

3 QUALIFICATIONS

3.1 Contractor Staff

Contractor is to provide documentation which verifies the qualifications of all personnel that perform work as part of this specification. As the Contractor adds or removes staff to complete the work as part of this specification the Contractor is required to notify the City, in writing, and to provide documentation which verifies the individual's qualifications. The City will upon verification of qualifications, give notice of approval of individuals for the specific qualification level as outlined below.

For the purposes of this specification, qualification definitions have been developed which define the minimum requirements for performing the different aspects of signals construction and maintenance. The qualifications focus on electrical trade qualifications and certifications recognized by the International Municipal Signals Association (IMSA).

It is the responsibility of the Contractor to ensure that its personnel are appropriately qualified to operate all vehicles and equipment as required.

The following table describes the minimum requirements for the 3 qualification levels as defined by the City of Edmonton which are TECH I, TECH II and TECH III.

	TECH I	TECH II	TECH III
Electrical Qualifications (As defined in the Alberta Apprenticeship & Industry Training Act – Electrician Trade Regulation (Alta Reg 98/95))			
Certified Journeyman and Power Lineman or Power System Electrician or Electrician	✓	✓	✓
Master Electrician			✓
Electronics Qualifications			
Electronics Course Work		✓	✓
Digital Logic Course Work		✓	✓
Microprocessor and/or PLC Course Work			✓
Traffic Signal Qualifications			
IMSA Work Zone Safety	✓	✓	✓
IMSA Traffic Signals Level I	✓	✓	✓
IMSA Traffic Signals Level II		✓	✓
IMSA Traffic Signals Level III			✓
Number of Years Experience			
Working as a TECH I		2	2
Working as a TECH II			2
Working as a TECH I/TECH II Total			5

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

The contractor shall submit to the City the name of a single individual who is responsible for making all necessary decisions concerning contract services and management.

3.2 Use of Subcontractors

Work that is sublet “subcontracted” shall not include work which is in turn subcontracted by an additional party. Subcontract work shall be limited to work performed by the subcontractor’s own forces.

The names of all subcontractors to be employed on the Contract are to be provided and are subject to approval by the City. Subcontractors assigned to regular, continuous work for the Contract shall have a single designated representative authorized to represent the subcontractor in dealings with the Contractor and the City with respect to Contract matters. This individual shall have a thorough knowledge of Contract requirements and will have the authority to commit resources for Contract work.

There shall not be wholesale subcontracting of maintenance. The Contractor shall perform not less than 51% of the maintenance with his own forces based on the amounts payable to the Contractor. In all cases, the Contractor’s daily management and supervision shall be done with his own forces. A representative of the Contractor must be on site at all locations which are being dealt with by a subcontractor.

4 WORK ZONE SAFETY

Work Zone Safety while carrying out construction and maintenance duties on behalf of the City of Edmonton are of utmost importance. The Contractor shall at all times follow the latest edition of the Procedures for On-Street Construction Safety produced by the City of Edmonton Transportation Operations. In addition the Contractor shall follow the Occupational Health And Safety Act. In the event that there is a conflict between the Occupational Health and Safety Act and the City of Edmonton procedures for on-street construction safety, the Occupational Health and Safety Act shall apply.

All Contractor on-site personnel must possess one or more of the following qualifications:

- IMSA Work Zone Safety Certification;
- Alberta Construction Association Work Zone Safety Certification; or
- City approved equivalent.

4.1 *Precautions*

Because of the characteristics of certain traffic control installations, extra precautions, planning and co-ordinating may be required to perform the work while fulfilling the obligations of the City's procedures for On-Street Construction and Safety. An example of this would be performing work on the variable speed located above Whitemud Drive at the Quesnell Bridge since work will be performed in close vicinity to traffic moving at high speeds and limited sight lines.

5 TRAFFIC SIGNAL CONSTRUCTION

5.1 *Permits*

5.1.1 OSCAM Permits

The Contractor shall be responsible for obtaining On-Street Construction and Maintenance (OSCAM) permits as required and is responsible for Permit fees. The Contractor shall follow all rulings and directives from the City as a result of obtaining these permits.

5.1.2 Electrical Permits

The Contractor shall be responsible for obtaining all electrical permits where required in carrying out the work as described in this document including all permit fees. The Contractor is responsible for arranging all electrical inspections as required to fulfill all requirements of the permit.

5.2 *Designs*

All designs required for traffic management construction and maintenance shall be provided by the City to the Contractor. The Contractor is required to adhere to the designs unless written approval is provided in advance by the City.

It is expected that the Contractor will work diligently in co-operation with the City to identify any on-site issues at the time of construction which may require alteration to the design. On-site alterations to the designs shall be marked up accordingly by the Contractor on all design drawings and approved by the City prior to construction. The mark-up drawings shall be returned by the Contractor to the City following construction so that the City can complete the as-built drawing set.

5.3 *Installation of Conduits*

The following sections describe the requirements for the installation of conduits to support the following cables:

- Power;
- Wireless Communication;
- Control; and
- Detection.

All specifications described shall be followed unless indicated otherwise on the designs.

5.3.1 Standards Reference

All conduit installations shall comply with the current edition of Canadian Electric Code and the Alberta Electrical & Utility Code.

5.3.2 Procedures

There are three acceptable procedures for conduit installation:

- Pushing shall be done as a first choice to minimize cost and disruption;
- Trenching as an alternative to pushing shall be agreed to onsite between the Contractor and the City; and
- Barring is an acceptable method for short runs as an alternative to trenching and pushing.

Depth and compaction of conduit installation shall comply with the Alberta Electrical and Utility Code. Conduit installation shall also comply with the current edition of the Canadian Electrical Code.

All conduits shall be marked with a 300 mm cover of sand and a detectable warning tape where specified in the designs as per the IMSA standards.

Where conduits traverse other utilities, each utility must be opened with a 300 mm x 300 mm square cut to observe the push such that no ducts are damaged or cut. The Contractor must comply with all right-of-way crossings requirements for all utilities. This includes but is not limited to:

- Telephone / Communication;
- Gas lines;
- Power greater than 240 v; and
- Water mains less than 1.5 m deep.

Separate 50 mm conduits shall be installed for power, detection, telecommunication and control. All conduits which are installed from the controller cabinet to the pole must be 50 mm. Conduits which are to contain control cables and traverse from pole to pole must be 50 mm. 75 mm shall be used for long distances.

Pull boxes must be installed for extended conduit lengths as indicated on the designs. Multiple bends in opposing directions are strictly forbidden. Conduit entrances into pull boxes must be installed such that conduit designated for communication is capable of accommodating a minimum of 23 cm bend radius and a minimum of 30 cm clearance from the top of the cable bend to the top of the pull box. The primary purpose of this requirement is to accommodate fiber optic cable installation.

All conduits must contain a pull string at all times. All unused conduits must be capped. All splices into existing bends shall ensure smooth bends and be taped using PVC electrical tape as listed in Appendix "A".

5.3.3 Notifications/Permits

The Contractor is responsible for contacting Alberta 1 Call and shall meet the utility locator onsite. The Contractor must pay for all missed appointments with the utility locator.

Where high pressure gas lines and high voltage lines (72 kV or greater) exist, the Contractor must meet individually with the owner(s) to verify the locates.

The Contractor shall notify the City and arrange an inspection of the conduit installations by the City prior to backfill taking place.

The contractor shall contact the City regarding any unidentified utilities found on the work site. The City shall notify external utilities and sign all agreements with the external utilities prior to work commencing. This includes but is not limited to:

- Power greater than 72 kv;
- High pressure gas lines;
- Communication cables; and
- High pressure water lines

Where ducts enter vaults or man holes owned by others it is the responsibility of the Contractor to notify the owner and co-ordinate the installation.

The City shall be responsible for obtaining the Utility Line Assignment (ULA) and the Unmetered Power Application (UML).

5.3.4 Documentation

The City monitors all construction and completes the as-built for the project. Conduit locations which deviate from the design provided must be indicated to the City.

Cabinet as-built must be received by the City before the Construction Completion Certificate is approved.

5.3.5 Materials

The following are acceptable materials that are required during the installation of conduits for traffic signal purposes:

- Septicon rigid PVC conduit or equivalent, 50 mm and 75 mm where required;
- PVC glue;
- Black PVC electrical tape; and
- Scepter PVC pull boxes and junction boxes.

The acceptable locations and methods of use are indicated in the procedures section or in the designs. Detailed specifications for the products are found in Appendix “A”.

5.3.6 Qualifications

Installation of all conduit must conform to any requirements set out in the Canadian Electric Code.

5.3.7 Quality Control Checks & Procedures

Inspection of all conduit installations must be made by a City Traffic Signal Technologist prior to backfilling. The Signal Technologist will inspect for compliance with the design drawings. In addition, the following items will be inspected:

- Number of conduits;
- Alignment;
- Connections;
- Depth;
- Number of bends;
- Bend radius; and
- Damage to conduits.

Prior to backfilling, the City shall inspect all work.

5.4 *Installation of Cabinets*

The following sections describe the general installation of the traffic cabinet and base. In addition, procedures for signal activation will be addressed.

5.4.1 Procedures

Unless otherwise specified, the cabinet installation will involve the installation of a precast M1 type base. The precast M1 type base design can be found in Appendix “A”. The following procedure shall be followed during the installation of the precast base.

- Hole approximately 1.2 m in depth with NO disturbed soil at the base;
- Sand layer installed at the base to a maximum of 300 mm;
- 2 - 30 mm x 150 mm planks placed on the sand (levelled); and
- Base set on the plank.

In addition to all specifications included in the cabinet base design, all requirements of the latest version of the City of Edmonton Construction

Specification for Portland Cement Concrete for Structural Footings shall be followed. Note that site conditions may dictate that more stringent requirements must be followed. A copy of the January 1996 specification is attached for reference only in Appendix “F”.

Ducts shall be installed into the cabinets as per the design. A minimum of one spare 50 mm duct must be installed in each of the four portals of the base unless otherwise specified.

The base shall be level and oriented as per the design.

The installation shall be inspected and approved by a City Traffic Signals Technologist prior to backfilling. The City shall sign an inspection form indicating that all requirements have been met. The inspection form will be provided by the City.

The signal cabinet is to be bolted to the cabinet base after backfilling is complete. The cabinet shall be level and oriented as per the design. Shims shall not be used to level the cabinet. Silicon shall be applied on the outside where the base of the cabinets meets the concrete base. Foam sealant shall be applied such that an air tight seal is made at the opening of the precast base where the conduits enter the cabinet.

For cabinets mounted to poles, the cabinet is to be strapped to the pole using stainless steel strapping. Saddle brackets and angle irons are to be used as illustrated in the drawings in Appendix “A”. The underside of the cabinet must be sealed with a steel plate, gasket and silicon. All conduits shall protrude through the bottom of the cabinet and be properly sealed.

The cabinet shall be fully grounded as per the Canadian Electric Code utilizing grounding rods that are to be installed by the Contractor. The ground rods utilized must be appropriate to withstand the soil conditions. It is anticipated that copper clad ground rods will be required.

Detailed procedures for installation and termination of wiring within the cabinet are found in Section 5.5.

5.4.2 Bench Testing

Signal cabinets must be pre-wired at the Contractor’s shop. The cabinet must be configured to operate as per the designs provided by the City including timing, phasing and additional control logic.

When full compliance with the designs is confirmed, the cabinet must be bench tested for a minimum of 48 hours with no failure. All timing plans and time-of-day plans must be tested. Where applicable, the cabinets must be bench tested with communication enabled to one of the Traffic Management Centre’s signal

control computers for 48 hours with no errors. It is critical that a full conflict monitor test be performed prior to the bench test period beginning.

5.4.3 Signal Startup

The City will identify to the Contractor the date and time that the signals will be placed into “flashing” and “full” operation. “Full” activation of a signal will typically follow “flash” activation by a minimum of three days. A City Traffic Signals Technologist must be onsite while signals are placed into full operation.

Upon placing the signals into “flashing” operation the Contractor shall complete a “Flashing Operation” checklist provided by the City. The checklist shall be reviewed and signed-off by the City Traffic Signals Technician on-site.

Once the traffic signals are placed into full operation, the Contractor shall immediately perform an onsite activation test which includes but is not limited to:

- Conflict monitor test as outlined in Section 6.6.4.1.
- Vehicle detector test;
- Pushbutton test;
- Lamp inspection;
- Offset check for local coordinator signals;
- Operational compliance with timing sheet designs; and
- System operation confirmation with the City Traffic Management Centre for communication enabled signals.

A “Traffic Signal Commissioning Report” that documents the activation tests and other acceptance criteria shall be completed jointly by the Contractor and the City. Both parties shall sign-off this report.

5.4.4 Notifications/Permits

The Contractor shall be in compliance with the following:

1. Cabinet installation and wiring must be inspected by a City Traffic Signal Technologist prior to activation.
2. The Contractor is responsible for obtaining all permits as required including electrical permits.
3. The Contractor must notify the City when signals are placed into flashing operation.

5.4.5 Documentation

As-built mark-up drawings must be created and supplied to the City Operations Signals and Street Lighting office and placed within the signal cabinet in a

weather protected pouch. The as-builts must be provided within 15 business days and must include:

- Controller programming sheets;
- Logic wiring diagrams;
- Cabinet wiring diagrams;
- Cabinet bench test results;
- Checklist for “flashing” operation; and
- Commissioning Report for “full” operation

All work including signal activation and work performed subsequent to activation must be recorded in the cabinet logbook including time, date, technicians, details of work performed and the reason for performing the work.

5.4.6 Materials

- Cabinets
Nema M1
Nema P

All cabinets are to be provided by the City. Specifications can be found in Appendix “A”.

- Foam sealant; and
- Precast base.

5.4.7 Qualifications

The following tasks shall be performed by individuals having at minimum a TECH I qualification as defined in Section 3.1.

- Cabinet base installation;
- Backfilling;
- Cabinet placement; and
- Installation of cables.

The following tasks shall be performed by individuals having at minimum a TECH II qualification as defined in Section 3.1.

- Cabinet rewiring;
- Cabinet bench testing;
- Termination of all cables;
- Testing of signals; and
- Activation of signals.

5.4.8 Quality Control Checks & Procedures

The following points shall be observed throughout the duration of work required in this section:

- A City Traffic Signals Technologist must inspect the cabinet base installation prior to backfilling;
- City to verify cabinet is installed according to the inventory number assigned;
- City to inspect cabinets for damage due to installation prior to complete acceptance; and
- Signals must be on flash for a minimum of three days and a City Traffic Signal Technologist must be present before signal activation.

5.5 Installation of Cabling/Wiring

The following sections describe the specifications for the installation of all cabling and wiring as required for control, communication and detection devices.

5.5.1 Standards Reference

All installations of wiring and cable shall comply with the Canadian Electric Code and the Alberta Electric and Utility Code.

5.5.2 Procedures

Communications:

The Contractor is responsible for installing the communication cable from the telephony demarcation point to the cabinet. Installation must take place to the nearest telephone support structure with enough cable slack to allow the telephone company to pull to their demarcation point.

There are typically two types of telephony communication cable installations required. The communications cable required in the central business district is typically a 19 AWG twisted pair solid conductor communications cable. The specifications for this cable can be found in Appendix "A". The remaining traffic signal installations which require telephony communications cabling will require a 25 pair twisted solid 24 AWG telephone cable. Additional specifications for this cable can be found in Appendix "A".

For locations requiring a wireless radio connection, a Cat5E cable will be installed from the traffic cabinet to the antenna mounting location that will be identified on the design drawings.

The City provided design drawings will indicate the type of cable to be utilized in each application.

Control:

For cable entrances and exits from the poles, rubber grommets must be used to prevent abrasion to the signal cables.

Splicing of control cables is only permitted within the junction boxes, handholes, and at the base of poles and pedestals. Splices are not permitted within the signal fixtures or within conduits. Twist-on marretts shall be used for all splices with electrical PVC tape for mechanical protection.

Cables for audible pedestrian signals shall enter the walk/wait fixtures via a weatherproof connector.

Control cables shall not be installed through overhead structures.

Control cables which run from the control cabinet to handholes and handholes to pole bases shall be a minimum 16 conductor, 14 AWG IMSA colour coded traffic signal control cable unless otherwise specified in the signal design. All traffic signal control cables must have solid conductors. Each individual fixture requires a minimum 6 conductor, 14 AWG IMSA colour coded traffic signal control cable and 1 bare 14 AWG ground wire. Each individual fixture must be grounded as per the Canadian Electrical Code.

Power:

All power cabling must be appropriately sized and installed to meet the requirements of the Canadian Electric Code.

It is expected that the Contractor shall perform a neat and professional installation of all cabling and wiring within the traffic control cabinet. All cables and conductors must have appropriate slack and strain relief in the cabinet. All conductors shall be neatly routed to the appropriate terminal block positions. All conductors shall be securely terminated on the terminal block. The conductors shall be stripped such that the amount of exposed conductor protruding from the terminal block does not exceed 3 mm.

Loops:

Specifications for the cabling used in the installation of loops can be found in Section 5.7.4.

5.5.3 Testing

For all conductors which are installed and terminated to devices, a continuity test shall be performed to confirm proper termination. This test must be performed prior to activation or testing of any signal devices.

5.5.4 Documentation

Upon the completion of installation of all cabling, any changes regarding the cabling must be reported to the City.

5.5.5 Materials

The following materials are approved for use in performing the installation of cabling and wire as per this specification:

- IMSA 14 AWG colour coded solid conductor traffic signal control cable;
- 19 AWG shielded solid conductor twisted pair cable;
- 25 pair twisted 24 AWG solid conductor shielded telephone cable approved for underground use;
- 25 pair twisted 24 AWG solid conductor shielded telephone cable with messenger approved for aerial use;
- Manufacturer's specifications.

5.5.6 Qualifications

Installation and termination of all cabling excluding termination within the traffic control cabinet shall be performed by individuals having a minimum TECH I qualification as defined in Section 3.1.

5.5.7 Quality Control Checks & Procedures

The following points shall be inspected by the City upon completion of the work required in this section:

- Proper conductor sizing and quantities;
- Proper strain relief and weatherproofing;
- Neat and secure terminations;
- Proper amount of slack provided for all cables;
- Proper labeling of cables as required; and
- Proper splicing.

5.6 *Installation of Signal Poles*

The following sections describe both the underground and aboveground work for the installation of signal poles used to support all traffic signal equipment.

5.6.1 Procedures

All poles and bases shall be installed as per the instructions indicated on the pole designs and intersection design drawings. The pole location, orientation, grade and slope is critical and shall be as per the design drawings. The Contractor is

responsible for ensuring proper location and orientation of all poles and providing for surveys as required to install the bases and poles. Any changes to pole locations or orientation shall be approved by the City prior to the commencement of work.

In addition to all specifications included in the signal pole base design, all requirements of the latest version of the City of Edmonton Construction Specification for Portland Cement Concrete for Structural Footings shall be followed. Note that site conditions may dictate that more stringent requirements must be followed. A copy of the January 2016 specification is attached for reference only in Appendix "F".

Reinforced anchor rod cages shall be supplied and installed as per the individual pole designs which are referenced in Appendix "B". All traffic signal poles must utilize 1¼" diameter Dywidag type anchor rods unless otherwise indicated on the pole designs. Conduits installed in the pole base shall match that of the signal design. Anchor bolt templates are recommended to be used.

Shimming and use of leveling nuts are not permitted for traffic signal poles. Bases must be level. All nuts shall be properly torqued as per the specific pole design.

All poles must be grounded as per the Canadian Electric Code. Horizontal and vertical clearances from the signal pole to any high voltage lines must meet the Canadian Electric Code and Alberta Electrical Communications Utility Code (ECUC). Procedures supplied by the electrical utility must be followed for pole installations taking place in the vicinity of high voltage lines.

Where new poles are being installed in favour of existing poles, the signals must be deactivated prior to performing the cut over.

Where a 15.5" BCD pole is being installed on a 14" BCD base, a City approved adaptor plate must be used. Similarly, where the design calls for a 14.0" BCD pole to be mounted on a 15.5" BCD base, a City approved base adaptor must be utilized.

All poles and cantilever arms shall be handled as per the manufacturer's instructions.

5.6.2 Notifications Required

For pole relocations where signals are being de-energized, the Contractor is responsible for arranging police point duty. This is required for the duration of time that the signals are not active.

All Sonotube must be stripped back such that it is not visible above final grade.

It is the Contractor's responsibility to notify the City prior to backfilling of pole bases for inspection purposes.

5.6.3 Documentation

As-built documentation of pole locations shall be completed by City Technician.

5.6.4 Materials

The installation of the traffic signal poles requires the use of the following list of materials. Where available, the design drawings or specifications are included for each item in Appendix "B". Prior to the commencement of work, it is the responsibility of the Contractor to ensure that the Contractor has possession of the latest design drawings or specification for each product.

- 28' cantilever pole with 14" BCD;
- 35' cantilever pole with 14" BCD;
- 35' cantilever pole with 15.5" BCD;
- 50' cantilever pole with 15.5" BCD;
- 60' cantilever pole with 20" BCD;
- 14' streetlight CCL pole extension;
- 16' 2 – piece pedestal pole 11.5" BCD;
- 45' CCTV Pole 16" BCD;
- Typical pre-cast concrete base – 11.5" BCD;
- Base – 16'-PT-CPB;
- Base – 28' / 35' CCL – 14" BCD;
- Base – 35' ADV Sign / 50' CCL – 15.5" BCD;
- Base – 60' CCL – 20" BCD;
- DYWIDAG bolts and nuts installation standard;
- M-1 Traffic control cabinet pre-cast base;
- Pole mounted cabinet and rigid PVC conduit; and
- STD safety base installation instructions;

Some additional pole types such as structures and wood poles not itemized in this section will be referenced in the intersection designs as required.

For the procurement of new and refurbished poles, the City inspection procedure shall be followed.

5.6.5 Qualifications

All Contractors performing work for the installation of signal pole bases or signal poles must have, at minimum, a TECH I qualification as defined in Section 3.1.

5.6.6 Quality Control Checks & Procedures

The City Traffic Signal Technologist will inspect the installation of the base and pole for the following items prior to acceptance:

- Pole and base alignment with 2% rake;
- Demonstrated torque levels;
- Grounding;
- Conduits (quantity and direction);
- Quality of workmanship on concrete finishing;
- Pole elevation meeting specified grade;
- Pole base slope; and
- Cleanliness of the construction site.

5.7 Installation of Traffic Signal Detection Loops

The following sections specify the installation of traffic signal detection loops. These specifications shall be followed for the installation of loops as part of new build traffic signal construction or as part of ongoing maintenance.

5.7.1 Procedures

The detection loops shall be installed as indicated on the design drawings paying particular attention to the location, size and type as indicated. Where asphalt construction is scheduled, the Contractor is required to co-ordinate with the City to ensure that all loops are installed prior to the final lift of asphalt being placed.

The outline of loops and loop tails will be made with chalk or spray paint prior to cutting by the City. The saw cut depth shall be such that a minimum level of cover is placed above the loop wires for both concrete and asphalt:

- Concrete requires 25 mm of cover; and
- Asphalt requires 50 mm of cover.

Corners shall be cut utilizing the angle cut method. Care must be taken to ensure that the angle cut does not create an open “isolated triangle” of asphalt that may become unstable relative to the surrounding asphalt.

All saw cuts must be cleaned of loose debris using a suitable blower or vacuum. If required, clear pressurized water may be used to remove all debris followed by a blower to dry all surfaces. The number of “turns” of loop wire must be the same as what is called for by the signal design unless otherwise indicated by the City.

The “tail” portion of the loop assembly consists of the loop wire that extends from the loop portion in the pavement to the nearest junction box. There shall be

no splices between the loop tail and the loop. The loop tail shall be twisted from the loop to the nearest junction box at a minimum rate of 16 turns per metre.

The shielded lead in cable shall be spliced to the loop tail at the junction box. The two wires shall be soldered together and properly encapsulated and sealed with a waterproof sealant.

Loops must be properly labeled according to the approach and lane. Labels must be placed within all splice boxes and within the cabinet.

5.7.2 Notifications Required

Prior to and at the completion of the work the Contractor shall notify the City Transportation Operations, Traffic Management Centre (TMC).

5.7.3 Documentation

The City Technician will be on site to monitor all construction and will record all construction for the as-built to be completed by the City.

5.7.4 Materials

The following materials are approved for use for the installation of traffic signal detection loops.

All loop lead-in cable shall be #14 AWG stranded twisted shielded pair with approximately fifty (50) twists per metre. The shield shall be aluminum - polyester and be encased in a continuous polyethylene outer jacket. In addition the loop lead-in cable shall meet IMSA specification 50-2.

All loop detection cable shall be #14 AWG stranded wire rated for 600 volts. The loop wire shall meet IMSA specification 51-1 for PVC insulated wire, 51-3 for XHHW crosslinked polyethylene insulated wire or 51-5 for PVC insulated wire with a PVC or polyethylene tube jacket.

All loop sealant shall be approved by the City. Current loop sealants being used are included for reference in Appendix "A".

5.7.5 Qualifications

The installation of traffic signal detection loops shall be performed by individuals having a minimum TECH I qualification as defined in Section 3.1. Cabinet terminations and testing requires a TECH II qualification as defined in Section 3.1.

5.7.6 Quality Control Checks & Procedures

The following points shall be inspected by the City upon completion of the work required in this section:

- Loop placement;
- Loop depth;
- Proper number of turns of loop wire;
- Proper number of turns of loop tail;
- Proper labeling of loops;
- Proper splicing; and
- Proper operation of the loops as inspected by the City.

5.8 Installation & Fastening of External Equipment

The following sections specify the installation of external devices including but not limited to:

- LED signals;
- Audible signals;
- Programmable signal fixtures;
- Above ground detectors; and
- In ground loops.
- Programmable overhead signs
- Antennae communication equipment

5.8.1 Procedures

There are various types of signal configurations utilized throughout the City. The type of signal configuration to be installed at any one location will be indicated on the design drawings including fixture element types, size, orientation, visors and louver types. All fixtures shall be installed of the type, location and orientation shown on the fixture cards. A sample fixture card is shown in Appendix “C”.

In the event that the installation shown on the design conflicts with the installation shown on the fixture card the Contractor shall notify the City immediately and obtain verification of the installation prior to commencement of the work.

There are various hardware configurations utilized throughout the City to support the fixtures. Drawings which specify the requirements of an approved installation within the City of Edmonton for fixtures are shown in Appendix “C”.

All steel mounting hardware must be painted utilizing a primer and yellow paint unless otherwise specified by the City. All installations shown utilizing band-it

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

type steel wrapping must be installed such that a minimum of 2 wraps are utilized.

Vertical four light and five light fixtures on cantilevers and pedestals shall utilize the astro-bracket type of mounting.

All pedestrian signals shall be mounted between 2.13 m and 3.05 m above the sidewalk. Pedestrian push buttons shall be mounted between 1.07 m and 1.22 m above the sidewalk.

Audible pedestrian signals shall be mounted as per the design drawings utilizing hose clamps.

Tuning of programmable heads and audible signals must be done in the presence of a representative from the City. All other fixtures must be aligned as per the design drawings and fixture cards and done so to maximize motorist and pedestrian safety.

5.8.2 Notifications Required

All signals must be appropriately bagged or covered prior to activation to minimize confusion for motorists. The City shall be notified prior to the removal of the coverings or activation of the fixtures.

5.8.3 Documentation

City staff will complete as-built information regarding signal hardware.

5.8.4 Materials

The following materials are approved for use for the installation of traffic signal equipment:

Brand Name	Manufacturer/Distributor	Details
Stainless Steel Strapping and Buckles		
Steel Strapping	Acklands Grainger	19.5 mm x 0.76 mm
Astro-Bracket		
Astro-Brac	Pelco Products Inc.	
Signal Assembly Materials		
Guywire	Titan or Anixter	5/16"
Preform	Traydor Industries or Anixter	5/16"
Dead-end Clevace	Traydor, Anixter or Gescan	
Machine Bolts	Traydor Industries or Anixter	
Eye Nut	Trydor or Anixter	5/8" stamped 'SP'
Saddle Clamp	Pelco Products Inc.	
Strain Insulators	Gescan or Eecol Electric	
Davit Arm Hangers	Totem Welding, Edmonton	"T"s"

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

Brand Name	Manufacturer/Distributor	Details
Back boards	Pelco	Louvered Backboards
Audible Pedestrian	Polara Engineering Inc.	EN2 PBS

5.8.5 Qualifications

All External Signal equipment installation shall be performed by individuals with a minimum qualification of TECH I as defined in Section 3.1.

5.8.6 Quality Control Checks & Procedures

The City Traffic Signal Technologist will inspect the external signal equipment for the following items prior to acceptance:

- Location, height and orientation;
- Secureness;
- Bulb orientation;
- Proper use of steel wrapping;
- No damage to equipment or poles;
- Proper louvers;
- Proper assembly of all aerial cables and clamps; and
- Cleanliness of the final installation.

6 TRAFFIC SIGNAL MAINTENANCE

6.1 *General*

The proper functioning of the various Traffic Signal System Equipment is essential to maintain the safe, efficient and effective flow of traffic throughout the Traffic Control Network. It is imperative that all equipment in the various systems be serviceable and in good operating condition to ensure maximum safety and efficiency and to prevent unnecessary failures.

6.2 *Facilities*

Throughout the duration of this Contract, the Contractor shall provide the City and his suppliers/consultants with access to the Contractor's building and workshops used in the conduct of the Contract during normal business hours and in such time as may be dictated by emergency operations. The Contractor shall provide within the Greater Edmonton Area, and satisfactory to the City, a building or buildings of sufficient size to accommodate the Contractor's own needs and to provide, in the opinion of the City, adequate space for the facilities to service the Contract.

6.2.1 Electrical Shop & Services

An electrical shop shall be fully equipped and staffed to the City's satisfaction. The electrical shop shall be used to build, overhaul, rebuild, and test all varieties and types of structural, electrical, electromechanical, and solid state control devices or such other equipment as may from time to time be used or required. This equipment shall include poles and signal heads of all types and technologies.

6.2.2 Electronic Shop & Services

An electronic shop shall be fully equipped and staffed to the City's satisfaction. The electronic shop shall be used to design, manufacture, test, program and repair all types of conventional, solid state and printed circuit electronic devices including controllers, flashers, vehicle detectors, analog and digital timers.

6.2.3 Storage

The Contractor shall provide and maintain to the satisfaction of the City the following secure storage facilities.

6.2.3.1 Enclosed Storage Area

The Contractor shall provide an enclosed and heated storage area. The storage area shall be fitted with the necessary bins, shelves, racks, etc., which in the opinion of the City are necessary to efficiently and safely store any and all equipment purchased for the Contract.

6.2.3.2 Outdoor Storage Area

The Contractor shall provide a fenced and gated outdoor storage area. This outdoor storage area shall be fitted with all necessary bins and racks which in the opinion of the City, are necessary to efficiently and safely store any all equipment and material to be used in the Contract Field Equipment.

6.3 *Field Equipment*

6.3.1 General

The Contractor shall provide as many vehicles of different types as required by the workload for the proper performance of the Contract. The fact that certain vehicles and equipment are not listed in this section does not relieve the Contractor of the responsibility of providing adequate vehicles and equipment of the proper type to efficiently and safely carry out all works required under this Contract. The Contractor shall have available for immediate use any and all vehicles, equipment, tools and machines as the City may from time to time consider necessary for the proper performance of the work or any part of it.

6.3.2 Vehicle Equipment

All vehicles shall be adequately maintained in roadworthy condition, and maintained in a clean and neat appearance. All vehicles shall be equipped with:

- The necessary warning devices;
- The necessary equipment and tools as required by the work and/or by the City to provide both safety and efficiency; and
- The necessary communications equipment as outlined in Section 6.4.

6.3.3 Required Fleet

The required fleet includes panel trucks, light trucks, and aerial trucks. It also includes the required equipment for proper work zone set up as per the guidelines.

In order to ensure that the required equipment will be available at all times, the Contractor must submit a contingency plan for approval by the City, which addresses the supply of replacement equipment within 24 hours or their being required in order to ensure that all obligated response times are met.

6.4 *Communications*

All Contractor staff must be available by telephone at all times.

6.5 *Trouble Call*

The purpose of the trouble call is to record any problem with any traffic signal control device, ensure the signal is operating in a safe mode of operation, and to initiate and record a repair/check procedure.

It is the responsibility of the Contractor at all times to endeavor to mitigate any hazardous conditions that may exist upon arrival to a City-owned traffic control device and prior to leaving that site.

The Contractor shall be required to perform to the satisfaction of the City all necessary repairs to such traffic control signals and other signals, electrical and electronic equipment as may become defective, or damaged. The Contractor shall be required to provide such emergency services 24 hours per day, each day of the year. Emergency service in response to a trouble call, shall begin immediately upon notification of a defect in any device, either orally or in writing, by the City or by any recognized authority.

6.5.1 Reporting

The Contractor is responsible for maintaining a central call in telephone number to receive trouble calls from the public or the City on a 24 hour basis. The trouble call operator shall request and record all required information from the caller including:

- Date and time the call was received;
- Name of the caller and phone number if available;
- Location of the problem;
- A description of the problem;

The following information must also be recorded:

- Who the trouble call was dispatched to and when, including the trouble truck unit number;
- Observed conditions upon arrival; and
- Time of trouble call completion and action taken or a reference to a scheduled repair.
- Record of any City provided service related to the repair.

The reporting must include enough detail to identify the exact nature of the problem and the component repaired or replaced.

For trouble calls that are completed and the traffic control device has not been restored to normal operation, the repair must be scheduled and recorded separately. The repair record must include:

- A reference to the trouble call;
- Location;

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

- Time and date of the original trouble call;
- The work performed; and
- Time that the repair was completed.
- SDR checklist to be provided by the City and completed by the contractor at the time of site visit.

The reporting must include enough detail to identify the exact nature of the problem and the component repaired or replaced.

6.5.2 Documentation

All of the information gathered as part of the reporting function in Section 6.5.1 shall be available on a required basis as requested by the City. At a minimum, reports which summarize the information gathered shall be presented to the City on a weekly basis.

In addition to the above documentation **all** visits to the traffic control device shall be recorded in the traffic control cabinet log book including:

- Date and time in format of: dd/mon/yyyy - hh:mm in 24 hour format i.e. 02/Feb/2003 - 16:25;
- Contractor individuals visiting the location including full names and employer;
- Reason for the visit to the traffic control device; and
- Action taken.

The cabinet log book must always remain in the traffic control cabinet and shall only be removed if specifically requested by the City for information gathering purposes.

6.5.3 Response Times

Time elapsed between notification of the emergency and arrival of the repair crew shall not exceed the limits as specified below:

Priority	Response Time	Temporary Repairs Completed	Permanent Repairs Completed
High Priority	Within 1 hour	Within 1 hour of site arrival	Within 24 hours
Low Priority	End of next business day	Within 1 hour of site arrival	Within 15 business days.

The lists of high priority and low priority occurrences are provided in Appendix “E”. The City may alter the contents of these figures over the course of the Contract and from day to day as specific situations arise. The listings as provided in Appendix “E” are given as a minimum guideline. It is the responsibility of the Contractor to obtain as much information as required to make an informed

decision as to whether or not a specific repair notification is required to be moved into a high priority category or not.

If the repair crew cannot complete a permanent repair within 1 hour of arrival, a temporary repair will be completed with the objective to make the operation of the traffic signal or other device safe. Depending on the priority of the call, the permanent repair will be completed within the time duration specified.

A list of Critical Intersections (denoted by the “CR” in the first column) is provided in Appendix ‘E’. Those intersections identified as being “Critical” must be restored to proper operation as soon as possible and may require qualified staff to be called in immediately. “Non-Critical” intersections must be restored to proper operation by 06:00 hours next business day.

Based on best modern practice, if replacement is deemed cost effective compared to repair, the City shall be notified for approval prior to commencing replacement work.

6.5.3.1 Storm Related Work

The existence of a “storm condition” will be determined by the City based on weather reports issued by Environment Canada. In addition to storm conditions, other emergency special conditions, i.e. power grid blackout, major disaster will also be considered. If the Contractor determines that the storm conditions are preventing the Contractor from meeting the emergency service standards, the Contractor shall contact the City to seek pre-approval for the appropriate response plan.

6.5.4 Qualifications

Individuals responding to trouble calls must have a minimum qualification of TECH I as defined in Section 3.1.

In addition, all work performed on site must be performed by individuals having the qualifications as set out in the specific sections on this document. It is the responsibility of the Contractor to ensure that the appropriate personnel perform each task.

6.5.5 Liquidated Damages

Failure to perform the requirements in Section 6.5 may result in the assessment of liquidated damages, at the discretion of the City.

Failure to meet minimum response time requirement: \$100/hour/incident, or any portion of an hour thereof.

Temporary repairs not affected within 1 hour: \$100/hour/incident, or any portion of an hour thereof.

Permanent repairs not affected within time limit: 5% of the total cost of the job/business day/incident.

6.5.6 Mitigating Hazardous Conditions

It is the responsibility of the Contractor at all times to endeavor to mitigate any hazardous conditions that may exist upon arrival to a city owned traffic control device and prior to leaving that site.

Regardless of the reason for a visit to a traffic control device, prior to leaving the site the Contractor shall perform a “walk around” inspection to verify proper operation of all devices.

6.6 *Preventative/Scheduled Maintenance*

The purpose of the preventative and scheduled maintenance is to perform routine inspection and upkeep of all traffic control devices as scheduled by the City. The following sections will identify the requirements of the scheduled and preventative maintenance.

6.6.1 Maintenance Scheduling

Maintenance activities itemized under Section 6.6 are typically scheduled to happen within a given month (unless otherwise noted). It is the responsibility of the Contractor to schedule their own forces to complete the work within the given time frames.

6.6.1.1 Liquidated Damages

Failure to perform the scheduled maintenance within the time frames provided throughout Section 6.6 may result in the assessment of liquidated damages by the City. For each maintenance activity at a given location (i.e., external, cabinet, etc.) that is not completed within the given time frame, the City may assess liquidated damages in the amount of \$100 per month in which the activities are overdue.

6.6.2 Scheduling General Repairs

All repairs identified as being required during the maintenance being performed, shall be repaired immediately by the maintenance crew if the resources are available or otherwise be scheduled to be repaired.

6.6.3 External Maintenance

The purpose of the external maintenance program is to perform a routine inspection and upkeep of the external components and facilities of all traffic control devices. The work does not include the maintenance within the main traffic signal control cabinet. The external maintenance does however include an inspection of the external cabinet assembly including:

- Cabinet base seal;
- Paint; and
- Corrosion.

The following devices are expected to be included as part of the external maintenance program:

- Traffic control cabinet;
- Overhead signs;
- Fixtures;
- Cables;
- Fastening equipment;
- Bulbs;
- Poles;
- Cleaning of overhead detection equipment; and
- Any unique monitoring and control devices that require special maintenance as instructed by the City (i.e. height detectors, overhead detection cameras, etc).

6.6.3.1 Overhead Signs

All overhead traffic control signs, which are associated with an intersection, must be maintained as part of the external maintenance program for that intersection. The following items shall be checked as part of the maintenance procedures:

- Proper orientation and alignment;
- Proper photo cell operation;
- Relamping of the internal bulbs according to the schedule provided by the City;
- Cleaning of the sign face; and
- Checked for cracked or faded sign faces
 - ◆ cracked sign faces are to be replaced;
 - ◆ faded signs are to be reported to the City.

6.6.3.2 Fixtures/Attachments

The following checks and inspections shall be performed as part of the fixture external maintenance:

- Incandescent amber bulb replacement ensuring proper wattage and correct position of bulb filament;
- LED bulb replacement if more than 10% of the LEDs are not operational or if the bulb's light output falls below an acceptable level;
- Cleaning and inspection of the lens and reflector;
- Proper orientation of the lens (focusing);
- Inspection of gaskets on the lens;
- Inspection of door locking mechanism and hinges;
- Inspection of the entire fixture orientation including an inspection of the mounting bracket;
- Inspection of the internal wiring and terminations;
- Inspection for water intrusion and foreign objects;
- Programmable heads and louvered heads checked for proper orientation and focusing;
- Louvers and visors inspected to be free of debris, obstructions and damage;
- Audible pedestrian signals checked for proper operation, orientation and proper audible indication;
- Inspection of all push button assemblies; and
- Inspection of fixture back plate for proper colour and condition free of fading or weather damage.

6.6.3.3 Cables

All cabling shall be inspected for:

- Twisting, cracking, chaffing;
- Proper slack and strain relief;
- Proper drip loops; and
- Proper weather seal at the cable entrance and exits.

6.6.3.4 Fastening Equipment

Maintenance of fastening equipment includes fixture mounting hardware, overhead guywires, downhauls, etc.

The following items shall be checked as part of the external maintenance program:

- Checking tightness of nuts and bolts;

- Proper clearances of aerial installations as per the original design or construction specifications;
- Inspection of all stainless steel strapping;
- Fixture orientation as it relates to proper lock nut and strapping tension;
- Proper tension on all hangers; and
- Observation for any excessive wear on all moving components.

In addition to the above items all fastening equipment shall be inspected for paint, corrosion, and proper alignment.

6.6.3.5 Bulb Replacement

Traffic signal bulbs are to be replaced as indicated in Section 6.6.3.2. Some bulbs may be requested to be replaced at less frequent intervals than the external maintenance schedule. This schedule will be provided by the City.

6.6.3.6 Special Instructions

During the scheduled external maintenance, the City may request that special tasks be performed that are not part of the regularly scheduled maintenance. Some examples may be collection of data from the intersection or special cleaning of height detectors, etc.

6.6.3.7 Poles

All poles and pedestals related to traffic signals or other traffic operations devices at an intersection in which external maintenance is being performed shall be inspected for:

- Paint wear;
- Corrosion;
- Alignment;
- Handhold covers in place; and
- Proper torqueing of mounting nuts.

6.6.3.8 Schedule

The schedule for external preventative maintenance will be determined and provided by the City. Maintenance shall not be performed during peak hours as outlined in the City of Edmonton Procedures For On-Street Construction Safety.

Some components of the external maintenance program may be requested to be performed at separate times. This will be indicated in the monthly schedule provided by the City.

The Contractor is responsible for scheduling the Police Point Duty for those intersections requiring it as indicated by the City within the published schedule.

The schedule provided by the City will indicate the month that the work is expected to be completed. It is expected that all work scheduled will be completed within that month.

6.6.3.9 Documentation

The City will provide all forms which are expected to be completed by the Contractor while carrying out the external maintenance duties. The forms will be provided prior to each month's maintenance program.

Forms will be provided in paper or electronic format at the discretion of the City. Forms shall be returned in the same format that they are provided.

All shall be completed in a legible and appropriate manner. All areas which are applicable to that location shall be completed. The date shall be entered in the proper format.

The Contractor shall document on the external maintenance forms all observations where external equipment is not performing as intended or expected. Some examples may be fixtures and signs which are chronically twisted or overgrowth of foliage or other works installed by others which impede the view of the traffic signals.

All forms shall be reviewed and signed by the Contractor's designated foreman for compliance with all contract and safety issues. Forms shall be completed and returned to the City within 3 business days of the completion of the work.

The Contractor shall record in the cabinet log book the date and time of the start and completion of work. Also recorded in the log book shall be the name of the personnel responsible on site during maintenance.

For any equipment that is replaced at any given location, the appropriate equipment replacement form must be completed. These forms are also required to be returned to the City within 3 business days of completion of the work.

Samples of the forms required can be found in Appendix "D".

6.6.3.10 Qualifications

Contractor individuals performing work as part of the external maintenance shall have a minimum qualification of TECH I as defined in Section 3.1.

6.6.4 Cabinet Maintenance

The purpose of the cabinet maintenance program is to perform a routine inspection and upkeep of the internal components of the main traffic control cabinet. This includes an inspection of the internal components to the cabinet and their operation.

6.6.4.1 Description

As part of the internal cabinet maintenance program the cabinet shell and environmental controls shall be inspected for the following:

- Inspection and replacement of filter as required;
- Operation of door locks and lubrication at each visit;
- Operation of door seals including a check for water intrusion and repair or replacement as required;
- Inspection of the heater and fan for proper operation;
- Confirmation of proper vent opening or closure as dictated by the cabinet climatizing schedule (Section 6.6.5.2); and
- General cleanliness and removal of any accumulated dust and debris.

As part of the internal component inspection for the cabinet maintenance program the following items shall be inspected, assessed and repaired as necessary:

- | | |
|--------------------------------|---|
| • Flashers: | Confirm for proper operation. |
| • Signal Flash Operation: | Correct displays shown on fixtures as indicated on the cabinet timing sheet. |
| • Controller Database: | Confirm controller data base matches the timing sheet. |
| • Police & Maintenance Panels: | Check for proper operation of all functions. |
| • Light Relays: | Confirmation of proper operation of all light relays. This includes at terminal voltage test in both the on and off position. |
| • Vehicle Detectors: | Proper operation of all vehicle detectors of all types and any detector indicators where applicable. Also |

City of Edmonton Transportation Operations

Traffic Signals Construction & Maintenance Specifications

- Pedestrian Detectors: verify that time delay mode is timing properly if required. Proper operation of pedestrian detectors and any illuminated indications where applicable.
- Fireheads: Proper indication of firehead fixture via the traffic controller.
- Communications Unit: Visual inspection for proper operation.
- Special Control Circuits: Confirmation of proper operation of any special control devices/relays external from the traffic controller.
- Time Clocks: Proper operation to a time of day, week, etc.
- All Clocks: Synchronize **all** clocks on all devices to the WWV Clock. Clock time reference to be obtained from the City Traffic Management Centre.
- Line Voltage: Check for proper AC line voltage.
- Connections: Check for proper tightness, frayed wiring, loosening of connections and corrosion.
- Grounding Strips: Check for proper tightness, frayed wiring, loosening of connections and corrosion.
- Traffic Controller: Visual inspection of the controller for proper displays and indications and also an inspection of all connectors. Replace controller battery as required.
- Conflict Monitor: Visual inspection of the Monitor for proper displays and indications and also an inspection of all connectors. Replace controller battery as required.
- Harnesses: Visual inspection of all harnesses and connectors for damage, improper routing and wear.
- Terminals: Check terminal connectors for tight and clean connections. Care must be taken not to over tighten or damage the terminal lugs.
- Grounding: Check ground rod resistance and report on form.
- Loops: Visual inspection of loops cut in the pavement.
- Overhead Detection: Verify that all detection zones are inputting calls to the controller as per

- Absence of Red and
 - +24 V DC Monitor:
- the controller programming sheets.
Confirm cabinet “Flash” operation, with absence of red on each channel and with the absence of +24 V DC.

The conflict monitors shall be inspected and tested for proper operation during cabinet maintenance. A 25 volt AC source shall be applied to all field terminations which create a conflicting movement display for all phases found on the controller timing sheet for that intersection. For each termination which represents a conflicting movement, the cabinet must trip the signals to the failsafe mode as indicated on the timing sheet for that location. The controller should be verified that it enters and exits the “Flash” mode properly.

The Contractor may be required to, in order to test all phases and functions for a controller, temporarily modify the controller clock or have the Traffic Management Centre alter its control program.

The traffic controller unit shall be inspected for proper programming and operation. Programming and operation shall be verified against the controller timing program sheet.

The following devices and functions shall also be confirmed for proper operation as per the timing sheet if applicable:

- Signals ahead warning signs;
- Master/slave co-ordination;
- Preemption; and
- Dial check for interval base controllers to verify proper operation of interval times and dial change intervals as per the timing sheets.

6.6.4.2 Special Instructions

During the scheduled cabinet maintenance the City may request that special tasks be performed that are not part of the regularly scheduled maintenance. Some examples of these tasks may be testing of ground rod resistance, testing height detectors, inventory of special controller types, and delivery of controller programming sheets or other documentation.

6.6.4.3 Schedule

The schedule for cabinet preventative maintenance will be determined and provided by the City Engineer. Maintenance shall not be performed during peak hours as outlined in the City of Edmonton Procedures For On-Street Construction Safety.

Some components of the cabinet maintenance program may be requested to be performed at separate times. This will be indicated in the monthly schedule provided by the City.

The Contractor is responsible for scheduling the Police Point Duty those intersections requiring it as indicated by the City within the published schedule. Costs for Police Point Duty are not the responsibility of the Contractor.

Prior to performing cabinet maintenance at a location the Contractor shall notify the Transportation Management Centre (TMC) that maintenance will be performed at that site. The Contractor will also notify the TMC when the work is complete.

The schedule provided by the City will indicate the month that the work is expected to be completed. It is expected that all work scheduled will be completed within that month.

6.6.4.4 Documentation

The City will provide all forms which are expected to be completed by the Contractor while carrying out the cabinet maintenance duties. The forms will be provided prior to each month's maintenance program.

Forms will be provided in paper or electronic format at the discretion of the City. Forms shall be returned in the same format that they are provided.

All forms must be completed in a legible and appropriate manner. All areas which are applicable to that location must be completed. The date shall be entered in the proper format.

The Contractor shall document on the cabinet maintenance forms all observations where internal equipment is not performing as intended or expected. One example may be clocks which appear to drift significantly or observations of repeated visits to a site as indicated by the log book.

All forms shall be reviewed and signed by the Contractor's designated foreman. Forms shall be completed and returned to the City within 3 business days of the completion of the work.

The Contractor shall record in the cabinet log book the date and time of the start of work and completion of work. Also recorded in the log book shall be the name of the personnel responsible on site during maintenance.

For any equipment that is replaced at any given location, the appropriate equipment replacement form must be completed. These forms are also required to be returned to the City within 3 days of completion of the work.

Samples of the forms required can be found in Appendix “D”.

6.6.4.5 Qualifications

All Contractor individuals performing cabinet maintenance shall have a minimum qualification of TECH II as defined in Section 3.1.

6.6.5 Cabinet Climatizing

The purpose of the cabinet climatization program is to prepare all environmentally controlled traffic control cabinets and other associated control cabinets related to traffic operations for winter and/or summer operation.

6.6.5.1 Description

Each cabinet shall be visited twice annually (spring and fall).

During the spring cabinet climatization the following tasks will be performed:

- Open vent;
- Check filter for cleanliness, clean or replace if required;
- Check filter for proper seal to the opening of the cabinet;
- Verify proper operation of fan and heater; and
- Check cleanliness of cabinet and remove any accumulated dust and debris.

During the fall cabinet climatization the following tasks shall be performed:

- Close vent and verify proper seal to the opening;
- Verify proper operation of heater and fan; and
- Check cleanliness of cabinet and remove any accumulated dust and debris.

6.6.5.2 Schedule

The cabinet climatization schedule will be determined and provided by the City. It is expected that the climatization will be performed within the month that it is scheduled.

6.6.5.3 Documentation

The City will provide all forms which are expected to be completed by the Contractor while carrying out the cabinet climatization duties. The forms will be provided prior to each month's maintenance program.

Forms will be provided in paper or electronic format at the discretion of the City. Forms shall be returned in the same format that they are provided.

All forms must be completed in a legible and appropriate manner. All areas which are applicable to that location must be completed. The date shall be entered in the proper format.

All forms shall be reviewed and signed by the Contractor's designated foreman. Forms shall be completed and returned to the City within 3 business days of the completion of the work.

The Contractor shall record in the cabinet log book the date and time of the start of work and completion of work. Also recorded in the log book shall be the name of the personnel responsible on site during maintenance.

For any equipment that is replaced at any given location, the appropriate equipment replacement form must be completed. These forms are also required to be returned to the City within 3 business days of completion of the work.

Sample forms that may be required can be found in Appendix "D".

6.6.5.4 Qualifications

Contractor individuals performing cabinet climatization work shall have a minimum qualification of TECH II as defined in Section 3.1.

6.6.6 Timing Checks (local Co-ordinator)

The purpose of this maintenance function is to perform a check of the co-ordination between signals which utilize the internal time clocks for synchronization with other signals. This maintenance task will be performed by the City of Edmonton Traffic Management Centre or by the Contractor at the request of the City.

6.6.6.1 Description

This maintenance task shall be performed as a verification of the operation of the traffic control signals. Entrance to the traffic control cabinet for this procedure shall not be required.

Each intersection shall be verified for proper timing and operation of:

- Main street and side street minimum and maximum timings for vehicle phases;
- Main street and side street timings for pedestrian phases;
- Verification of operation of detection on all approaches; and
- Co-ordination of the start of main street green between intersections.

These checks shall be performed on all timing plans in which the intersection operates during the time of day and week in which they operate. The phasings or time of day plans of the traffic controller shall not be altered.

6.6.6.2 Schedule

Each signal shall be checked twice annually during the off-peak pan. Each intersection shall be checked annually during each of the time of day plans in which it operates each week. This will require multiple visits for each site. The City will provide instruction to the contractor to indicate which visits will be completed by the contractor.

6.6.6.3 Documentation

Documentation shall be performed on the signal co-ordination bar charts generated by the City. The marked up bar charts shall be returned to the Traffic Management Centre (TMC) for review by the TMC Technologist and to be logged on file.

6.6.6.4 Qualifications

The timing checks performed as part of this maintenance function shall be performed by a City of Edmonton Traffic Signal Technologist.

6.6.7 Dynamic Message Sign Maintenance

Maintenance is required to be performed on the City's Dynamic Message Signs to ensure proper operation and proper dissemination of information to motorists.

6.6.7.1 Description

Maintenance for the Dynamic Message Signs will be required to be performed within the sign and the control cabinet as indicated:

- **Bulbs** Check bulbs on the entire sign and replace all defective bulbs. A group re-lamping of the bulbs is not required unless specifically stated by the City.
- **Pixel Operation:** This may require assistance from the City Traffic Management Centre.
- **Dimming:** Verify dimming circuit for proper day/night operation. Repair as necessary.
- **Sign Face:** Wash sign faces with non-abrasive cleaning solution. Report cracked, broken or severely scratched sign faces to the City.
- **Heating/Ventilation:** Inspect control cabinet and sign housing for proper operation of heaters and fans.
- **Connectors:** Inspect all connections for proper seating and seal.
- **Wiring:** Inspect all wiring for wear or corrosion.
- **Locks:** Verify proper security into controller cabinet.
- **Cleaning:** Vacuum interior of control cabinet and sign housing.

6.6.7.2 Schedule

The variable message sign maintenance schedule will be determined and provided by the City. It is expected that the maintenance will be performed within the month that it is scheduled.

6.6.7.3 Documentation

The City will provide all forms which are expected to be completed by the Contractor while carrying out the dynamic message sign maintenance duties. The forms will be provided prior to each month's maintenance program.

Forms will be provided in paper or electronic format at the discretion of the City. Forms shall be returned in the same format that they are provided.

All forms must be completed in a legible and appropriate manner. All areas which are applicable to that location must be completed. The date shall be entered in the proper format.

The Contractor shall document on all observations where the dynamic message sign is not performing as intended or expected.

All forms shall be reviewed and signed by the Contractor's designated foreman for compliance with the terms of this specification. Forms shall be completed and returned to the City within 3 business days of the completion of the work.

The Contractor shall record in the cabinet log book the date and time of the start of work and completion of work. Also recorded in the log book shall be the name of the personnel responsible on site during maintenance.

For any equipment that is replaced at any given location, the appropriate equipment replacement form must be completed. These forms are also required to be returned to the City within 3 business days of completion of the work.

Sample forms can be found in Appendix "D".

6.6.7.4 Qualifications

Contractor individuals performing Dynamic Message Sign maintenance work shall have a minimum qualification of TECH II as defined in Section 3.1.

6.6.8 Closed Circuit Television (CCTV) Maintenance

Regularly scheduled maintenance is required at all CCTV camera locations to ensure proper control and transported video signals to the Traffic Management Centre.

6.6.8.1 Description

As part of the CCTV maintenance program the following items shall be inspected, assessed and repaired as necessary:

- Pan/tilt/zoom: Verify proper operation with the assistance of the Traffic Management Centre
- Enclosure heater, fan and weather seals: Ensure proper operation and repair or replace as necessary.
- Connectors: Check for proper seating of all

- connectors and seals and all enclosure entrances.
- External cabling: Inspection for proper slack.
- Control cabinet heater and fan: Inspection for excessive weathering.
- Cabinet and enclosure cleanliness: Inspect for proper operation and repair as necessary.
- Control cabinet locks: Vacuum as required.
- Verify proper security into cabinet.

6.6.8.2 Schedule

The CCTV maintenance schedule will be determined and provided by the City. It is expected that the maintenance will be performed within the month that it is scheduled.

6.6.8.3 Documentation

The City will provide all forms which are expected to be completed by the Contractor while carrying out the CCTV maintenance duties. The forms will be provided prior to each month's maintenance program.

Forms will be provided in paper or electronic format at the discretion of the City. Forms shall be returned in the same format that they are provided.

All forms must be completed in a legible and appropriate manner. All areas which are applicable to that location must be completed. The date shall be entered in the proper format.

The Contractor shall document on the external maintenance forms all observations where CCTV equipment is not performing as intended or expected.

All forms shall be reviewed and signed by the Contractor's designated foreman for compliance with the terms of this specification. Forms shall be completed and returned to the City within 3 business days of the completion of the work.

The Contractor shall record in the cabinet log book the date and time of the start of work and completion of work. Also recorded in the log book shall be the name of the personnel responsible on site during maintenance.

For any equipment that is replaced at any given location, the appropriate equipment replacement form must be completed. These forms are also required to be returned to the City within 3 business days of completion of the work.

Sample forms can be found in Appendix “D”.

6.6.8.4 Qualifications

Contractor individuals performing Closed Circuit Television (CCTV) maintenance work must have a minimum qualification of TECH I as defined in Section 3.1.

6.6.9 Variable Speed Limit Signs

Fibre optic variable speed signs are used throughout the City that require regularly scheduled maintenance. The variable speed limit signs are typically located above major freeways and as a result special precautions will be required with respect to on-site safety, timeframes in which the work is performed and individuals notified within the City prior to performing the maintenance.

6.6.9.1 Description

The following items shall be inspected, assessed and repaired as necessary as part of the variable speed limit sign maintenance program:

- | | |
|---------------------------|--|
| • Halogen bulbs | Group replace all bulbs. |
| • LED bulbs | Replace as necessary. |
| • Pixels | Visual inspection of sign operation to verify proper illumination of each pixel. |
| • Dimming | Verify proper operation of photo cell and dimming circuit. |
| • Cooling fans and heater | Verify proper operation and repair if required. |
| • Cleaning | Clean sign face and interior of sign housing. |
| • Connections | Check for proper seating and tightness of all connectors and terminals. |
| • Wiring | Inspection of all external wiring for excessive wear and corrosion. |
| • Weather seals | Inspect cabinet and sign enclosure weather seals. |
| • Cabinet | Inspect all connections, heater and fan at the traffic control cabinet. |
| • Security | Verify proper locks are being used on |

all cabinets.

Maintenance crews will be required to co-ordinate with City Traffic Management Centre staff prior to activating or altering any speed sign.

6.6.9.2 Schedule

The variable speed limit sign maintenance schedule will be determined and provided by the City. It is expected that the maintenance will be performed within the month that it is scheduled.

6.6.9.3 Documentation

The City will provide all forms which are expected to be completed by the Contractor while carrying out the Variable Speed Sign maintenance duties. The forms will be provided prior to each month's maintenance program.

Forms will be provided in paper or electronic format at the discretion of the City. Forms shall be returned in the same format that they are provided.

All forms must be completed in a legible and appropriate manner. All areas which are applicable to that location must be completed. The date shall be entered in the proper format.

The Contractor shall document on the maintenance forms all observations where equipment is not performing as intended or expected.

All forms shall be reviewed and signed by the Contractor's designated foreman for compliance with the terms of this specification. Forms shall be completed and returned to the City within 3 business days of the completion of the work.

The Contractor shall record in the cabinet log book the date and time of the start of work and completion of work. Also recorded in the log book shall be the name of the personnel responsible on site during maintenance.

For any equipment that is replaced at any given location, the appropriate equipment replacement form must be completed. These forms are also required to be returned to the City within 3 business days of completion of the work.

Sample forms can be found in Appendix “D”.

6.6.9.4 Qualifications

Contractor individuals performing Variable Speed Limit Sign maintenance work must have a minimum qualification of TECH I as defined in Section 3.1.

6.7 General Repairs

The following sections will describe the requirements for performing general repairs for all City traffic control devices. This includes all repairs that are made at any location at any time whether performed as a result of a trouble call or routine maintenance.

6.7.1 Description

All repairs to the City Traffic Control devices and their supporting structures shall be performed in a manner to restore those devices and structures to the operation functions requirements as they were originally designed for. All repairs shall conform to the construction and maintenance standards set forth in this document.

All equipment shall be replaced with “like” equipment. Equipment that exceeds the original design/function can only be used as a temporary measure at the Contractor’s expense. An example of this may be use of an 8 phase controller at a 2 phase intersection. Only City approved materials are accepted for use while performing general repairs.

The Contractor shall maintain a history of all general repairs indicating:

- Location;
- Description;
- Date/time the problem was identified;
- Date/time the repair was scheduled or is to be scheduled;
- Action taken; and
- Date/time completed.

The listing shall be available to the City on a daily basis. The format of the listing shall be approved by the City.

6.7.2 Schedule

The Contractor is responsible for scheduling all general repairs. The City reserves the right to request that certain repairs be performed in a more timely manner than others.

6.7.3 Documentation

The Contractor is responsible for documenting the history of general repairs as indicated in Section 6.7.1.

For all general repairs which required equipment to be replaced at any location a City provided equipment replacement form must be completed. If the equipment types are not listed on the provided form, then a description of the equipment removed and replaced must be provided in the comment section of the form. All sections of the form must be completed in a legible manner. All forms are required to be reviewed by the Contractor foreman and returned to the City within 3 business days.

Forms will be provided in paper or electronic format at the discretion of the City. Forms shall be returned in the same format that they are provided.

All repairs made at a traffic control location must be documented in the cabinet log book as described in Section 6.5.2.

Sample forms can be found in Appendix “D”.

6.7.4 Qualifications

All general repairs performed on traffic control devices must be performed by individuals with qualifications that match those qualifications as described throughout the construction and maintenance sections of this document.

6.8 *Specialized Repair Procedures & Specifications*

The following sections detail specific repair procedures that must be followed. These repairs relate to rectifying failures that have been identified during the Traffic Signal Maintenance program.

6.8.1 Anchor bolt repair ASTM-325; Grade 400 anchor rods.

The following procedures relate to the repair of CSA G30.12 grade 400 reinforcing steel, or A325 bolts only. Repairs shall only be carried out on anchor bolts if specifically directed to do so by the City.

The Contractor shall carry out the repair procedures as identified in report #15438-2 prepared by Ball Associates Engineering Ltd. Entitled “City of Edmonton Evaluation of Anchor Bolt Repairs” August 2, 1996. Appendix “A” of this report contains the specific procedures for performing the repairs, however, the entire report shall be reviewed by the Contractor in order to gain a full understanding of the purpose of these procedures. A copy of the report can be found in Appendix “F” of this document.

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

The Contractor shall, in addition to following the lamp standard repair procedures shall:

- Install lamp standards on repaired Assemblies in accordance with a written procedure that includes standard bearing and anchor bolt tightening. This procedure will be provided by the City.
- Ultrasonically, examine weld repaired anchor bolts five or more days after installation using the longitudinal wave method in accordance with CSA W59 dynamic structures. The results are to be immediately reviewed with the City and defective welds replaced.

Construction and Maintenance Specifications

TABLE OF CONTENTS

1	GENERAL.....	1
1.1	Definitions.....	1
1.2	Signal & Device Types	2
2	PRODUCTS & MATERIALS.....	3
2.1	Equipment Specifications	3
2.2	Quality Assurances	3
2.3	Procurement Procedures	3
2.4	Inventory Control Procedures	3
2.5	Disposal of Damaged & Obsolete Material	4
3	QUALIFICATIONS	5
3.1	Contractor Staff.....	5
3.2	Use of Subcontractors	6
4	WORK ZONE SAFETY.....	7
4.1	Precautions	7
5	TRAFFIC SIGNAL CONSTRUCTION.....	8
5.1	Permits	8
5.1.1	OSCAM Permits	8
5.1.2	Electrical Permits	8
5.2	Designs.....	8
5.3	Installation of Conduits.....	8
5.3.1	Standards Reference.....	8
5.3.2	Procedures.....	9
5.3.3	Notifications/Permits	10
5.3.4	Documentation	10
5.3.5	Materials	10
5.3.6	Qualifications	11
5.3.7	Quality Control Checks & Procedures.....	11
5.4	Installation of Cabinets	11
5.4.1	Procedures.....	11
5.4.2	Bench Testing	12
5.4.3	Signal Turn-On	13
5.4.4	Notifications/Permits	13
5.4.5	Documentation	13
5.4.6	Materials	14
5.4.7	Qualifications	14
5.4.8	Quality Control Checks & Procedures.....	15
5.5	Installation of Cabling/Wiring	15
5.5.1	Standards Reference.....	15
5.5.2	Procedures.....	15
5.5.3	Testing.....	16
5.5.4	Documentation	17
5.5.5	Materials	17
5.5.6	Qualifications	17
5.5.7	Quality Control Checks & Procedures.....	17

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

5.6	Installation of Signal Poles	17
5.6.1	Procedures	17
5.6.2	Notifications Required	18
5.6.3	Documentation	19
5.6.4	Materials	19
5.6.5	Qualifications	19
5.6.6	Quality Control Checks & Procedures	20
5.7	Installation of Traffic Signal Detection Loops	20
5.7.1	Procedures	20
5.7.2	Notifications Required	21
5.7.3	Documentation	21
5.7.4	Materials	21
5.7.5	Qualifications	21
5.7.6	Quality Control Checks & Procedures	22
5.8	Installation & Fastening of External Equipment	22
5.8.1	Procedures	22
5.8.2	Notifications Required	23
5.8.3	Documentation	23
5.8.4	Materials	23
5.8.5	Qualifications	24
5.8.6	Quality Control Checks & Procedures	24
6	TRAFFIC SIGNAL MAINTENANCE	25
6.1	General	25
6.2	Facilities	25
6.2.1	Electrical Shop & Services	25
6.2.2	Electronic Shop & Services	25
6.2.3	Storage	25
6.2.3.1	Enclosed Storage Area	25
6.2.3.2	Outdoor Storage Area	26
6.3	Field Equipment	26
6.3.1	General	26
6.3.2	Vehicle Equipment	26
6.3.3	Required Fleet	26
6.4	Communications	26
6.5	Trouble Call	27
6.5.1	Reporting	27
6.5.2	Documentation	28
6.5.3	Response Times	28
6.5.3.1	Storm Related Work	29
6.5.4	Qualifications	29
6.5.5	Liquidated Damages	29
6.5.6	Mitigating Hazardous Conditions	30
6.6	Preventative/Scheduled Maintenance	30
6.6.1	Maintenance Scheduling	30
6.6.1.1	Liquidated Damages	30
6.6.2	Scheduling General Repairs	30
6.6.3	External Maintenance	31

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

6.6.3.1	Overhead Signs	31
6.6.3.2	Fixtures/Attachments	32
6.6.3.3	Cables.....	32
6.6.3.4	Fastening Equipment.....	32
6.6.3.5	Bulb Replacement	33
6.6.3.6	Special Instructions	33
6.6.3.7	Poles.....	33
6.6.3.8	Schedule.....	33
6.6.3.9	Documentation	34
6.6.3.10	Qualifications.....	35
6.6.4	Cabinet Maintenance.....	35
6.6.4.1	Description.....	35
6.6.4.2	Special Instructions.....	37
6.6.4.3	Schedule.....	37
6.6.4.4	Documentation.....	38
6.6.4.5	Qualifications.....	39
6.6.5	Cabinet Climatizing	39
6.6.5.1	Description.....	39
6.6.5.2	Schedule.....	39
6.6.5.3	Documentation.....	40
6.6.5.4	Qualifications.....	40
6.6.6	Timing Checks (local Co-ordinator).....	40
6.6.6.1	Description.....	41
6.6.6.2	Schedule.....	41
6.6.6.3	Documentation.....	41
6.6.6.4	Qualifications.....	41
6.6.7	Dynamic Message Sign Maintenance	41
6.6.7.1	Description.....	42
6.6.7.2	Schedule.....	42
6.6.7.3	Documentation.....	42
6.6.7.4	Qualifications.....	43
6.6.8	Closed Circuit Television (CCTV) Maintenance.....	43
6.6.8.1	Description.....	43
6.6.8.2	Schedule.....	44
6.6.8.3	Documentation.....	44
6.6.8.4	Qualifications.....	45
6.6.9	Variable Speed Limit Signs	45
6.6.9.1	Description.....	45
6.6.9.2	Schedule.....	46
6.6.9.3	Documentation.....	46
6.6.9.4	Qualifications.....	47
6.7	General Repairs.....	47
6.7.1	Description.....	47
6.7.2	Schedule.....	47
6.7.3	Documentation.....	48
6.7.4	Qualifications.....	48
6.8	Specialized Repair Procedures & Specifications.....	48

City of Edmonton Transportation Operations
Traffic Signals Construction & Maintenance Specifications

6.8.1 Anchor bolt repair ASTM-325; Grade 400 anchor rods..... 48

APPENDIX “A”

Sceptacon PVC Conduit
Loop Sealant - Specifications
Junction Boxes – Specifications
Traffic Cable - Specifications

APPENDIX “B”

- 28' cantilever pole with 14" BCD;
- 35' cantilever pole with 14" BCD;
- 35' cantilever pole with 15.5" BCD;
- 50' cantilever pole with 15.5" BCD;
- 60' cantilever pole with 20" BCD;
- 14' streetlight CCL pole extension;
- 16' 2 – piece pedestal pole 11.5" BCD;
- 45' CCTV Pole 16" BCD;
- Typical pre-cast concrete base – 11.5" BCD;
- Base – 16'-PT-CPB;
- Base – 28' / 35' CCL – 14" BCD;
- Base – 35' ADV Sign / 50' CCL – 15.5" BCD;
- Base – 60' CCL – 20" BCD;
- DYWIDAG bolts and nuts installation standard;
- M-1 Traffic control cabinet pre-cast base;
- Pole mounted cabinet and rigid PVC conduit;
- Safety Base - STD safety base installation instructions; and
- Transpo – Pole-Safe Model No. 4062

APPENDIX “C”

Sample Fixture Diagram
Fixture Assembly Drawings

APPENDIX “D”

Sample - Construction Completion Certificate
Sample - Final Acceptance Certificate
Sample - Cabinet Maintenance Form
Equipment Replacement Form
External Maintenance Form

APPENDIX “E”

Low Priority Repair Occurrences
High Priority Repair Occurrences

HIGH PRIORITY REPAIR OCCURRENCES

Traffic Signals/Pedestrian Crosswalks

High Priority (Immediate Response)

- Traffic Signals Out;
- Traffic Signals Stuck/Not Cycling/Erratic Behaviour;
- Traffic Signals in Flash Indication (Unscheduled);
- Conflicting Traffic Signal Indications;
- Any Signal / Pedestrian Indication Out;
- Pedestrian Crosswalk Not Working / Not Timing Correctly;
- Traffic Pole / Pedestal Down / Damaged (damage must be assessed);
- Broken / Exposed Junction / Pull Box (must be secured & electrically safe);
- Push Button Not Working / Missing;
- Traffic Signal Mast Arm Low / Loose;
- Traffic Signal Fixture/Backboard Loose / Twisted;
- Burn Out of a Portion or All of a Lane Usage or Variable Message Sign;
- Overhead Span Wire (Guy or Cable) Low/Loose;
- Overhead Sign Low / Loose / Twisted
- Cabinet Hit/Damaged;
- Cabinet Door(s) Open;
- Flashing Hazard Beacon Indication Out;
- Flashing Crosswalk Signal Indication Out;
- Flashing Signal Ahead Warning Beacon Out;
- Detection Faults (Vehicles/Pedestrians Not Being Serviced).

LOW PRIORITY REPAIR OCCURRENCES

Traffic Signals/Pedestrian Crosswalks

Low Priority (Scheduled Work)

- Pole Leaning;
- Pole Handhole Cover Missing (high priority if unsafe);
- Back Guy/Anchor Loose/Damaged;
- Riser Damaged;
- Dark Spot in Signal Head;
- Water in Signal Head;
- Detection System Faults (where temporary repairs have been made);
- Loss of Communication Lines;
- Communication Faults;
- Central Traffic Control System Faults;
- Push Button Stuck/Loose/Damaged (but still operational);
- Internally Lit Overhead Sign Burn Out;
- Signal Pole Oscillations;
- Dynamic Message Sign Not Working;
- CCTV System Faults;
- Data Sampling Station Faults;
- Overheight Detection System Faults.

APPENDIX “F”

Specifications for the Repair of Anchor Rods
Sample Construction Specifications for Portland Cement

APPENDIX “G”

Scope of Work / Specifications
Traffic Signal Commissioning Report
Specifications TS2 TYPE 1 Traffic Control Equipment
BullsEye Pedestrian Button Specifications
Polara Pedestrian Button Specifications
City of Edmonton Enviso Package
City of Edmonton Enviso Questionnaire