Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
Ontario Provincial Standard Specifications (OPSSs)					
610	November 2016	April 2025	TBD	Rev: Construction Specification for Removal of Electrical Equipment and Materials is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed.	Mike Pearsall
615	April 2017	April 2025	TBD	Rev: Construction Specification for Installation of Poles is implemented. The specification has been updated to new PROV format with no technical content changes. Applicable content from SSP 615S06 has been incorporated into OPSS 615.	Mike Pearsall
620	April 2017	April 2025	TBD	Rev: Construction Specification for Traffic Signal Equipment is implemented. The specification has been updated to new PROV format with no technical content changes. Applicable content from SSP 106S18 has been incorporated into OPSS 620.	Mike Pearsall
622	April 2017	April 2025	TBD	Rev: Construction Specification for Installation of Traffic Signal Controllers is implemented. The specification has been updated to new PROV format with no technical content changes. Applicable content from SSP 106S19 and 622F03 has been incorporated into OPSS 622.	Mike Pearsall
630	November 2016	April 2025	TBD	Rev: Construction Specification for Installation of Sectional Steel High Mast Lighting Poles is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Gender neutral language updated. Applicable content from SSP 630F02 has been incorporated into OPSS 630.	Mike Pearsall
706	November 2016	April 2025	TBD	Rev: Construction Specification for Temporary Traffic Control Devices is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Applicable content from SSP 107S05 has been incorporated into OPSS 706.	Mike Pearsall

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
708	November 2016	April 2025	TBD	Rev: Construction Specification for Portable Temporary Traffic Signals is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed.	Mike Pearsall
723	November 2016	April 2025	TBD	Rev: Construction Specification for Energy Attenuators is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Applicable content from SSP 107S06 and 723S03 has been incorporated into OPSS 723.	Mike Pearsall
903	April 2016	April 2025	TBD	Rev: Construction Specification for Deep Foundations is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Applicable content from SSP 109F57 has been incorporated into OPSS 903.	Mike Pearsall
909	November 2016	April 2025	TBD	Rev: Construction Specification for Prestressed Concrete - Precast Girders is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Gender neutral language updated. Applicable content from SSP 109S24 has been incorporated into OPSS 909.	Mike Pearsall
918	November 2016	April 2025	TBD	Rev: Construction Specification for Modular Bridge Structures for Temporary Installations is implemented. The specification has been updated to new PROV format with no technical content changes. Applicable content from SSP 109S27 has been incorporated into OPSS 918.	Mike Pearsall
928	April 2012	April 2025	TBD	Rev: Construction Specification for Structure Rehabilitation - Concrete Removal is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Applicable content from SSP 109S32 has been incorporated into OPSS 928.	Mike Pearsall

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
930	November 2014	April 2025	TBD	Rev: Construction Specification for Structure Rehabilitation - Concrete Patches, Refacing, and Overlays is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed.	Mike Pearsall
1004	November 2012	April 2025	TBD	Rev: Material Specification for Aggregates – Miscellaneous is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Applicable content from SSP 110S16 has been incorporated into OPSS 1004.	Mike Pearsall
1006	April 2017	April 2025	TBD	Rev: Material Specification for Aggregates - Surface Treatment is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed. Applicable content from SSP 110S05 has been incorporated into OPSS 1006.	Mike Pearsall
1010	April 2013	April 2025	TBD	Rev: Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed.	Mike Pearsall

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
Standard Special Provisions (SSPs)					
106S18	April 2017	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Traffic Signal Equipment is revised to reflect the new publication version of OPSS 620.	Mike Pearsall
106S19	April 2017	N/A	TBD	Can: SSP Amendment to Construction Specification for Installation of Traffic Signal Controllers is cancelled. Applicable content has been incorporated into OPSS 622.	Mike Pearsall
107S05	April 2017	N/A	TBD	Can: SSP Amendment to Construction Specification for Temporary Traffic Control Devices is cancelled. Applicable content has been incorporated into OPSS 706.	Mike Pearsall
107S06	January 2025	N/A	TBD	Can: SSP Amendment to Construction Specification for Energy Attenuators is cancelled. Applicable content has been incorporated into OPSS 723.	Mike Pearsall
109S24	January 2025	N/A	TBD	Can: SSP Amendment to Construction Specification for Prestressed Concrete - Precast Girders is cancelled. Applicable content has been incorporated into OPSS 909.	Mike Pearsall
109S27	March 2018	N/A	TBD	Can: SSP Amendment to Construction Specification for Modular Bridge Structures for Temporary Installations is cancelled. Applicable content has been incorporated into OPSS 918.	Mike Pearsall
109S32	March 2018	N/A	TBD	Can: SSP Amendment to Construction Specification for Structure Rehabilitation - Concrete Removal is cancelled. Applicable content has been incorporated into OPSS 928.	Mike Pearsall
109F57	June 2020	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Deep Foundations is revised to reflect the new publication version of OPSS 903. Applicable content has been incorporated into OPSS 903.	Mike Pearsall
110S05	February 2019	N/A	TBD	Can: SSP Amendment to Material Specification for Aggregates - Surface Treatment is cancelled. Applicable content has been incorporated into OPSS 1006.	Mike Pearsall

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
110S06	February 2019	April 2025	TBD	Rev: SSP Amendment to Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material is revised to reflect the new publication version of OPSS 1010.	Mike Pearsall
110S16	May 2023	N/A	TBD	Can: SSP Amendment to Material Specification for Aggregates - Miscellaneous is cancelled. Applicable content has been incorporated into OPSS 1004.	Mike Pearsall
610F01	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Removal of Electrical Equipment and Materials is revised to reflect the new publication version of OPSS 610.	Mike Pearsall
615S05	August 2019	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Poles is revised to reflect the new publication version of OPSS 615.	Mike Pearsall
615S06	August 2019	N/A	TBD	Can: SSP Amendment to Construction Specification for Installation of Poles is cancelled. Applicable content has been incorporated into OPSS 615.	Mike Pearsall
630F02	June 2020	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Sectional Steel High Mast Lighting Poles is revised to reflect the new publication version of OPSS 630. Applicable content has been incorporated into OPSS 630.	Mike Pearsall
682F03	June 2020	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Traffic Signal Controllers is revised to reflect the new publication version of OPSS 622. Applicable content has been incorporated into OPSS 622.	Mike Pearsall
682S13	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Poles is revised to reflect the new publication version of OPSS 615.	Mike Pearsall
682S16	June 2017	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Traffic Signal Controllers is revised to reflect the new publication version of OPSS 622.	Mike Pearsall

Reference Type/Code	Existing Version	New Version	Implemented In CPS	New, Revised (Rev), Cancelled (Can), Reissued/Reinstated (Rei)	Initiator
682F22	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Removal of Electrical Equipment and Materials is revised to reflect the new publication version of OPSS 610.	Mike Pearsall
682S30	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Poles is revised to reflect the new publication version of OPSS 615.	Mike Pearsall
706F04	August 2018	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Temporary Traffic Control Devices is revised to reflect the new publication version of OPSS 706.	Mike Pearsall
708F01	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Portable Temporary Traffic Signals is revised to reflect the new publication version of OPSS 708.	Mike Pearsall
723S03	May 2019	N/A	TBD	Can: SSP Amendment to Construction Specification for Energy Attenuators is cancelled. Applicable content has been incorporated into OPSS 723.	Mike Pearsall

Ontario Provincial Standard Specifications (OPSSs)					
610	November 2016	April 2025	TBD	Rev: Construction Specification for Removal of Electrical Equipment and Materials is implemented. The specification has been updated to new PROV format with no technical content changes. Legacy Appendix A removed.	Mike Pearsall
Standard Special Provisions (SSPs)					
610F01	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Removal of Electrical Equipment and Materials is revised to reflect the new publication version of OPSS 610.	Mike Pearsall
682F22	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Removal of Electrical Equipment and Materials is revised to reflect the new publication version of OPSS 610.	Mike Pearsall

Note: The 610 implemented in April 2025 replaces 610, November 2016 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR
REMOVAL OF ELECTRICAL EQUIPMENT AND MATERIALS

TABLE OF CONTENTS

610.01 SCOPE

This specification covers the requirements for demolition, salvage, and removal, either completely or partially, of electrical equipment and materials.

~~610.01.01 Specification Significance and Use~~

~~This specification is written as a provincial-oriented specification. Provincial-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of the Ontario Ministry of Transportation.~~

~~Use of this specification or any other specification shall be according to the Contract Documents.~~

~~**610.01.02 Appendices Significance and Use**~~

~~Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.~~

~~Appendices are developed for the Owner's use only.~~

~~Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.~~

~~Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.~~

~~The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.~~

610.02 REFERENCES

~~When the Contract Documents indicate that provincial-oriented specifications are to be used and there is a provincial-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.PROV, unless use of a municipal-oriented specification is specified in the Contract Documents. When there is not a corresponding provincial-oriented specification, the references below shall be considered to be to the OPSS listed, unless use of a municipal-oriented specification is specified in the Contract Documents.~~

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 492	Site Restoration Following Installation of Pipes, Utilities, and Associated Structures
OPSS 510	Removal

610.04 DESIGN AND SUBMISSION REQUIREMENTS

610.04.01 Submission Requirements

610.04.01.01 Operations Plans

An operations plan shall be submitted to the Contract Administrator a minimum of 3 weeks prior to the commencement of polychlorinated biphenyl (PCB) related activities. ~~–~~The plan shall describe the overall approach to the work and include the following:

a) Operational methodologies.

b) Work area delineation and security details.

c) Environmental impact management, such as spill prevention and containment and emergency response plan.

d) Contamination control.

e) Equipment and area decontamination procedures.

f) Ontario Ministry of the Environment, Conservation and ~~Climate Change (MOECC~~Parks (MECP) Compliance Approval numbers as applicable for transportation and transfer facilities.

PCB wastes and PCB related wastes to be moved to a transfer facility shall be included in the operations plan with details regarding their eventual transport to a disposal facility for destruction.

610.07 CONSTRUCTION

610.07.01 General

General requirements for electrical work shall be as specified in the Contract Documents.

Demolition, salvage, and removal of electrical equipment and materials shall be as specified in the Contract Documents.

The Contractor shall acquire all releases and agreements necessary to do the work.

610.07.02 Timing of Work

Existing electrical systems required to continue in-service shall remain functional during construction operations until new or modified systems are operational.

610.07.03 Removal

Removal of non-electrical material and objects required for the removal of electrical equipment and material shall be according to OPSS 510.

Electrical concrete structures shall be removed to a minimum of 1.0 m below finished grade.

Where partial removal of pavement, sidewalk, curb and gutter, or other structures is required for removal of electrical equipment, the broken edges of the object to remain in place shall be squared up and trimmed along straight lines at a minimum distance of 300 mm from any area disturbed by removal operations.

Steel reinforcement, conduits, ducts, wires, and debris associated with the removed portions of such structures shall be removed for disposal.

610.07.04 Demolition

Demolition of concrete, brick, timber, and masonry structures, including pole footings, equipment pads, concrete poles, and substation buildings shall be carried out in such a manner and with such equipment as not to disturb adjacent pavement, Utilities, other works, or electrical equipment and material to remain in place and with such care as to leave material designated to be salvaged in an undamaged condition.

610.07.05 Luminaires

Prior to removing luminaires, all lamps and glass shall be removed.

610.07.06 Cables and Conduits

Underground cables shall be completely removed and conduit systems shall be cut back to a depth of 600 mm below finished grade and abandoned in place.

610.07.07 Transformers

Transformers containing PCBs, including all internal components, and all PCB related wastes shall be removed and managed as subject waste as specified in the Contract Documents.

Transformers not containing PCBs shall be removed, salvaged, and transported to storage sites specified in the Contract Documents.

610.07.08 Temporary Installations

Equipment and materials supplied by the Contractor for use with temporary installations shall be removed. Equipment and materials supplied by the Owner for use with temporary installations shall be removed and salvaged as specified in the Contract Documents.

610.07.09 Salvage of Equipment

610.07.09.01 Damages

Prior to removal operations, the Contract Administrator shall be notified of any equipment that is broken or deteriorated to the point where salvage is not practical.

Equipment and materials damaged through improper handling or through loss after removal shall be repaired or replaced at no additional cost to the Owner.

610.07.09.02 Packaging of Electrical Equipment and Materials

Electrical equipment and materials that has been removed shall be packed for protection against damage.

All equipment or material in excess of 100 kg shall be securely mounted on wooden pallets suitable for handling by forklift trucks.

610.07.09.03 Shipping of Salvaged Electrical Equipment and Materials

All salvaged equipment and materials shall be loaded, transported, and unloaded at the sites specified in the Contract Documents.

Delivery to any Owner unloading sites shall be made between 09:00 and 15:30, local time. The Contract Administrator shall be notified 3 Business Days in advance of delivery to the Owner's unloading sites.

610.07.10 Quality Control

610.07.10.01 Pre-Removal Testing and Inspection

Components specified for removal shall be inspected prior to removal. If the components are to be salvaged for reuse within the Working Area or for storage at the Owner's premises, the Contractor shall make a list of any imperfections of those components and shall submit the list to the Contract Administrator 3 Business Days prior to the commencement of removal.

610.07.10.02 Proof of Performance Testing and Inspection

The removal work shall be inspected to ensure that all electrical removals have been carried out and that all components requiring disposal at approved sites have been completed so that no such materials remain on the Owner's lands.

610.07.11 Site Restoration

Site restoration shall be according to OPSS 492.

610.07.12 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

610.10 BASIS OF PAYMENT

610.10.01 Removal of Electrical Equipment - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

Work required to salvage and transport liquid type transformers shall be administered as a Change in the Work.

Appendix 610-A, November 2016
FOR USE WHILE DESIGNING MUNICIPAL CONTRACTS

Note: This is a non-mandatory Commentary Appendix intended to provide information to a designer, during the design stage of a contract, on the use of the OPS specification in a municipal contract. This appendix does not form part of the standard specification. Actions and considerations discussed in this appendix are for information purposes only and do not supersede an Owner's design decisions and methodology.

Designer Action/Considerations

No information provided here

Related Ontario Provincial Standard Drawings

No information provided here.

Note: The 610 implemented in April 2025 replaces 610, November 2016 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR REMOVAL OF ELECTRICAL EQUIPMENT AND MATERIALS

TABLE OF CONTENTS

610.01 SCOPE

This specification covers the requirements for demolition, salvage, and removal, either completely or partially, of electrical equipment and materials.

610.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 492 Site Restoration Following Installation of Pipes, Utilities, and Associated Structures
OPSS 510 Removal

610.04 DESIGN AND SUBMISSION REQUIREMENTS

610.04.01 Submission Requirements

610.04.01.01 Operations Plans

An operations plan shall be submitted to the Contract Administrator a minimum of 3 weeks prior to the commencement of polychlorinated biphenyl (PCB) related activities. The plan shall describe the overall approach to the work and include the following:

a) Operational methodologies.

b) Work area delineation and security details.

c) Environmental impact management, such as spill prevention and containment and emergency response plan.

d) Contamination control.

e) Equipment and area decontamination procedures.

f) Ontario Ministry of the Environment, Conservation and Parks (MECP) Compliance Approval numbers as applicable for transportation and transfer facilities.

PCB wastes and PCB related wastes to be moved to a transfer facility shall be included in the operations plan with details regarding their eventual transport to a disposal facility for destruction.

610.07 CONSTRUCTION

610.07.01 General

General requirements for electrical work shall be as specified in the Contract Documents.

Demolition, salvage, and removal of electrical equipment and materials shall be as specified in the Contract Documents.

The Contractor shall acquire all releases and agreements necessary to do the work.

610.07.02 Timing of Work

Existing electrical systems required to continue in-service shall remain functional during construction operations until new or modified systems are operational.

610.07.03 Removal

Removal of non-electrical material and objects required for the removal of electrical equipment and material shall be according to OPSS 510.

Electrical concrete structures shall be removed to a minimum of 1.0 m below finished grade.

Where partial removal of pavement, sidewalk, curb and gutter, or other structures is required for removal of electrical equipment, the broken edges of the object to remain in place shall be squared up and trimmed along straight lines at a minimum distance of 300 mm from any area disturbed by removal operations.

Steel reinforcement, conduits, ducts, wires, and debris associated with the removed portions of such structures shall be removed for disposal.

610.07.04 Demolition

Demolition of concrete, brick, timber, and masonry structures, including pole footings, equipment pads, concrete poles, and substation buildings shall be carried out in such a manner and with such equipment as not to disturb adjacent pavement, Utilities, other works, or electrical equipment and material to remain in place and with such care as to leave material designated to be salvaged in an undamaged condition.

610.07.05 Luminaires

Prior to removing luminaires, all lamps and glass shall be removed.

610.07.06 Cables and Conduits

Underground cables shall be completely removed and conduit systems shall be cut back to a depth of 600 mm below finished grade and abandoned in place.

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Transformers containing PCBs, including all internal components, and all PCB related wastes shall be removed and managed as subject waste as specified in the Contract Documents.

Transformers not containing PCBs shall be removed, salvaged, and transported to storage sites specified in the Contract Documents.

610.07.08 Temporary Installations

Equipment and materials supplied by the Contractor for use with temporary installations shall be removed. Equipment and materials supplied by the Owner for use with temporary installations shall be removed and salvaged as specified in the Contract Documents.

610.07.09 Salvage of Equipment

610.07.09.01 Damages

Prior to removal operations, the Contract Administrator shall be notified of any equipment that is broken or deteriorated to the point where salvage is not practical.

Equipment and materials damaged through improper handling or through loss after removal shall be repaired or replaced at no additional cost to the Owner.

610.07.09.02 Packaging of Electrical Equipment and Materials

Electrical equipment and materials that has been removed shall be packed for protection against damage.

All equipment or material in excess of 100 kg shall be securely mounted on wooden pallets suitable for handling by forklift trucks.

610.07.09.03 Shipping of Salvaged Electrical Equipment and Materials

All salvaged equipment and materials shall be loaded, transported, and unloaded at the sites specified in the Contract Documents.

Delivery to any Owner unloading sites shall be made between 09:00 and 15:30, local time. The Contract Administrator shall be notified 3 Business Days in advance of delivery to the Owner’s unloading sites.

610.07.10 Quality Control

610.07.10.01 Pre-Removal Testing and Inspection

Components specified for removal shall be inspected prior to removal. If the components are to be salvaged for reuse within the Working Area or for storage at the Owner's premises, the Contractor shall make a list of any imperfections of those components and shall submit the list to the Contract Administrator 3 Business Days prior to the commencement of removal.

610.07.10.02 Proof of Performance Testing and Inspection

The removal work shall be inspected to ensure that all electrical removals have been carried out and that all components requiring disposal at approved sites have been completed so that no such materials remain on the Owner's lands.

610.07.11 Site Restoration

Site restoration shall be according to OPSS 492.

610.07.12 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

610.10 BASIS OF PAYMENT

610.10.01 Removal of Electrical Equipment - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

Work required to salvage and transport liquid type transformers shall be administered as a Change in the Work.

REMOVAL OF ELECTRICAL EQUIPMENT - Item No.

Special Provision No. 610F01 ~~November 2016~~April 2025

Amendment to OPSS 610, ~~November 2016~~April 2025

610.07.09.03 Shipping of Salvaged Electrical Equipment and Materials

Clause 610.07.09.03 of OPSS 610 is amended by the addition of the following:

Transformers designated for removal shall be removed, salvaged and transported to the site(s) specified in Table 1. All wiring and conduit systems shall be disconnected and the transformer salvaged complete with all fittings and hardware.

TABLE 1
Salvaged Equipment and Unloading Site(s)

Equipment	Site
~~[* Designer Fill-In, See Notes to Designer]~~*	*

[* Designer Fill-In, See Notes to Designer]

NOTES TO DESIGNER:

* Contact Regional Electrical Engineering Section for specification of unloading site(s) for equipment to be salvaged and fill-in Table 1 accordingly. Add/delete rows as necessary.

WARRANT: With this tender item, when electrical equipment will be salvaged as recommended by the Central Region Electrical Engineering Section or the local Regional Electrical Coordinator.

REMOVAL OF ELECTRICAL EQUIPMENT - Item No.

Special Provision No. 610F01 April 2025

Amendment to OPSS 610, April 2025

610.07.09.03 Shipping of Salvaged Electrical Equipment and Materials

Clause 610.07.09.03 of OPSS 610 is amended by the addition of the following:

Transformers designated for removal shall be removed, salvaged and transported to the site(s) specified in Table 1. All wiring and conduit systems shall be disconnected and the transformer salvaged complete with all fittings and hardware.

TABLE 1
Salvaged Equipment and Unloading Site(s)

Equipment	Site
*	*

[* Designer Fill-In, See Notes to Designer]

NOTES TO DESIGNER:

* Contact Regional Electrical Engineering Section for specification of unloading site(s) for equipment to be salvaged and fill-in Table 1 accordingly. Add/delete rows as necessary.

WARRANT: With this tender item, when electrical equipment will be salvaged as recommended by the Central Region Electrical Engineering Section or the local Regional Electrical Coordinator.

REMOVAL OF ADVANCED TRAFFIC MANAGEMENT SYSTEM EQUIPMENT - Item No.

Special Provision No. 682F22 ~~November 2016~~April 2025

Amendment to OPSS 610, ~~November 2016~~April 2025

610.07 CONSTRUCTION

Section 610.07 of OPSS 610 is amended by the addition of the following subsection:

610.07.13 Advanced Traffic Management System Equipment

A detailed equipment removal plan with detailed schedule and procedures shall be submitted for review and approval to the Contract Administrator 2 weeks prior to commencing any removal work.

Prior to removal operations, all equipment to be salvaged shall be inspected and tested. The Contract Administrator will witness all tests and inspections. Twenty-four hours advance notice shall be provided to the Contract Administrator prior to commencing any removal work.

The following test and/or inspections shall be performed for equipment to be salvaged under this Contract:

~~[* Designer Fill-in - See Notes to Designer]~~

Equipment	Test / Inspection Details
*	*

[* Designer Fill-in - See Notes to Designer]

The following equipment shall be removed and salvaged for delivery/storage as indicated:

~~[** Designer Fill-in - See Notes to Designer]~~

Description	Quantity	Delivery / Storage Location
**	**	**

[** Designer Fill-in - See Notes to Designer]

The following equipment shall be removed and salvaged for re-installation under this Contract. A temporary storage location with regulated environmental controls to meet the manufacturers storage requirements shall be utilized when equipment cannot be re-installed and re-energized during the same working day as removal:

~~[*** Designer Fill-in - See Notes to Designer]~~

Description	Quantity	Temporary Storage Location
***	***	***

[*** Designer Fill-in - See Notes to Designer]

The above equipment shall be delivered to and from the Working Area if temporary storage is required.

All remaining equipment identified for removal shall become the property of the Contractor and shall be managed as specified in the Contract Documents.

Where the Owner's premises are required for delivery and/or storage, 72 hours notice shall be provided to the Contract Administrator prior to delivery and/or pickup. The delivery and/or pickup from Owner's premises shall be made between 7:00 am and 3:00 pm Monday through Friday.

610.10 BASIS OF PAYMENT

Section 610.10 of OPSS 610 is amended by the addition of the following subsection:

610.10.02 Removal of Advanced Traffic Management System Equipment - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

NOTES TO DESIGNER:

* List all tests required to be performed on salvaged equipment prior to removal. Fill-in table size is reduced. Add rows as required.

** Provide description and quantity of equipment to be salvaged and delivery/storage location. Fill-in table size is reduced. Add rows as required.

*** Provide description and quantity of equipment to be salvaged for re-installation and temporary storage location if necessary. Fill-in table size is reduced. Add rows as required.

WARRANT: Always with this tender item

REMOVAL OF ADVANCED TRAFFIC MANAGEMENT SYSTEM EQUIPMENT - Item No.

Special Provision No. 682F22 April 2025

Amendment to OPSS 610, April 2025

610.07 CONSTRUCTION

Section 610.07 of OPSS 610 is amended by the addition of the following subsection:

610.07.13 Advanced Traffic Management System Equipment

A detailed equipment removal plan with detailed schedule and procedures shall be submitted for review and approval to the Contract Administrator 2 weeks prior to commencing any removal work.

Prior to removal operations, all equipment to be salvaged shall be inspected and tested. The Contract Administrator will witness all tests and inspections. Twenty-four hours advance notice shall be provided to the Contract Administrator prior to commencing any removal work.

The following test and/or inspections shall be performed for equipment to be salvaged under this Contract:

Equipment	Test / Inspection Details
*	*

[* Designer Fill-in - See Notes to Designer]

The following equipment shall be removed and salvaged for delivery/storage as indicated:

Description	Quantity	Delivery / Storage Location
**	**	**

[** Designer Fill-in - See Notes to Designer]

The following equipment shall be removed and salvaged for re-installation under this Contract. A temporary storage location with regulated environmental controls to meet the manufacturers storage requirements shall be utilized when equipment cannot be re-installed and re-energized during the same working day as removal:

Description	Quantity	Temporary Storage Location
***	***	***

[*** Designer Fill-in - See Notes to Designer]

The above equipment shall be delivered to and from the Working Area if temporary storage is required.

All remaining equipment identified for removal shall become the property of the Contractor and shall be managed as specified in the Contract Documents.

Where the Owner's premises are required for delivery and/or storage, 72 hours notice shall be provided to the Contract Administrator prior to delivery and/or pickup. The delivery and/or pickup from Owner's premises shall be made between 7:00 am and 3:00 pm Monday through Friday.

610.10 BASIS OF PAYMENT

Section 610.10 of OPSS 610 is amended by the addition of the following subsection:

610.10.02 Removal of Advanced Traffic Management System Equipment - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Material to do the work.

NOTES TO DESIGNER:

* List all tests required to be performed on salvaged equipment prior to removal. Fill-in table size is reduced. Add rows as required.

** Provide description and quantity of equipment to be salvaged and delivery/storage location. Fill-in table size is reduced. Add rows as required.

*** Provide description and quantity of equipment to be salvaged for re-installation and temporary storage location if necessary. Fill-in table size is reduced. Add rows as required.

WARRANT: Always with this tender item

Ontario Provincial Standard Specifications (OPSSs)					
615	April 2017	April 2025	TBD	Rev: Construction Specification for Installation of Poles is implemented. The specification has been updated to new PROV format with no technical content changes. Applicable content from SSP 615S06 has been incorporated into OPSS 615.	Mike Pearsall
Standard Special Provisions (SSPs)					
615S05	August 2019	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Poles is revised to reflect the new publication version of OPSS 615.	Mike Pearsall
615S06	August 2019	N/A	TBD	Can: SSP Amendment to Construction Specification for Installation of Poles is cancelled. Applicable content has been incorporated into OPSS 615.	Mike Pearsall
682S13	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Poles is revised to reflect the new publication version of OPSS 615.	Mike Pearsall
682F22	November 2016	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Removal of Electrical Equipment and Materials is revised to reflect the new publication version of OPSS 610.	Mike Pearsall

Note: The 615 implemented in April 2025 replaces 615, April 2017 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR INSTALLATION OF POLES

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615.01 SCOPE

This specification covers the requirements for the installation of poles used for the mounting of lighting equipment, traffic signals and control equipment, low-voltage aerial cables, and extra low-voltage aerial cables.

~~615.01.01 Specification Significance and Use~~

~~This specification is written as a provincial-oriented specification. Provincial-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of the Ontario Ministry of Transportation.~~

~~Use of this specification or any other specification shall be according to the Contract Documents.~~

~~615.01.02 Appendices Significance and Use~~

~~Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.~~

~~Appendices are developed for the Owner's use only.~~

~~Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.~~

~~Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.~~

~~The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.~~

615.02 REFERENCES

~~When the Contract Documents indicate that provincial-oriented specifications are to be used and there is a provincial-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.PROV, unless use of a municipal-oriented specification is specified in the Contract Documents. When there is not a corresponding provincial-oriented specification, the references below shall be considered to be to the OPSS listed, unless use of a municipal-oriented specification is specified in the Contract Documents.~~

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 492	Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 501	Compacting
OPSS 603	Installation of Ducts
OPSS 609	Grounding
OPSS 610	Removal of Electrical Equipment and Materials
OPSS 904	Concrete Structures

Ontario Provincial Standard Specifications, Material

OPSS 1350	Concrete - Material and Production
OPSS 1440	Steel Reinforcement for Concrete
OPSS 2420	Wood Poles
OPSS 2421	Spun Concrete Poles
OPSS 2422	Heavy Class Steel and Sectional Steel Poles, Base Mounted
OPSS 2423	Steel Poles, Base Mounted
OPSS 2452	Aluminum Poles, Base Mounted
OPSS 2453	Sectional Steel Poles

CSA Standards

C83-96 (R2011)	Communication and Power Line Hardware
G12-14	Zinc Coated Steel Wire Strand

Others

Ontario Electrical Safety Code

615.05 MATERIALS

615.05.01 Concrete

Concrete shall be according to OPSS 1350 with a nominal minimum 28-Day compressive strength of 30 MPa.

615.05.02 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440.

615.05.03 Poles

Concrete poles shall be according to OPSS 2421.

Steel poles for base mounting shall be according to OPSS 2423.

Aluminum poles for base mounting shall be according to OPSS 2452.

Sectional steel poles for direct burial or base mounting shall be according to OPSS 2453. Where sectional steel poles have heights not listed in OPSS 2453, the sectional steel poles shall be according to OPSS 2453 in all other respects.

Wooden poles shall be according to OPSS 2420.

Heavy class steel poles and heavy class sectional steel poles shall be according to OPSS 2422. This class is required for poles with mast arms longer than 5.5 m.

Heavy class steel sectional poles and heavy class steel poles of the same height may be substituted for one another provided that the poles are fully compatible with the installation and all other associated work is according to the Contract Documents.

615.05.04 Frangible Bases

Frangible bases shall be according to the manufacturer's specifications and the Contract Documents and shall come complete with one-piece shroud covers.

615.05.05 Pole Hardware and Accessories

Pole line hardware shall be according to CSA C83.

Steel guy cable shall be according to CAN/CSA G12.

Guy anchors shall be of the helical power driven or direct buried expandable type with a minimum diameter of 250 mm and a minimum anchor rod ultimate strength of 50 kN.

The hardware and accessories for wood pole anchors installed in rock shall be according to Table 1.

615.07 CONSTRUCTION

615.07.01 General

The general requirements for electrical work shall be as specified in the Contract Documents.

Concrete, wooden, and metal poles shall be installed at locations specified in the Contract Documents.

All compaction shall be according to OPSS 501.

Grounding of poles shall be according to OPSS 609 and the Contract Documents.

615.07.01.01 Pole Orientation

Concrete and metal poles shall be installed with the handhole location on the pole as specified in the Contract Documents and such that the top wiring aperture is at right angles to the centreline of the road being served.

615.07.01.02 Pole Handling

Poles shall be handled using suitable non-abrasive slings at the pole pick up points as specified by the pole manufacturer.

615.07.01.03 Removals

Removals shall be according to OPSS 610.

615.07.02 Sectional Steel Poles

615.07.02.01 Assembly

Sectional steel poles shall be assembled in order of section number, taper, and diameter. Sections with wiring apertures shall be set with consideration given to the handhole location.

All sections shall be assembled by compression according to the manufacturer's instructions such that each section meets the normal overlap limits marked on the pole or refusal. Seam welds shall be slightly offset during assembly. The finished length of the pole shall be less than or equal to the nominal pole length.

Pole lengths of 5.64 m or more shall be assembled using three self-tapping screws or impact inserted pins. Screws and pins shall be installed in the overlap of all sections below the signal bracket so that they are spaced equally around the pole.

615.07.03 Direct Buried Poles

615.07.03.01 Installation in Earth

Excavation shall be by auger or by other suitable means to obtain a hole large enough to accommodate concrete encasement and backfill. Where the excavation extends beyond the neat limits specified in the Contract Documents, and, where concrete encasement is specified in the Contract Documents, concrete may be placed to the undisturbed earth or the encasement may be formed with the remainder of the backfill made up of native material.

615.07.03.02 Installation in Rock

Where rock is encountered, the method of installation shall be chosen from those specified in the Contract Documents and be based on the depth of rock below finished grade. Each method of installation in rock shall be approved by the Contract Administrator prior to construction.

Rock anchors, bolts for rock mounts, and steel dowel bars shall be installed in drilled holes and grouted in place with non-shrink grout. Poles shall be cut off at the top end to provide the correct top of pole elevation. Wooden poles that have been cut off shall have the ends treated with preservative according to the pole manufacturer's specifications.

Concrete levelling pads, concrete backfill up to the top of the rock grade, and formed concrete encasement shall be placed according to OPSS 904.

Native or imported earth material shall be used as backfill above or around the concrete encasement and compacted.

Rock excavation shall be according to OPSS 603.

615.07.03.03 Pole Alignment

Direct buried poles shall be held plumb by using a suitable temporary support assembly during concrete setting time and during backfilling operations.

615.07.04 Base Mounted Poles

615.07.04.01 Preparation

Anchorage templates shall be removed prior to installation of poles and frangible bases.

All studs, bolts, and nuts shall be cleaned and coated with white lithium-based grease.

615.07.04.02 Installation of Frangible Bases

When frangible bases are specified in the Contract Documents, they shall be installed according to manufacturer's specifications.

615.07.04.03 Pole Installation

When specified in the Contract Documents, poles shall be installed on frangible bases.

Poles shall be set plumb.

615.07.05 Apertures

Drilled apertures shall be accurately aligned to suit pole attachments or equipment. Wiring apertures in metal poles shall be provided with rubber grommets. Apertures in metal poles shall be deburred, and in galvanized steel poles, be coated with grey zinc-rich paint and allowed to dry before placing rubber grommets in them.

Unused pole apertures shall be plugged with rubber, neoprene, or plastic plugs.

615.07.06 Guy Anchors

Guy anchors and associated hardware shall be installed as specified in the Contract Documents and the Ontario Electrical Safety Code. Anchorage plates shall be installed at the specified guy lead distance and adjusted to

remain clear of any existing guy anchors by a minimum distance of 600 mm and then backfilled with native material and compacted.

Guy anchors shall be installed with single or double guy cable sets as specified in the Contract Documents.

All guy cables shall be installed to a snug condition prior to aerial cable stringing and readjusted upon completion to maintain poles in a plumb position.

Guy cables shall be tightened to maintain pole alignment and aerial cable clearances.

615.07.07 Quality Control

615.07.07.01 Pre-Installation Testing and Inspection

Poles shall be inspected for any obvious flaws, prior to installation.

Heavy class steel and sectional steel poles shall be certified that they are according to the supplier's design and drawings as specified in OPSS 2422. The certification shall reference the supplier's drawing numbers.

Sectional steel poles shall be certified that they are according to the supplier's design and drawing numbers as specified in OPSS 2453. The certification shall reference the supplier's drawing numbers.

615.07.07.02 Proof of Performance Testing and Inspection

The work of pole installation shall be inspected to ensure that it is according to the Contract Documents. The inspection shall ensure that:

a) Poles and appurtenances have been properly installed.

b) Poles are plumb.

c) Anchorage assemblies and frangible bases are installed correctly.

615.07.08 Temporary Electrical Work

The work for temporary electrical installations shall be the same as for permanent installations of the same type of work, except the work shall include the removal of the installations when they are no longer required.

615.07.09 Site Restoration

Site restoration shall be according to OPSS 492.

615.07.10 Management of Excess Materials

Management of excess material shall be as specified in the Contract Documents.

615.09 MEASUREMENT FOR PAYMENT

615.09.01 Actual Measurement

615.09.01.01 Poles

For measurement purposes, a count shall be made of the number of poles installed regardless of the type and size of the poles, and shall include any frangible bases and guy anchors installed with the poles.

615.09.01.02 Sectional Steel Poles, Direct Buried in Earth

For measurement purposes, a count shall be made of the number of sectional steel poles direct buried in earth.

615.09.01.03 Concrete Poles, Direct Buried in Earth

For measurement purposes, a count shall be made of the number of concrete poles direct buried in earth.

615.09.01.04 Wooden Poles, Direct Buried in Earth

For measurement purposes, a count shall be made of the number of wooden poles direct buried in earth.

615.09.01.05 Sectional Steel Poles, Direct Buried in Rock

For measurement purposes, a count shall be made of the number of sectional steel poles direct buried in rock.

615.09.01.06 Concrete Steel Poles, Direct Buried in Rock

For measurement purposes, a count shall be made of the number of concrete poles direct buried in rock.

615.09.01.07 Wooden Poles, Direct Buried in Rock

For measurement purposes, a count shall be made of the number of wooden poles direct buried in rock.

615.09.01.08 Sectional Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted sectional steel poles installed.

615.09.01.09 Heavy Class Sectional Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted heavy class sectional steel poles installed.

615.09.01.10 Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted steel poles installed.

615.09.01.11 Heavy Class Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted heavy class steel poles installed.

615.09.01.12 Aluminum Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted aluminum poles installed.

615.09.01.13 Frangible Bases

For measurement purposes, a count shall be made of the number of frangible bases installed.

615.09.01.14 Guy Anchors

For measurement purposes, a count shall be made of the number of guy anchors installed, regardless of the size and type.

615.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

615.10 BASIS OF PAYMENT

615.10.01 Poles - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Materials to do the work.

615.10.02
Sectional Steel Poles, Direct Buried in Earth - Item
Concrete Poles, Direct Buried in Earth - Item
Wooden Poles, Direct Buried in Earth - Item
Sectional Steel Poles, Direct Buried in Rock - Item
Concrete Poles, Direct Buried in Rock - Item
Wooden Poles, Direct Buried in Rock - Item
Sectional Steel Poles, Base Mounted - Item
Heavy Class Sectional Steel Poles, Base Mounted - Item
Steel Poles, Base Mounted - Item
Heavy Class Steel Poles, Base Mounted - Item
Aluminum Poles, Base Mounted - Item
Frangible Bases - Item
Guy Anchors - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

615.10.03
Sectional Steel Poles, Direct Buried in Earth (Temporary) - Item
Concrete Poles, Direct Buried in Earth (Temporary) - Item
Wooden Poles, Direct Buried in Earth (Temporary) - Item
Sectional Steel Poles, Direct Buried in Rock (Temporary) - Item
Concrete Poles, Direct Buried in Rock (Temporary) - Item
Wooden Poles, Direct Buried in Rock (Temporary) - Item
Sectional Steel Poles, Base Mounted (Temporary) - Item
Steel Poles, Base Mounted (Temporary) - Item
Aluminum Poles, Base Mounted (Temporary) - Item
Frangible Bases (Temporary) - Item
Guy Anchors (Temporary) - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Materials to do the work.

Progress payment for the above tender items shall be based on the following percentages of the Contract price:

a) 80% for supply and installation.

b) 20% for removal.

615.10.04 Rock Excavation

Payment for rock excavation shall be according to OPSS 603.

Rock excavation shall not include holes drilled in rock for the placement of steel dowel bars.

TABLE 1
Hardware and Accessories for Wood Pole Anchors in Rock

Manufacturer	Product Identity	Model	Assembly #	Product Notes
Locweld Inc 50 Iberville Candiac, QC J5R 1J5 Tel: 450.659.9661 Fax: 450.444.3111 OR 2159 Vincent Massey Drive P.O. Box 1900 Cornwall, Ontario, K6H 6N6 Tel: 613.936.9190 Fax: 613.936.9217 Email: sales @locweld.ca Homepage: www.locweld.ca Canadian Source: Poltec Industries Ltee 10, -440 Henault, Montreal, QC H1G 5R4 Tel: 514.326.6030 Fax: 514.326.9923	Anchor for Pole Butt Diameter 200 to 305 mm	P-9UT	Assembly 9-3 for 3 Anchor Configuration	Rock Drill 50 mm. Use drilling template for 3-Anchor Configuration.
	Anchor for Pole Butt Diameter 280 to 406 mm	P-9UT	Assembly 9-4 for 4 Anchor Configuration	Rock Drill 50 mm. Use drilling template for 4-Anchor Configuration
	Anchor for Pole Butt Diameter 355 to 508 mm	P-9UT	Assembly 9-5 for 5 Anchor Configuration	Rock Drill 50 mm. Use drilling template for 5-Anchor Configuration

Note: The 615 implemented in April 2025 replaces 615, April 2017 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR INSTALLATION OF POLES

TABLE OF CONTENTS

615.01 SCOPE

This specification covers the requirements for the installation of poles used for the mounting of lighting equipment, traffic signals and control equipment, low-voltage aerial cables, and extra low-voltage aerial cables.

615.02 REFERENCES

This specification refers to the following standards, specifications, or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 492 Site Restoration Following Installation of Pipelines, Utilities, and Associated Structures
OPSS 501 Compacting
OPSS 603 Installation of Ducts
OPSS 609 Grounding
OPSS 610 Removal of Electrical Equipment and Materials
OPSS 904 Concrete Structures

Ontario Provincial Standard Specifications, Material

OPSS 1350	Concrete - Material and Production
OPSS 1440	Steel Reinforcement for Concrete
OPSS 2420	Wood Poles
OPSS 2421	Spun Concrete Poles
OPSS 2422	Heavy Class Steel and Sectional Steel Poles, Base Mounted
OPSS 2423	Steel Poles, Base Mounted
OPSS 2452	Aluminum Poles, Base Mounted
OPSS 2453	Sectional Steel Poles

CSA Standards

C83-96 (R2011)	Communication and Power Line Hardware
G12-14	Zinc Coated Steel Wire Strand

Others

Ontario Electrical Safety Code

615.05 MATERIALS

615.05.01 Concrete

Concrete shall be according to OPSS 1350 with a nominal minimum 28-Day compressive strength of 30 MPa.

615.05.02 Steel Reinforcement

Steel reinforcement shall be according to OPSS 1440.

615.05.03 Poles

Concrete poles shall be according to OPSS 2421.

Steel poles for base mounting shall be according to OPSS 2423.

Aluminum poles for base mounting shall be according to OPSS 2452.

Sectional steel poles for direct burial or base mounting shall be according to OPSS 2453. Where sectional steel poles have heights not listed in OPSS 2453, the sectional steel poles shall be according to OPSS 2453 in all other respects.

Wooden poles shall be according to OPSS 2420.

Heavy class steel poles and heavy class sectional steel poles shall be according to OPSS 2422. This class is required for poles with mast arms longer than 5.5 m.

Heavy class steel sectional poles and heavy class steel poles of the same height may be substituted for one another provided that the poles are fully compatible with the installation and all other associated work is according to the Contract Documents.

615.05.04 Frangible Bases

Frangible bases shall be according to the manufacturer’s specifications and the Contract Documents and shall come complete with one-piece shroud covers.

615.05.05 Pole Hardware and Accessories

Pole line hardware shall be according to CSA C83.

Steel guy cable shall be according to CAN/CSA G12.

Guy anchors shall be of the helical power driven or direct buried expandable type with a minimum diameter of 250 mm and a minimum anchor rod ultimate strength of 50 kN.

The hardware and accessories for wood pole anchors installed in rock shall be according to Table 1.

615.07 CONSTRUCTION

615.07.01 General

The general requirements for electrical work shall be as specified in the Contract Documents.

Concrete, wooden, and metal poles shall be installed at locations specified in the Contract Documents.

All compaction shall be according to OPSS 501.

Grounding of poles shall be according to OPSS 609 and the Contract Documents.

615.07.01.01 Pole Orientation

Concrete and metal poles shall be installed with the handhole location on the pole as specified in the Contract Documents and such that the top wiring aperture is at right angles to the centreline of the road being served.

615.07.01.02 Pole Handling

Poles shall be handled using suitable non-abrasive slings at the pole pick up points as specified by the pole manufacturer.

615.07.01.03 Removals

Removals shall be according to OPSS 610.

615.07.02 Sectional Steel Poles

615.07.02.01 Assembly

Sectional steel poles shall be assembled in order of section number, taper, and diameter. Sections with wiring apertures shall be set with consideration given to the handhole location.

All sections shall be assembled by compression according to the manufacturer's instructions such that each section meets the normal overlap limits marked on the pole or refusal. Seam welds shall be slightly offset during assembly. The finished length of the pole shall be less than or equal to the nominal pole length.

Pole lengths of 5.64 m or more shall be assembled using three self-tapping screws or impact inserted pins. Screws and pins shall be installed in the overlap of all sections below the signal bracket so that they are spaced equally around the pole.

615.07.03 Direct Buried Poles

615.07.03.01 Installation in Earth

Excavation shall be by auger or by other suitable means to obtain a hole large enough to accommodate concrete encasement and backfill. Where the excavation extends beyond the neat limits specified in the Contract Documents, and, where concrete encasement is specified in the Contract Documents, concrete may be placed to the undisturbed earth or the encasement may be formed with the remainder of the backfill made up of native material.

615.07.03.02 Installation in Rock

Where rock is encountered, the method of installation shall be chosen from those specified in the Contract Documents and be based on the depth of rock below finished grade. Each method of installation in rock shall be approved by the Contract Administrator prior to construction.

Rock anchors, bolts for rock mounts, and steel dowel bars shall be installed in drilled holes and grouted in place with non-shrink grout. Poles shall be cut off at the top end to provide the correct top of pole elevation. Wooden poles that have been cut off shall have the ends treated with preservative according to the pole manufacturer's specifications.

Concrete levelling pads, concrete backfill up to the top of the rock grade, and formed concrete encasement shall be placed according to OPSS 904.

Native or imported earth material shall be used as backfill above or around the concrete encasement and compacted.

Rock excavation shall be according to OPSS 603.

615.07.03.03 Pole Alignment

Direct buried poles shall be held plumb by using a suitable temporary support assembly during concrete setting time and during backfilling operations.

615.07.04 Base Mounted Poles

615.07.04.01 Preparation

Anchorage templates shall be removed prior to installation of poles and frangible bases.

All studs, bolts, and nuts shall be cleaned and coated with white lithium-based grease.

615.07.04.02 Installation of Frangible Bases

When frangible bases are specified in the Contract Documents, they shall be installed according to manufacturer's specifications.

615.07.04.03 Pole Installation

When specified in the Contract Documents, poles shall be installed on frangible bases.

Poles shall be set plumb.

615.07.05 Apertures

Drilled apertures shall be accurately aligned to suit pole attachments or equipment. Wiring apertures in metal poles shall be provided with rubber grommets. Apertures in metal poles shall be deburred, and in galvanized steel poles, be coated with grey zinc-rich paint and allowed to dry before placing rubber grommets in them.

Unused pole apertures shall be plugged with rubber, neoprene, or plastic plugs.

615.07.06 Guy Anchors

Guy anchors and associated hardware shall be installed as specified in the Contract Documents and the Ontario Electrical Safety Code. Anchorage plates shall be installed at the specified guy lead distance and adjusted to remain clear of any existing guy anchors by a minimum distance of 600 mm and then backfilled with native material and compacted.

Guy anchors shall be installed with single or double guy cable sets as specified in the Contract Documents.

All guy cables shall be installed to a snug condition prior to aerial cable stringing and readjusted upon completion to maintain poles in a plumb position.

Guy cables shall be tightened to maintain pole alignment and aerial cable clearances.

615.07.07 Quality Control

615.07.07.01 Pre-Installation Testing and Inspection

Poles shall be inspected for any obvious flaws, prior to installation.

Heavy class steel and sectional steel poles shall be certified that they are according to the supplier's design and drawings as specified in OPSS 2422. The certification shall reference the supplier's drawing numbers.

Sectional steel poles shall be certified that they are according to the supplier's design and drawing numbers as specified in OPSS 2453. The certification shall reference the supplier's drawing numbers.

615.07.07.02 Proof of Performance Testing and Inspection

The work of pole installation shall be inspected to ensure that it is according to the Contract Documents. The inspection shall ensure that:

a) Poles and appurtenances have been properly installed.

b) Poles are plumb.

c) Anchorage assemblies and frangible bases are installed correctly.

615.07.08 Temporary Electrical Work

The work for temporary electrical installations shall be the same as for permanent installations of the same type of work, except the work shall include the removal of the installations when they are no longer required.

615.07.09 Site Restoration

Site restoration shall be according to OPSS 492.

615.07.10 Management of Excess Materials

Management of excess material shall be as specified in the Contract Documents.

615.09 MEASUREMENT FOR PAYMENT

615.09.01 Actual Measurement

615.09.01.01 Poles

For measurement purposes, a count shall be made of the number of poles installed regardless of the type and size of the poles, and shall include any frangible bases and guy anchors installed with the poles.

615.09.01.02 Sectional Steel Poles, Direct Buried in Earth

For measurement purposes, a count shall be made of the number of sectional steel poles direct buried in earth.

615.09.01.03 Concrete Poles, Direct Buried in Earth

For measurement purposes, a count shall be made of the number of concrete poles direct buried in earth.

615.09.01.04 Wooden Poles, Direct Buried in Earth

For measurement purposes, a count shall be made of the number of wooden poles direct buried in earth.

615.09.01.05 Sectional Steel Poles, Direct Buried in Rock

For measurement purposes, a count shall be made of the number of sectional steel poles direct buried in rock.

615.09.01.06 Concrete Steel Poles, Direct Buried in Rock

For measurement purposes, a count shall be made of the number of concrete poles direct buried in rock.

615.09.01.07 Wooden Poles, Direct Buried in Rock

For measurement purposes, a count shall be made of the number of wooden poles direct buried in rock.

615.09.01.08 Sectional Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted sectional steel poles installed.

615.09.01.09 Heavy Class Sectional Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted heavy class sectional steel poles installed.

615.09.01.10 Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted steel poles installed.

615.09.01.11 Heavy Class Steel Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted heavy class steel poles installed.

615.09.01.12 Aluminum Poles, Base Mounted

For measurement purposes, a count shall be made of the number of base mounted aluminum poles installed.

615.09.01.13 Frangible Bases

For measurement purposes, a count shall be made of the number of frangible bases installed.

615.09.01.14 Guy Anchors

For measurement purposes, a count shall be made of the number of guy anchors installed, regardless of the size and type.

615.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

615.10 BASIS OF PAYMENT

615.10.01 Poles - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Materials to do the work.

615.10.02
Sectional Steel Poles, Direct Buried in Earth - Item
Concrete Poles, Direct Buried in Earth - Item
Wooden Poles, Direct Buried in Earth - Item
Sectional Steel Poles, Direct Buried in Rock - Item
Concrete Poles, Direct Buried in Rock - Item
Wooden Poles, Direct Buried in Rock - Item
Sectional Steel Poles, Base Mounted - Item
Heavy Class Sectional Steel Poles, Base Mounted - Item
Steel Poles, Base Mounted - Item
Heavy Class Steel Poles, Base Mounted - Item
Aluminum Poles, Base Mounted - Item
Frangible Bases - Item
Guy Anchors - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

615.10.03
Sectional Steel Poles, Direct Buried in Earth (Temporary) - Item
Concrete Poles, Direct Buried in Earth (Temporary) - Item
Wooden Poles, Direct Buried in Earth (Temporary) - Item
Sectional Steel Poles, Direct Buried in Rock (Temporary) - Item
Concrete Poles, Direct Buried in Rock (Temporary) - Item
Wooden Poles, Direct Buried in Rock (Temporary) - Item
Sectional Steel Poles, Base Mounted (Temporary) - Item
Steel Poles, Base Mounted (Temporary) - Item

Aluminum Poles, Base Mounted (Temporary) - Item
Frangible Bases (Temporary) - Item
Guy Anchors (Temporary) - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Materials to do the work.

Progress payment for the above tender items shall be based on the following percentages of the Contract price:

a) 80% for supply and installation.

b) 20% for removal.

615.10.04 Rock Excavation

Payment for rock excavation shall be according to OPSS 603.

Rock excavation shall not include holes drilled in rock for the placement of steel dowel bars.

TABLE 1
Hardware and Accessories for Wood Pole Anchors in Rock

Manufacturer	Product Identity	Model	Assembly #	Product Notes
Locweld Inc 50 Iberville Candiac, QC J5R 1J5 Tel: 450.659.9661 Fax: 450.444.3111 OR 2159 Vincent Massey Drive P.O. Box 1900 Cornwall, Ontario, K6H 6N6 Tel: 613.936.9190 Fax: 613.936.9217 Email: sales @locweld.ca Homepage: www.locweld.ca Canadian Source: Poltec Industries Ltee 10, 440 Henault, Montreal, QC H1G 5R4 Tel: 514.326.6030 Fax: 514.326.9923	Anchor for Pole Butt Diameter 200 to 305 mm	P-9UT	Assembly 9-3 for 3 Anchor Configuration	Rock Drill 50 mm. Use drilling template for 3-Anchor Configuration.
	Anchor for Pole Butt Diameter 280 to 406 mm	P-9UT	Assembly 9-4 for 4 Anchor Configuration	Rock Drill 50 mm. Use drilling template for 4-Anchor Configuration
	Anchor for Pole Butt Diameter 355 to 508 mm	P-9UT	Assembly 9-5 for 5 Anchor Configuration	Rock Drill 50 mm. Use drilling template for 5-Anchor Configuration

BREAKAWAY BASE ANTI-THEFT DEVICE - Item No.

Special Provision No. 615S05 ~~May 2017~~April 2025

Amendment to OPSS 615, April ~~2017~~2025

615.02 REFERENCES

Section 615.02 of OPSS 615 is amended by the addition of the following:

National Cooperative Highway Research Program (NCHRP)

NCHRP Report 350 Recommended Procedures for the Safety Performance Evaluation of Highway Features

OPSS 615 is amended by the addition of the following section:

615.04 DESIGN AND SUBMISSION REQUIREMENTS

615.04.01 Design Requirements

615.04.01.01 Breakaway Base Anti-Theft Device

The breakaway base anti-theft device shall be designed to be compatible with the Safe-T-Base breakaway coupler base. The Safe-T-Base breakaway coupler base fitted with the anti-theft device shall maintain the breakaway characteristics of the Safe-T-Base breakaway coupler base without the anti-theft device.

615.04. 02 Submission Requirements

615.04.02.01 Breakaway Base Anti-Theft Device

Within 60 days of contract award the following shall be submitted to the Contract Administrator:

a) Letter stamped and signed by an Engineer certifying that the breakaway base anti-theft device is compatible with the Safe-T-Base breakaway coupler base.

b) Shop drawings and design information that fully detail the breakaway base anti-theft device.

c) Test report from a FHWA accredited test facility documenting the NCHRP Report 350 compliance testing for breakaway devices with the pendulum bogie system with a crushable nose validating that the addition of the anti-theft device to the Safe-T-Base breakaway coupler base does not affect the breakaway function of the base.

d) Documentation that the test facility and pendulum bogie system with crushable nose has been accredited and accepted by the FHWA for compliance testing of breakaway devices according to NCHRP Report 350.

e) Verification that the NCHRP Report 350 compliance testing was overseen and operated by staff from a FHWA accredited test facility.

Fabrication of the breakaway base anti-theft devices shall not commence until the complete submission has been accepted by the Contract Administrator.

615.05 MATERIAL

Section 615.05 of OPSS 615 is amended by the addition of the following subsection:

615.05.06 Breakaway Base Anti-Theft Device

The breakaway base anti-theft devices shall be according to the accepted shop drawings, manufacturer's specifications and the Contract Documents.

615.07 CONSTRUCTION

Section 615.07 of OPSS 615 is amended by the addition of the following clauses:

615.07.04.04 Breakaway Base Anti-Theft Device

615.07.04.04.01 Ordering

Immediately following the award of the Contract, the Contractor shall order the breakaway base anti-theft devices as required for this Contract.

The Contractor shall obtain verification of the delivery dates of the breakaway base anti-theft devices from the supplier and notify the Contract Administrator of the delivery dates within 72 hours after the award of the Contract.

The Contractor shall ensure there is timely and accurate communication with both the Owner and the supplier regarding the delivery, schedules, and requirements for the breakaway base anti-theft devices.

615.07.04.04.02 Installation

The breakaway base anti-theft devices shall be installed at the locations indicated in the Contract Documents.

The breakaway base anti-theft devices shall be installed according to the manufacturer's recommendations and specifications.

New lamps shall be installed at each pole location after the breakaway base anti-theft device has been completely installed and the pole bolted down. The Contractor shall verify that the lighting at each pole is fully operational before leaving the site.

OPSS 615 is amended by the addition of the following section:

615.08 QUALITY ASSURANCE

The Contract Administrator may make random inspections of the work.

615.09 MEASUREMENT FOR PAYMENT

Section 615.09 of OPSS 615 is amended by the addition of the following clause:

615.09.01.15 Breakaway Base Anti-Theft Device

For measurement purposes, a count shall be made of the number of breakaway base anti-theft devices installed.

615.10 BASIS OF PAYMENT

Subsection 615.10.02 of OPSS 615 is amended by the addition of the following item:

Breakaway Base Anti-Theft Device - Item

WARRANT: Always with this tender item, when the item is requested by Regional Operations.

BREAKAWAY BASE ANTI-THEFT DEVICE - Item No.

Special Provision No. 615S05 April 2025

Amendment to OPSS 615, April 2025

615.02 REFERENCES

Section 615.02 of OPSS 615 is amended by the addition of the following:

National Cooperative Highway Research Program (NCHRP)

NCHRP Report 350 Recommended Procedures for the Safety Performance Evaluation of Highway Features

OPSS 615 is amended by the addition of the following section:

615.04 DESIGN AND SUBMISSION REQUIREMENTS

615.04.01 Design Requirements

615.04.01.01 Breakaway Base Anti-Theft Device

The breakaway base anti-theft device shall be designed to be compatible with the Safe-T-Base breakaway coupler base. The Safe-T-Base breakaway coupler base fitted with the anti-theft device shall maintain the breakaway characteristics of the Safe-T-Base breakaway coupler base without the anti-theft device.

615.04. 02 Submission Requirements

615.04.02.01 Breakaway Base Anti-Theft Device

Within 60 days of contract award the following shall be submitted to the Contract Administrator:

a) Letter stamped and signed by an Engineer certifying that the breakaway base anti-theft device is compatible with the Safe-T-Base breakaway coupler base.

b) Shop drawings and design information that fully detail the breakaway base anti-theft device.

c) Test report from a FHWA accredited test facility documenting the NCHRP Report 350 compliance testing for breakaway devices with the pendulum bogie system with a crushable nose validating that the addition of the anti-theft device to the Safe-T-Base breakaway coupler base does not affect the breakaway function of the base.

d) Documentation that the test facility and pendulum bogie system with crushable nose has been accredited and accepted by the FHWA for compliance testing of breakaway devices according to NCHRP Report 350.

e) Verification that the NCHRP Report 350 compliance testing was overseen and operated by staff from a FHWA accredited test facility.

Fabrication of the breakaway base anti-theft devices shall not commence until the complete submission has been accepted by the Contract Administrator.

615.05 MATERIAL

Section 615.05 of OPSS 615 is amended by the addition of the following subsection:

615.05.06 Breakaway Base Anti-Theft Device

The breakaway base anti-theft devices shall be according to the accepted shop drawings, manufacturer's specifications and the Contract Documents.

615.07 CONSTRUCTION

Section 615.07 of OPSS 615 is amended by the addition of the following clauses:

615.07.04.04 Breakaway Base Anti-Theft Device

615.07.04.04.01 Ordering

Immediately following the award of the Contract, the Contractor shall order the breakaway base anti-theft devices as required for this Contract.

The Contractor shall obtain verification of the delivery dates of the breakaway base anti-theft devices from the supplier and notify the Contract Administrator of the delivery dates within 72 hours after the award of the Contract.

The Contractor shall ensure there is timely and accurate communication with both the Owner and the supplier regarding the delivery, schedules, and requirements for the breakaway base anti-theft devices.

615.07.04.04.02 Installation

The breakaway base anti-theft devices shall be installed at the locations indicated in the Contract Documents.

The breakaway base anti-theft devices shall be installed according to the manufacturer's recommendations and specifications.

New lamps shall be installed at each pole location after the breakaway base anti-theft device has been completely installed and the pole bolted down. The Contractor shall verify that the lighting at each pole is fully operational before leaving the site.

OPSS 615 is amended by the addition of the following section:

615.08 QUALITY ASSURANCE

The Contract Administrator may make random inspections of the work.

615.09 MEASUREMENT FOR PAYMENT

Section 615.09 of OPSS 615 is amended by the addition of the following clause:

615.09.01.15 Breakaway Base Anti-Theft Device

For measurement purposes, a count shall be made of the number of breakaway base anti-theft devices installed.

615.10 BASIS OF PAYMENT

Subsection 615.10.02 of OPSS 615 is amended by the addition of the following item:

Breakaway Base Anti-Theft Device - Item

WARRANT: Always with this tender item, when the item is requested by Regional Operations.

CONCRETE POLES, DIRECT BURIED IN EARTH - Item No.

Special Provision No. 682S13 ~~February 2009~~April 2025

Amendment to OPSS 615, ~~November 2008~~April 2025

615.05 MATERIALS

Section 615.05 of OPSS 615 is amended by the addition of the following subsection:

615.05.06 Concrete Pole Fill

Concrete pole fill shall have a minimum compressive strength of 3.5 MPa.

615.07 CONSTRUCTION

615.07.03 Direct Buried Poles

Subsection 615.07.03 of OPSS 615 is amended by the addition of the following clauses:

615.07.03.04 Pole Filling

The hollow core of the pole shall be filled with concrete up to the lower wiring aperture level. Duct opening shall be covered with metal plate after duct installation.

615.07.03.05 Duct Entry

The Contractor shall trim the pole wiring aperture to allow duct entry and mortar the duct in place.

WARRANT: All ATMS Contracts with this item.

CONCRETE POLES, DIRECT BURIED IN EARTH - Item No.

Special Provision No. 682S13 April 2025

Amendment to OPSS 615, April 2025

615.05 MATERIALS

Section 615.05 of OPSS 615 is amended by the addition of the following subsection:

615.05.06 Concrete Pole Fill

Concrete pole fill shall have a minimum compressive strength of 3.5 MPa.

615.07 CONSTRUCTION

615.07.03 Direct Buried Poles

Subsection 615.07.03 of OPSS 615 is amended by the addition of the following clauses:

615.07.03.04 Pole Filling

The hollow core of the pole shall be filled with concrete up to the lower wiring aperture level. Duct opening shall be covered with metal plate after duct installation.

615.07.03.05 Duct Entry

The Contractor shall trim the pole wiring aperture to allow duct entry and mortar the duct in place.

WARRANT: All ATMS Contracts with this item.

CONCRETE POLES, DIRECT BURIED IN EARTH WITH CAMERA RAISING AND LOWERING SYSTEM - Item No.
CONCRETE POLES, DIRECT BURIED IN ROCK WITH CAMERA RAISING AND LOWERING SYSTEM - Item No.

Special Provision No. 682S30 ~~May 2019~~April 2025

Amendment to OPSS 615, April ~~2017~~2025

Concrete Poles with Camera Raising and Lowering System

615.01 SCOPE

Section 615.01 of OPSS 615 is amended by the addition of the following:

This specification also covers the requirements for the erection, integration and testing of centrifugally cast, prestressed concrete poles complete with camera raising and lowering system used for attachment and lowering of closed circuit television cameras (CCTV).

615.02 REFERENCES

Section 615.02 of OPSS 615 is amended by the addition of the following to **CSA Standards**:

CSA S6-14 Canadian Highway Bridge Design Code

Section 615.02 of OPSS 615 is amended by the addition of the following to **Others**:

Journal of the Prestressed Concrete Institute Guide Specification for Prestressed Concrete Poles (May-June, 1982)

Section 615.02 of OPSS 615 is further amended by the addition of the following

ASTM International

~~A 36~~A36 Standard Specification for Carbon Structural Steel
~~A 153~~A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
~~A 416~~A416 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
~~A 615~~A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
~~B 240~~B240 Standard Specification for Zinc and Zinc-Aluminium (ZA) Alloys in Ingot Form for Foundry and Die Castings
~~C 150~~C150 Standard Specification for Portland Cement
~~C 494~~C494 Standard Specification for Chemical Admixtures for Concrete

American Society of Civil Engineers (ASCE):

ASCE 7 Minimum Design Loads for Buildings and Other Structures

International Organisation for Standardization (ISO):

ISO 9001 Quality Management Standard

Ministry of Transportation of Ontario Publications

MTO Report: Procedures for the Design of High Mast Pole Foundations, 2004

OPSS 615 is amended by the addition of the following section:

615.04 DESIGN AND SUBMISSION REQUIREMENTS

615.04.01 Design Requirements

615.04.01.01 Poles

Poles shall be prestressed and the concrete placed by the centrifugal spinning process. The centrifugal spinning is to insure both a minimum 28-day compressive strength of 55 Mpa and a minimum of 19 mm cover over the prestressing strand.

Poles shall be designed and constructed so that all wiring and grounding facilities are concealed within the pole. All handholes, couplings, thru-bolt holes and ground wire shall be cast into the pole during the manufacturing process.

Poles shall be round in cross section and provide a continuous taper of 15 mm per metre of length and provide a minimum 19 mm of concrete coverage over the prestressing strands.

All cable entry holes shall be according to the locations and sizes shown on the submittal drawings, and shall be free from sharp edges for passages of electrical wiring. As a minimum the following openings shall be provided:

a) Two 76 mm x 305 mm conduit entrance openings centered 457 mm below grade;

b) Two 114 mm x 305 mm steel galvanized reinforced handhole frames with flush cover located above grade.

c) Four threaded entry points that can accommodate 50 mm ducts, two on each side of the handhole.

All poles to have a minimum inside raceway dimension of 76 mm at tip of pole.

Poles shall be designed to accommodate and interface with the camera lowering system and related equipment. The pole and the raising and lowering system shall be considered an integral system.

Poles shall be designed considering application of wind load and dead load.

Poles shall be designed according to ASCE 7 to withstand a 3-second gust of 145 to 241 kilometres per hour.

All poles up to 21.3 m shall be designed to have a maximum deflection not greater than 25 mm. All poles of 24.4 m shall be designed for maximum deflection not greater than 30 mm.

The Contractor shall complete the lateral deflection analysis, based on manufacturers design and the soils conditions at the installations sites; and determine required embedment depth, hole diameter and backfill material to be used. The analysis and design shall be done in accordance with the Canadian Highway and Bridge Design Code CSA S6-14, the Structural manual and MTO Report: Procedures For The Design Of High Mast Pole Foundations dated 2004. The analysis and design shall be signed and stamped by a Design Engineer and a Design-checking Engineer and shall be submitted to the Contract Administrator prior to proceeding with construction.

In relation to the embedment depth, the handhole shall be placed approximately 1.2 metres above ground.

Poles shall be soft grey in colour. If a colour other than grey is proposed, all pigments used shall be non-fade iron or chromium oxides. Color other than grey must be approved by the Contract Administrator. All poles to be etched and finished with two coats of waterproof breathing membrane of methyl methacrylate. Any

deviation from this aggregate finish, colour, and composition requires approval from the Contract Administrator.

All manufacturing tolerance, details of reinforcement, and finishes shall be according to the Guide Specification for Prestressed Concrete Poles as published in the May-June, 1982, issue of the Journal of the Prestressed Concrete Institute

615.04.01.02 Camera Lowering System

The camera-lowering system shall be designed to withstand wind forces of 160 kilometres per hour with a 30 percent gust factor using a 1.65 safety factor.

When requested by the Contract Administrator, independent laboratory testing documents from the manufacturer shall be submitted to verify compliance to the stated wind force criteria. The test shall use the actual effective projected area (EPA) or an EPA greater than that of the camera system to be attached.

615.04.02 Submission Requirements

The following shall be submitted to the Contract Administrator prior to ordering:

a) Working Drawings showing the interface or mounting provision of the raising and lowering system on the concrete pole for an integrated and seamless unit.

b) Product references for the raising and lowering system.

c) The name, contact information and experience record of the concrete pole manufacturer. The manufacturer shall have a minimum of 10 years of experience in the design and production of centrifugally spun concrete poles.

d) The name, contact information and experience records of the camera-lowering system manufacturer. The experience records must show a minimum of 3 years of manufacturing experience and 3 completed projects with references for each successful installation.

Documentation from the manufacturer shall be submitted to the Contract Administrator certifying that the electrical Contractor performing installation of the camera raising and lowering system has been instructed on the installation, operation and safety features of the system.

615.05 MATERIALS

615.05.01 Concrete

Subsection 615.05.01 of OPSS 615 is deleted in its entirety and replaced with the following:

Concrete shall be according to OPSS 1350 for 55 MPa class and shall achieve a minimum 28-day compressive strength of 55 MPa.

Cement shall be according to the latest requirements of Type I Portland cement according to ASTM C 150. Maximum size aggregate may be 19 mm or less than 75% of the space between reinforcing steel and surface of pole. Any water reducers, retarders, or accelerating admixtures shall be according to ASTMC 494. Water shall be free from foreign materials in amounts harmful to concrete and embedded steel.

A concrete cylinder test shall be performed for each 75 m^3 of concrete poured. A final quality control check shall be carried out on each pole after manufacturing is complete. All quality control procedures shall be mandated in a written manual and be available for inspection.

615.05.02 Steel Reinforcement

Subsection 615.05.02 of OPSS 615 is amended by the addition of the following clauses:

615.05.02.01 Reinforcing Steel

Deformed steel reinforcement shall be according to ASTMA 615 for Grade 60 rebar.

615.05.02.02 Spiral Reinforcement

Steel spiral reinforcement shall be according to ASTMA 82 and shall not be less than 3.8 mm diameter.

615.05.02.03 Prestressing Steel

Prestressing steel reinforcement shall be uncoated 7-wire, stress-relieved strand according to ASTMA 416.

615.05.02.04 Hardware

All hardware supplied with the pole shall be according to ASTM A 36 and zinc alloy AC41A shall be according to ASTM B 240. The finish shall be hot dipped galvanized according to ASTM A 153.

Section 615.05 is amended by addition of the following subsections:

615.05.06 Electrical Ground

All poles will be supplied with a #6 stranded copper ground wire cast into the wall of the pole at the handhole box location.

615.05.07 Concrete Fill

Concrete to fill the pole shall have a minimum compressive strength of 3.5 MPa**.**

615.05.08 Lowering System

615.05.08.01 Functional Requirements

The camera lowering system shall mount to a purpose-designed tenon bolted to the top of the pole.

The camera lowering system shall be designed to support and lower a dome type camera, cabling, connectors and other supporting field components without damage or causing degradation of camera operations.

The lowering system shall consist of a suspension contact unit, divided support arm, and a pole adapter for attachment to a pole-top tenon, pole-top junction box, and camera connection box.

The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and insure the contact unit cannot twist under high wind conditions.

The suspension contact unit shall have a load capacity 91 kg with a 4 to 1 safety factor.

There shall be a locking mechanism between the fixed and moveable components of the lowering device.

The movable assembly shall have a minimum of 2 latches. This latching mechanism shall securely hold the device and its mounted equipment. The latching mechanism shall operate by alternately raising and lowering the assembly using the winch and lowering cable. When latched, all weight shall be removed from the lowering cable.

The fixed unit shall have a heavy duty cast tracking guide and means to allow latching in the same position each time. –The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture.

The prefabricated components of the lift unit support system shall be designed to preclude the lifting cable from contacting the power or video cabling.

Internal conduits shall be supplied in the pole for the power, communications, and video cabling. –The conduits shall be rigidly secured inside the pole.

The only cable permitted to move within the pole or lowering system during lowering or raising shall be the lowering cable.- All other cables must remain stable and secure during lowering and raising operations.

The manufacturer shall provide weights and / or counterweights as necessary to allow easy alignment of the guide pin and connectors when camera is being raised into position.

The lowering unit will have sufficient weight to disengage the camera and its control components in order that it can be lowered properly.

The manufacturer shall provide a mounting flange sufficient for mounting their respective camera assembly to the bottom of the camera connection box.

All electrical and video connections between the fixed and lowerable portion of the contact block shall be protected from exposure to the weather by a waterproof seal to prevent degradation of the electrical contacts.

615.05.08.02 Physical

The lowering device tenon top, cap, arm and detaching unit shall be made of durable and corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

All pulleys for the camera lowering device and portable lowering tool shall have sealed, self-lubricated bearings, oil tight bronze bearings, or sintered bronze bushings.

The lowering cable shall be a minimum 3 mm diameter stainless steel aircraft cable with a minimum breaking strength of 790 kg with 7 strands of # 19 AWG wire each.

The interface and locking components shall be made of stainless steel and or aluminium.

All external components of the lowering device shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

615.05.08.03 Electrical

The female and male socket contact halves of the connector block shall be made of thermosetting synthetic rubber known as Hypalon or equivalent. –The female brass socket contacts and the male high conductivity brass or gold plated pin contacts shall be securely attached to the connector block body.

The current carrying male contacts shall be 2.8 +/- 0.2 mm in diameter. -There shall be two male contacts that are longer than the rest which will make first and break last providing optimum grounding performance.

The number of contacts shall be 14 and the camera mounted thereto, shall be capable of performing all of its necessary functions on 14 contacts or less.

The current carrying female contacts shall be 2.8 +/- 0.2 mm in diameter. –All of the contacts shall be recessed or chamfered from the face of the connector block.- The design of the connector block shall create a watertight seal when the two halved are mated.

The wire leads from both the male and female contacts shall be securely attached in the connector body. -The current carrying and signal wires shall be constructed of #18/1 AWG jacketed wire.

The contacts shall be self-wiping with a shoulder at the base of each male contact so that it will recess into the female block, thereby giving a rain-tight seal when mated. –The manufacturer of the electrical contact connector must be ISO 9001 certified.- The connector must be identified by the manufacturer for outdoor use.

The electrical connections between the fixed and movable lowering device components shall be designed to conduct high frequency data bits and 1 volt peak-to-peak video signals as well as the power requirements for operation of dome environmental controls.

The manufacturer shall provide the power and signal connectors for attachment to the bare leads in the pole top and camera junction boxes. -These connectors shall come with 3 foot lead wires.

The camera raising and lowering system shall be CSA approved.

615.05.09 Lowering Tool

The camera-lowering system shall be operated by use of a portable lowering tool. -The tool shall consist of a lightweight metal frame and winch assembly with cable as described herein, a quick release cable connector, an adjustable safety clutch. -The tool shall be designed to operate with either a hand crank supplied with the tool or a variable speed industrial duty electric drill. –This tool shall be compatible with, and seat properly on supplied pole and provide easy access to the support cable through the handhole of the pole.

The lowering tool shall attach to the handhole on the pole with one single bolt and a stabilizing strap. -The bolt receptor shall accommodate a 19 mm stainless steel bolt.- The stabilizing strap shall consist of a wide nylon webbing strap that wraps around the pole and hooks on to the lowering tool. –The strap is tightened with a quick-release hand ratchet and shall not interfere with the operation of the lowering tool. –The tool shall support itself and the load assuring lowering operations and provide a means to prevent freewheeling when loaded. -The lowering tool shall be delivered to the designated ATMS Maintenance representative at the start of the project. -Two stainless steel through bolts and wing nuts shall be supplied with this item.

The lowering tool shall have a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load.

The lowering tool shall be provided with an adapter for operating the lowering device by a portable drill using a clutch mechanism.

The lowering tool shall be equipped with a positive breaking mechanism to secure the cable reel during raising and lowering operations and prevent freewheeling.

The spooling cable provided with the lowering tool shall be of sufficient length to enable the camera to be lowered to 1.2 m or lower from finished grade.

The manufacturer shall provide a minimum of one lowering tool and a wireless industrial duty high-torque variable speed reversible drill with 24V motor and two quick-charge batteries with charger as a unit. –The lowering tool and drill turned over to the designated ATMS Maintenance representative shall be new and unused.

615.07 CONSTRUCTION

Subsection 615.07.03 of OPSS 615 is amended by the addition of the following clauses:

615.07.03.04 Pole Filling

The hollow core of the pole shall be filled with concrete up to the lower wiring aperture level.

615.07.03.04 Duct Entry

Pole wiring aperture shall be trimmed to allow duct entry and mortar the duct in place.

615.07.03.05 Handling and Installation

The camera raising and lowering system shall be integrated with the concrete pole and the dome camera supplied under this Contract and installed as shown in the Contract Drawings.

The installation shall follow the manufacturer's guidelines for the three components and applicable Contract requirements.

Pre-stressed concrete poles shall be lifted and supported during manufacturing, stockpiling, transporting and installation operations only at the points shown on the shop drawings.

Transportation, site handling, and installation shall be performed using only manufacturer recommended equipment and methods, and by qualified personnel.

In order to mitigate the effects of poor soil quality condition, a steel liner shall be used to support walls of the augured hole.

The lowering device manufacturer shall furnish a factory representative to assist the electrical Contractor with the assembly and testing of the first lowering system onto the pole assembly. The Contractor shall be responsible for providing "on site" operational instructions to Owner's maintenance personnel.

615.07.07 Quality Control

615.07.07.01 Pre-Installation Testing and Inspection

Section 615.07.07.01 of OPSS 615 is amended by the deletion of the last paragraph.

615.07.07.02 Proof of Performance Testing and Inspection

Clause 615.07.07.02 of OPSS 615 is amended by addition of the following:

For each installed concrete pole complete with raising and lowering system, the assembly shall be fully raised and lowered a minimum of 5 times, which shall constitute a complete performance test. Each time the assembly is fully raised and lowered, the assembly shall be raised from the bottom of the pole (top of the handhole) to the top of the pole, latched, then unlatched, and then lowered to the bottom of the pole. After each raising and lowering sequence, the raising/lowering equipment shall be inspected to ensure that components are not damaged and are working properly. The cables inside the pole shall be inspected and check for any twisted cables. Any twisted cables shall be untwisted before the next raising and lowering sequence commences. After each raising and lowering sequence, the Contractor shall also verify that the video signal from the camera is being received at the cabinet (or at TOC) and the camera controls are functioning properly.

If any problems or deficiencies occur during the testing, the testing shall stop and the problem or deficiency corrected. Once the problem or deficiency has been corrected, the testing on that pole and associated material shall be repeated in its entirety i.e., the assembly shall again be fully raised and lowered a minimum of 5 times. This process shall be repeated until the assembly can be fully raise and lower a minimum of 5 times without any problems or deficiencies occurring during the testing.

The testing and inspection shall be witnessed by the Contract Administrator and the Owner's maintenance representative.

615.09 MEASUREMENT OF PAYMENT

615.09.01 Actual Measurements

Subsection 615.09.01 of OPSS 615 is amended by the addition of the following clause:

615.09.01.15 Concrete Poles, Direct Buried in Earth with Camera Raising and Lowering System

For measurement purposes, a count shall be made of the number of concrete poles, direct buried in earth with camera raising and lowering system installed.

615.09.01.16 Concrete Poles, Direct Buried in Rock with Camera Raising and Lowering System

For measurement purposes, a count shall be made of the number of concrete poles, direct buried in rock with camera raising and lowering system installed.

615.10 BASIS OF PAYEMENT

Subsection 615.10.02 of OPSS 615 is amended by the addition of the following:

Concrete Poles, Direct Buried in Earth with Camera Raising and Lowering System - Item
Concrete Poles, Direct Buried in Rock with Camera Raising and Lowering System - Item

NOTES TO DESIGNER:

Additional lowering tool and drill may be required by ATMS Maintenance. –The additional units are to be quantified as Spare items.

WARRANT: Always with these tender items.

CONCRETE POLES, DIRECT BURIED IN EARTH WITH CAMERA RAISING AND LOWERING SYSTEM - Item No.
CONCRETE POLES, DIRECT BURIED IN ROCK WITH CAMERA RAISING AND LOWERING SYSTEM - Item No.

Special Provision No. 682S30 April 2025

Amendment to OPSS 615, April 2025

Concrete Poles with Camera Raising and Lowering System

615.01 SCOPE

Section 615.01 of OPSS 615 is amended by the addition of the following:

This specification also covers the requirements for the erection, integration and testing of centrifugally cast, prestressed concrete poles complete with camera raising and lowering system used for attachment and lowering of closed circuit television cameras (CCTV).

615.02 REFERENCES

Section 615.02 of OPSS 615 is amended by the addition of the following to **CSA Standards**:

CSA S6-14 Canadian Highway Bridge Design Code

Section 615.02 of OPSS 615 is amended by the addition of the following to **Others**:

Journal of the Prestressed Concrete Institute Guide Specification for Prestressed Concrete Poles (May-June, 1982)

Section 615.02 of OPSS 615 is further amended by the addition of the following

ASTM International

A36 Standard Specification for Carbon Structural Steel
A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A416 Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
B240 Standard Specification for Zinc and Zinc-Aluminium (ZA) Alloys in Ingot Form for Foundry and Die Castings
C150 Standard Specification for Portland Cement
C494 Standard Specification for Chemical Admixtures for Concrete

American Society of Civil Engineers (ASCE):

ASCE 7 Minimum Design Loads for Buildings and Other Structures

International Organisation for Standardization (ISO):

ISO 9001 Quality Management Standard

Ministry of Transportation of Ontario Publications

MTO Report: Procedures for the Design of High Mast Pole Foundations, 2004

OPSS 615 is amended by the addition of the following section:

615.04 DESIGN AND SUBMISSION REQUIREMENTS

615.04.01 Design Requirements

615.04.01.01 Poles

Poles shall be prestressed and the concrete placed by the centrifugal spinning process. The centrifugal spinning is to insure both a minimum 28-day compressive strength of 55 Mpa and a minimum of 19 mm cover over the prestressing strand.

Poles shall be designed and constructed so that all wiring and grounding facilities are concealed within the pole. All handholes, couplings, thru-bolt holes and ground wire shall be cast into the pole during the manufacturing process.

Poles shall be round in cross section and provide a continuous taper of 15 mm per metre of length and provide a minimum 19 mm of concrete coverage over the prestressing strands.

All cable entry holes shall be according to the locations and sizes shown on the submittal drawings, and shall be free from sharp edges for passages of electrical wiring. As a minimum the following openings shall be provided:

a) Two 76 mm x 305 mm conduit entrance openings centered 457 mm below grade;

b) Two 114 mm x 305 mm steel galvanized reinforced handhole frames with flush cover located above grade.

c) Four threaded entry points that can accommodate 50 mm ducts, two on each side of the handhole.

All poles to have a minimum inside raceway dimension of 76 mm at tip of pole.

Poles shall be designed to accommodate and interface with the camera lowering system and related equipment. The pole and the raising and lowering system shall be considered an integral system.

Poles shall be designed considering application of wind load and dead load.

Poles shall be designed according to ASCE 7 to withstand a 3-second gust of 145 to 241 kilometres per hour.

All poles up to 21.3 m shall be designed to have a maximum deflection not greater than 25 mm. All poles of 24.4 m shall be designed for maximum deflection not greater than 30 mm.

The Contractor shall complete the lateral deflection analysis, based on manufacturers design and the soils conditions at the installations sites; and determine required embedment depth, hole diameter and backfill material to be used. The analysis and design shall be done in accordance with the Canadian Highway and Bridge Design Code CSA S6-14, the Structural manual and MTO Report: Procedures For The Design Of High Mast Pole Foundations dated 2004. The analysis and design shall be signed and stamped by a Design Engineer and a Design-checking Engineer and shall be submitted to the Contract Administrator prior to proceeding with construction.

In relation to the embedment depth, the handhole shall be placed approximately 1.2 metres above ground.

Poles shall be soft grey in colour. If a colour other than grey is proposed, all pigments used shall be non-fade iron or chromium oxides. Color other than grey must be approved by the Contract Administrator. All poles to be etched and finished with two coats of waterproof breathing membrane of methyl methacrylate. Any

deviation from this aggregate finish, colour, and composition requires approval from the Contract Administrator.

All manufacturing tolerance, details of reinforcement, and finishes shall be according to the Guide Specification for Prestressed Concrete Poles as published in the May-June, 1982, issue of the Journal of the Prestressed Concrete Institute

615.04.01.02 Camera Lowering System

The camera-lowering system shall be designed to withstand wind forces of 160 kilometres per hour with a 30 percent gust factor using a 1.65 safety factor.

When requested by the Contract Administrator, independent laboratory testing documents from the manufacturer shall be submitted to verify compliance to the stated wind force criteria. The test shall use the actual effective projected area (EPA) or an EPA greater than that of the camera system to be attached.

615.04.02 Submission Requirements

The following shall be submitted to the Contract Administrator prior to ordering:

a) Working Drawings showing the interface or mounting provision of the raising and lowering system on the concrete pole for an integrated and seamless unit.

b) Product references for the raising and lowering system.

c) The name, contact information and experience record of the concrete pole manufacturer. The manufacturer shall have a minimum of 10 years of experience in the design and production of centrifugally spun concrete poles.

d) The name, contact information and experience records of the camera-lowering system manufacturer. The experience records must show a minimum of 3 years of manufacturing experience and 3 completed projects with references for each successful installation.

Documentation from the manufacturer shall be submitted to the Contract Administrator certifying that the electrical Contractor performing installation of the camera raising and lowering system has been instructed on the installation, operation and safety features of the system.

615.05 MATERIALS

615.05.01 Concrete

Subsection 615.05.01 of OPSS 615 is deleted in its entirety and replaced with the following:

Concrete shall be according to OPSS 1350 for 55 MPa class and shall achieve a minimum 28-day compressive strength of 55 MPa.

Cement shall be according to the latest requirements of Type I Portland cement according to ASTM C 150. Maximum size aggregate may be 19 mm or less than 75% of the space between reinforcing steel and surface of pole. Any water reducers, retarders, or accelerating admixtures shall be according to ASTMC 494. Water shall be free from foreign materials in amounts harmful to concrete and embedded steel.

A concrete cylinder test shall be performed for each 75 m^3 of concrete poured. A final quality control check shall be carried out on each pole after manufacturing is complete. All quality control procedures shall be mandated in a written manual and be available for inspection.

615.05.02 Steel Reinforcement

Subsection 615.05.02 of OPSS 615 is amended by the addition of the following clauses:

615.05.02.01 Reinforcing Steel

Deformed steel reinforcement shall be according to ASTMA 615 for Grade 60 rebar.

615.05.02.02 Spiral Reinforcement

Steel spiral reinforcement shall be according to ASTMA 82 and shall not be less than 3.8 mm diameter.

615.05.02.03 Prestressing Steel

Prestressing steel reinforcement shall be uncoated 7-wire, stress-relieved strand according to ASTMA 416.

615.05.02.04 Hardware

All hardware supplied with the pole shall be according to ASTM A 36 and zinc alloy AC41A shall be according to ASTM B 240. The finish shall be hot dipped galvanized according to ASTM A 153.

Section 615.05 is amended by addition of the following subsections:

615.05.06 Electrical Ground

All poles will be supplied with a #6 stranded copper ground wire cast into the wall of the pole at the handhole box location.

615.05.07 Concrete Fill

Concrete to fill the pole shall have a minimum compressive strength of 3.5 MPa**.**

615.05.08 Lowering System

615.05.08.01 Functional Requirements

The camera lowering system shall mount to a purpose-designed tenon bolted to the top of the pole.

The camera lowering system shall be designed to support and lower a dome type camera, cabling, connectors and other supporting field components without damage or causing degradation of camera operations.

The lowering system shall consist of a suspension contact unit, divided support arm, and a pole adapter for attachment to a pole-top tenon, pole-top junction box, and camera connection box.

The divided support arm and receiver brackets shall be designed to self-align the contact unit with the pole center line during installation and insure the contact unit cannot twist under high wind conditions.

The suspension contact unit shall have a load capacity 91 kg with a 4 to 1 safety factor.

There shall be a locking mechanism between the fixed and moveable components of the lowering device.

The movable assembly shall have a minimum of 2 latches. This latching mechanism shall securely hold the device and its mounted equipment. The latching mechanism shall operate by alternately raising and lowering the assembly using the winch and lowering cable. When latched, all weight shall be removed from the lowering cable.

The fixed unit shall have a heavy duty cast tracking guide and means to allow latching in the same position each time. The contact unit housing shall be weatherproof with a gasket provided to seal the interior from dust and moisture.

The prefabricated components of the lift unit support system shall be designed to preclude the lifting cable from contacting the power or video cabling.

Internal conduits shall be supplied in the pole for the power, communications, and video cabling. The conduits shall be rigidly secured inside the pole.

The only cable permitted to move within the pole or lowering system during lowering or raising shall be the lowering cable. All other cables must remain stable and secure during lowering and raising operations.

The manufacturer shall provide weights and / or counterweights as necessary to allow easy alignment of the guide pin and connectors when camera is being raised into position.

The lowering unit will have sufficient weight to disengage the camera and its control components in order that it can be lowered properly.

The manufacturer shall provide a mounting flange sufficient for mounting their respective camera assembly to the bottom of the camera connection box.

All electrical and video connections between the fixed and lowerable portion of the contact block shall be protected from exposure to the weather by a waterproof seal to prevent degradation of the electrical contacts.

615.05.08.02 Physical

The lowering device tenon top, cap, arm and detaching unit shall be made of durable and corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

All pulleys for the camera lowering device and portable lowering tool shall have sealed, self-lubricated bearings, oil tight bronze bearings, or sintered bronze bushings.

The lowering cable shall be a minimum 3 mm diameter stainless steel aircraft cable with a minimum breaking strength of 790 kg with 7 strands of # 19 AWG wire each.

The interface and locking components shall be made of stainless steel and or aluminium.

All external components of the lowering device shall be made of corrosion resistant materials, powder coated, galvanized, or otherwise protected from the environment by industry-accepted coatings to withstand exposure to a corrosive environment.

615.05.08.03 Electrical

The female and male socket contact halves of the connector block shall be made of thermosetting synthetic rubber known as Hypalon or equivalent. The female brass socket contacts and the male high conductivity brass or gold plated pin contacts shall be securely attached to the connector block body.

The current carrying male contacts shall be 2.8 +/- 0.2 mm in diameter. There shall be two male contacts that are longer than the rest which will make first and break last providing optimum grounding performance.

The number of contacts shall be 14 and the camera mounted thereto, shall be capable of performing all of its necessary functions on 14 contacts or less.

The current carrying female contacts shall be 2.8 +/- 0.2 mm in diameter. All of the contacts shall be recessed or chamfered from the face of the connector block. The design of the connector block shall create a watertight seal when the two halved are mated.

The wire leads from both the male and female contacts shall be securely attached in the connector body. The current carrying and signal wires shall be constructed of #18/1 AWG jacketed wire.

The contacts shall be self-wiping with a shoulder at the base of each male contact so that it will recess into the female block, thereby giving a rain-tight seal when mated. The manufacturer of the electrical contact connector must be ISO 9001 certified. The connector must be identified by the manufacturer for outdoor use.

The electrical connections between the fixed and movable lowering device components shall be designed to conduct high frequency data bits and 1 volt peak-to-peak video signals as well as the power requirements for operation of dome environmental controls.

The manufacturer shall provide the power and signal connectors for attachment to the bare leads in the pole top and camera junction boxes. These connectors shall come with 3 foot lead wires.

The camera raising and lowering system shall be CSA approved.

615.05.09 Lowering Tool

The camera-lowering system shall be operated by use of a portable lowering tool. The tool shall consist of a lightweight metal frame and winch assembly with cable as described herein, a quick release cable connector, an adjustable safety clutch. The tool shall be designed to operate with either a hand crank supplied with the tool or a variable speed industrial duty electric drill. This tool shall be compatible with, and seat properly on supplied pole and provide easy access to the support cable through the handhole of the pole.

The lowering tool shall attach to the handhole on the pole with one single bolt and a stabilizing strap. The bolt receptor shall accommodate a 19 mm stainless steel bolt. The stabilizing strap shall consist of a wide nylon webbing strap that wraps around the pole and hooks on to the lowering tool. The strap is tightened with a quick-release hand ratchet and shall not interfere with the operation of the lowering tool. The tool shall support itself and the load assuring lowering operations and provide a means to prevent freewheeling when loaded. The lowering tool shall be delivered to the designated ATMS Maintenance representative at the start of the project. Two stainless steel through bolts and wing nuts shall be supplied with this item.

The lowering tool shall have a reduction gear to reduce the manual effort required to operate the lifting handle to raise and lower a capacity load.

The lowering tool shall be provided with an adapter for operating the lowering device by a portable drill using a clutch mechanism.

The lowering tool shall be equipped with a positive breaking mechanism to secure the cable reel during raising and lowering operations and prevent freewheeling.

The spooling cable provided with the lowering tool shall be of sufficient length to enable the camera to be lowered to 1.2 m or lower from finished grade.

The manufacturer shall provide a minimum of one lowering tool and a wireless industrial duty high-torque variable speed reversible drill with 24V motor and two quick-charge batteries with charger as a unit. The lowering tool and drill turned over to the designated ATMS Maintenance representative shall be new and unused.

615.07 CONSTRUCTION

Subsection 615.07.03 of OPSS 615 is amended by the addition of the following clauses:

615.07.03.04 Pole Filling

The hollow core of the pole shall be filled with concrete up to the lower wiring aperture level.

615.07.03.04 Duct Entry

Pole wiring aperture shall be trimmed to allow duct entry and mortar the duct in place.

615.07.03.05 Handling and Installation

The camera raising and lowering system shall be integrated with the concrete pole and the dome camera supplied under this Contract and installed as shown in the Contract Drawings.

The installation shall follow the manufacturer's guidelines for the three components and applicable Contract requirements.

Pre-stressed concrete poles shall be lifted and supported during manufacturing, stockpiling, transporting and installation operations only at the points shown on the shop drawings.

Transportation, site handling, and installation shall be performed using only manufacturer recommended equipment and methods, and by qualified personnel.

In order to mitigate the effects of poor soil quality condition, a steel liner shall be used to support walls of the augured hole.

The lowering device manufacturer shall furnish a factory representative to assist the electrical Contractor with the assembly and testing of the first lowering system onto the pole assembly. The Contractor shall be responsible for providing "on site" operational instructions to Owner's maintenance personnel.

615.07.07 Quality Control

615.07.07.01 Pre-Installation Testing and Inspection

Section 615.07.07.01 of OPSS 615 is amended by the deletion of the last paragraph.

615.07.07.02 Proof of Performance Testing and Inspection

Clause 615.07.07.02 of OPSS 615 is amended by addition of the following:

For each installed concrete pole complete with raising and lowering system, the assembly shall be fully raised and lowered a minimum of 5 times, which shall constitute a complete performance test. Each time the assembly is fully raised and lowered, the assembly shall be raised from the bottom of the pole (top of the handhole) to the top of the pole, latched, then unlatched, and then lowered to the bottom of the pole. After each raising and lowering sequence, the raising/lowering equipment shall be inspected to ensure that components are not damaged and are working properly. The cables inside the pole shall be inspected and check for any twisted cables. Any twisted cables shall be untwisted before the next raising and lowering sequence commences. After each raising and lowering sequence, the Contractor shall also verify that the video signal from the camera is being received at the cabinet (or at TOC) and the camera controls are functioning properly.

If any problems or deficiencies occur during the testing, the testing shall stop and the problem or deficiency corrected. Once the problem or deficiency has been corrected, the testing on that pole and associated material shall be repeated in its entirety i.e., the assembly shall again be fully raised and lowered a minimum of 5 times. This process shall be repeated until the assembly can be fully raise and lower a minimum of 5 times without any problems or deficiencies occurring during the testing.

The testing and inspection shall be witnessed by the Contract Administrator and the Owner's maintenance representative.

615.09 MEASUREMENT OF PAYMENT

615.09.01 Actual Measurements

Subsection 615.09.01 of OPSS 615 is amended by the addition of the following clause:

615.09.01.15 Concrete Poles, Direct Buried in Earth with Camera Raising and Lowering System

For measurement purposes, a count shall be made of the number of concrete poles, direct buried in earth with camera raising and lowering system installed.

615.09.01.16 Concrete Poles, Direct Buried in Rock with Camera Raising and Lowering System

For measurement purposes, a count shall be made of the number of concrete poles, direct buried in rock with camera raising and lowering system installed.

615.10 BASIS OF PAYEMENT

Subsection 615.10.02 of OPSS 615 is amended by the addition of the following:

Concrete Poles, Direct Buried in Earth with Camera Raising and Lowering System - Item
Concrete Poles, Direct Buried in Rock with Camera Raising and Lowering System - Item

NOTES TO DESIGNER:

Additional lowering tool and drill may be required by ATMS Maintenance. The additional units are to be quantified as Spare items.

WARRANT: Always with these tender items.

Ontario Provincial Standard Specifications (OPSSs)					
620	April 2017	April 2025	TBD	Rev: Construction Specification for Traffic Signal Equipment is implemented. The specification has been updated to new PROV format with no technical content changes. Applicable content from SSP 106S18 has been incorporated into OPSS 620.	Mike Pearsall
Standard Special Provisions (SSPs)					
106S18	April 2017	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Traffic Signal Equipment is revised to reflect the new publication version of OPSS 620.	Mike Pearsall

Note: The 620 implemented in April 2025 replaces 620, April 2017 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR TRAFFIC SIGNAL EQUIPMENT

TABLE OF CONTENTS

620.01 SCOPE

This specification covers the requirements for the installation of traffic signal equipment, including traffic signal heads, mast arms, brackets, signal hangers, optically directed lens assemblies, LED modules, aerial mounting equipment and equipment modifications.

~~620.01.01 Specification Significance and Use~~

~~This specification is written as a provincial-oriented specification. Provincial-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of the Ontario Ministry of Transportation.~~

~~Use of this specification or any other specification shall be according to the Contract Documents.~~

~~**620.01.02 Appendices Significance and Use**~~

~~Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.~~

~~Appendices are developed for the Owner's use only.~~

~~Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.~~

~~Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.~~

~~The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.~~

620.02 REFERENCES

~~When the Contract Documents indicate that provincial-oriented specifications are to be used and there is a provincial-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.PROV, unless use of a municipal-oriented specification is specified in the Contract Documents. When there is not a corresponding provincial-oriented specification, the references below shall be considered to be to the OPSS listed, unless use of a municipal-oriented specification is specified in the Contract Documents.~~

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 604	Installation of Cable
OPSS 609	Grounding
OPSS 610	Removal of Electrical Equipment and Materials

Ontario Provincial Standard Specifications, Material

OPSS 2409	Traffic Signal Cable
OPSS 2460	Traffic Signal Arms, Brackets, Hangers, Fittings and Hardware
OPSS 2461	Signal Heads

Ontario Ministry of Transportation Publications

MTO Forms:

PH-CC-701	Request to Proceed
PH-CC-702	Notice to Proceed

CSA Standards

C22.2 No. 45.2-08 (R2013)	Electrical Rigid Metal Conduit - Aluminum, red brass, and stainless steel (Tri-national standard, with NMX-J-576-ANCE and UL 6A)
C22.2 No. 65-13	Wire connectors (Tri-national standard, with UL 486A-486B and NMX-J-543- ANCE)

C22.2 No. 85-14 Rigid PVC Boxes and Fittings
C22.2 No. 197-M1983 (R2013) PVC Insulating Tape
C22.2 No. 211.2-06 (R2011) Rigid PVC (Unplasticized) Conduit

620.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

Auxiliary Signal Head means a traffic signal head that is supplementary to the primary and secondary heads and which may be necessary due to local conditions.

Backboard means a panel surrounding a signal head.

Conflict Monitor means a device used to prevent conflicting signal phases.

Controller unit means a traffic signal controller

Highway Signal Head means a traffic signal head with 300 mm diameter red, amber and green lenses.

Light Emitting Diode (LED) means a semiconductor device that emits incoherent monochromatic light when electrically biased in the forward direction. This effect is a form of electroluminescence. The colour depends on the semiconducting material used, and can be near-ultraviolet, visible or infrared. These LEDs are used to provide red, amber, green or green arrow, etc. indications in traffic signal heads.

Load Switch means a device used to switch 120-volt power to the traffic control signal heads. Load switches are normally semi-conductor devices, which are switched by low voltage signal from the controller unit.

Pedestrian Signal Head means a traffic signal head comprising of a "walk" and "don't walk" symbol.

Primary Signal Head means a traffic signal head mounted on the far right side of an intersection approach.

Secondary Signal Head means a traffic signal head mounted on the far left side or in the median of an intersection approach.

Signal Head means an assembly containing the signal face.

Special Signal Head means a traffic signal head comprised of a combination of sections with red, amber and green or green arrow indications.

Standard Signal Head means a traffic signal head with 200 mm diameter red, amber and green lenses.

620.05 MATERIALS

620.05.01 Traffic Signal and Pedestrian Heads

Each traffic signal head shall be provided with LED modules unless otherwise specified in the Contract Documents.

Each traffic signal head shall be a highway signal head unless otherwise specified in the Contract Documents.

Traffic signal heads and pedestrian heads shall be according to OPSS 2461.

620.05.02 Mast Arms, Brackets, Signal Hangers

Mast arms, brackets and signal hangers shall be according to OPSS 2460. Signal hangers shall be adjustable mid-section hanger or dual-end hanger as specified in the Contract Documents.

620.05.03 Traffic Signal Cables

Traffic signal cables shall be according to OPSS 2409.

620.05.04 Tape

Electrical insulating tape shall be according to CSA C22.2 No. 197, rated for -10 °C to 90 °C use, 600 V.

620.05.05 LED Modules

LED modules shall be according to OPSS 2461.

620.05.06 Conduits and Fittings

Rigid PVC conduits and fittings shall be according to CSA C22.2 No. 211.2. Rigid aluminum conduits and fittings shall be according to CSA C22.2 No. 45.2.

620.05.07 Wire Connectors

Wire connectors shall be of the insulated wing nut vibration proof spring type and shall be according to CSA C22.2 No 65.

620.05.08 Junction Boxes and Fittings

PVC junction boxes and fittings shall be according to CAN/CSA C22.2 No. 85.

620.05.09 Strapping

Stainless steel strapping and buckles shall have a minimum ultimate strength of 4.5 KN.

620.05.10 Traffic Signal Mounting Equipment

Fittings, accessories and hardware shall meet the requirements specified in the Contract Documents.

620.05.11 Grommets

Grommets shall be rubber or neoprene sized to suit the aperture metal thickness and cable diameter.

620.05.12 Grounding Materials

Grounding materials shall be according to OPSS 609.

620.07 CONSTRUCTION

620.07.01 Mast Arms

The attachment point of the mast arm shall be set on the pole to obtain the required clearance from finished grade to the bottom of the signal head. When two or more mast arms are mounted on the same pole, the

primary head shall be set to obtain the required clearance height specified in the Contract Documents. Other mast arms, with secondary or auxiliary heads, shall be adjusted on the pole so that a minimum separation of one pole diameter is obtained between fittings or bolts touching the pole.

For wood pole mounting, holes shall be drilled to accommodate through bolts. Nuts shall be tightened to obtain a minimum wood compression of 3 mm under the washers.

Mast arm attachment to steel poles using "U" bolts or pole plates shall be tightened to a point where the pole just begins to deform.

Mast arms shall be installed perpendicular to the through lanes of traffic being served.

620.07.02 Traffic Signal Hangers

Traffic signal hangers shall be slip-fitted on the tenon of the mast arm and secured in position with the signal heads adjusted to vertical.

Installation of the signal hanger shall be according to the manufacturer's instructions.

620.07.03 Double Arm Brackets

Double arm brackets shall be assembled on signal heads prior to pole mounting. The arm shall be installed in parallel alignment and all locknuts securely tightened.

Pole plates shall be mounted on the side of the pole so the bottom of the signal head meets the required clearance height from finished grade. Pole plates shall be secured with stainless steel strapping which shall not overlap or secure any other equipment on the pole.

620.07.04 Signal Heads

Signal heads shall be installed facing the direction of approaching traffic according to the legal drawing, Form PHM-125, approved for the intersection.

Signal heads shall be securely covered with an opaque covering and shall remain in place until all tests have been completed and the signal heads are put into operation. Pedestrian heads shall be turned to face the pole prior to operation.

Signal heads shall be adjusted for maximum visibility and focusing prior to final tightening or sealing of hardware. Unused hubs in signal heads shall be plugged with sealing caps, without a gasket.

620.07.05 Wiring Apertures

In metal poles, wiring apertures shall be drilled as required. Apertures shall be located clear of the vertical seam and overlapping sections of sectional steel poles. Apertures shall be de-burred and painted with grey zinc rich paint. Rubber grommets shall be installed after paint is dry.

620.07.06 Pole Mounted Conduit Systems

Pole mounted conduit systems including rigid PVC junction boxes and all necessary fittings and hardware shall be installed where traffic signal equipment is to be installed on concrete or wood poles. Conduit shall be installed in straight lengths to follow the taper of the pole using stainless steel strapping or galvanized lag screws at 1.5 m maximum spacing. Offset bends shall be used where required to avoid pole attachments and conduits shall be kept free of kinks or scorch marks.

620.07.07 Wiring

Traffic signal cable shall be installed between the signal head and either the pole handhole or the pole mounted PVC junction box. Wiring shall be run through the mast arms, signal hangers and the upper arm of double arm brackets. A minimum length of 600 mm of riser cable shall be left in pole handholes.

Drip loops shall be left on all external cable. Cable shall be protected with rigid PVC conduit where slack lengths of more than 450 mm are externally exposed. Aerial cable from the PVC junction box to the signal head shall be installed according to OPSS 604.

Riser cables shall be connected to LED modules via terminal blocks, or with insulated wing nut vibration proof spring connectors. Termination of spare conductors and handhole or junction box connections shall be made with insulated spring connectors. All insulated spring connectors shall be held in place with three half laps of electrical vinyl tape. Upon completion of connections, all conductors shall be neatly bundled together and secured with four wraps of electrical vinyl tape.

Metal signal heads shall be grounded according to OPSS 609 by use of the designated spare conductor in the riser cable, connected securely to the ground terminal in the signal head and either the pole ground stud or the system ground wire in PVC junction boxes.

620.07.08 Optically Directed Signal Heads

Optically directed signal heads shall be installed according to the manufacturer's instructions. Signal heads shall be adjusted to focus along the designated roadways or traffic lanes.

620.07.09 Aerial Mounted Equipment

All equipment and fittings, hardware, PVC junction boxes, and accessories necessary for the mounting of equipment on aerial messenger cable systems shall be installed as specified in the Contract Documents. All compression nuts, locknuts and fitting hardware shall be securely tightened to prevent shifting of equipment by natural elements (i.e. wind, rain, ice or snow, etc.)

620.07.10 Equipment Modifications

Removal of existing equipment shall be according to OPSS 610. Installation of new, refurbished or modified equipment shall be according to the requirements for installation of the particular items of equipment as described herein.

620.07.11 Quality Control

620.07.11.01 Pre-installation Testing and Inspection

Signal heads, mast arm, double arm brackets and connection components shall be inspected prior to installation to ensure that they are according to the Contract Documents.

A Request to Proceed shall be submitted to the Contract Administrator after completion of the pre-installation testing and inspection.

The next operation after the completion of the pre-installation testing and inspection shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

620.07.11.02 Proof of Performance Testing and Inspection

The work shall be inspected and tested to ensure that it meets the requirements of the Contract Documents and without limiting the foregoing, to ensure the following:

a) All components are installed, tested and proven according to the Contract Documents

b) All cables are energized and in working order prior to activating the traffic signals for public display.

A Request to Proceed shall be submitted to the Contract Administrator after completion of the proof of performance testing and inspection.

The next operation after the completion of the proof of performance testing and inspection shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

620.08 QUALITY ASSURANCE

The Contract Administrator may provide direction for the aiming of signal heads, optically directed lens assemblies and LED modules. At any time, the Contract Administrator may test-drive the controlled traffic lanes and notify the Contractor of any adjustments required.

620.09 MEASUREMENT FOR PAYMENT

620.09.01 Actual Measurement

620.09.01.01

Single Member Arms and Signal Hangers
Single Member Arms and Signal Hangers (Temporary)
Overbrace Arms and Signal Hangers
Overbrace Arms and Signal Hangers (Temporary)
Double Arm Brackets
Double Arm Brackets (Temporary)
Highway Type Signal Heads
Highway Type Signal Heads (Temporary)
Special Type Signal Heads
Special Type Signal Heads (Temporary)
Standard Type Signal Heads
Standard Type Signal Heads (Temporary)
Pedestrian Type Signal Heads
Pedestrian Type Signal Heads (Temporary)
Single Signal Head Section
Single Signal Head Section (Temporary)
Optically Directed Signal Heads
Optically Directed Signal Heads (Temporary)

For measurement purposes, a count shall be made of the number of arms, hangers, brackets, and signal heads installed.

620.09.01.02 Traffic Signal Equipment Modifications

For measurement purposes, a count shall be made of the number of intersection locations where traffic signal equipment modification is carried out.

620.09.02 **Plan Quantity Measurement**

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

620.10 **BASIS OF PAYMENT**

620.10.01

Single Member Arms and Signal Hangers – Item
Single Member Arms and Signal Hangers (Temporary) – Item
Overbrace Arms and Signal Hangers – Item
Overbrace Arms and Signal Hangers (Temporary) – Item
Double Arm Brackets – Item
Double Arm Brackets (Temporary) – Item
Highway Type Signal Heads – Item
Highway Type Signal Heads (Temporary) – Item
Special Type Signal Heads – Item
Special Type Signal Heads (Temporary) – Item
Standard Type Signal Heads – Item
Standard Type Signal Heads (Temporary) – Item
Pedestrian Type Signal Heads – Item
Pedestrian Type Signal Heads (Temporary) – Item
Single Signal Head Section – Item
Single Signal Head Section (Temporary) – Item
Optically Directed Signal Heads – Item
Optically Directed Signal Heads (Temporary) – Item
Traffic Signal Equipment Modifications - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Note: The 620 implemented in April 2025 replaces 620, April 2017 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR TRAFFIC SIGNAL EQUIPMENT

TABLE OF CONTENTS

620.01 SCOPE

This specification covers the requirements for the installation of traffic signal equipment, including traffic signal heads, mast arms, brackets, signal hangers, optically directed lens assemblies, LED modules, aerial mounting equipment and equipment modifications.

620.02 REFERENCES

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 604 Installation of Cable
OPSS 609 Grounding
OPSS 610 Removal of Electrical Equipment and Materials

Ontario Provincial Standard Specifications, Material

OPSS 2409	Traffic Signal Cable
OPSS 2460	Traffic Signal Arms, Brackets, Hangers, Fittings and Hardware
OPSS 2461	Signal Heads

Ontario Ministry of Transportation Publications

MTO Forms:

PH-CC-701	Request to Proceed
PH-CC-702	Notice to Proceed

CSA Standards

C22.2 No. 45.2-08 (R2013)	Electrical Rigid Metal Conduit - Aluminum, red brass, and stainless steel (Tri-national standard, with NMX-J-576-ANCE and UL 6A)
C22.2 No. 65-13	Wire connectors (Tri-national standard, with UL 486A-486B and NMX-J-543- ANCE)
C22.2 No. 85-14	Rigid PVC Boxes and Fittings
C22.2 No. 197-M1983 (R2013)	PVC Insulating Tape
C22.2 No. 211.2-06 (R2011)	Rigid PVC (Unplasticized) Conduit

620.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

Auxiliary Signal Head means a traffic signal head that is supplementary to the primary and secondary heads and which may be necessary due to local conditions.

Backboard means a panel surrounding a signal head.

Conflict Monitor means a device used to prevent conflicting signal phases.

Controller unit means a traffic signal controller

Highway Signal Head means a traffic signal head with 300 mm diameter red, amber and green lenses.

Light Emitting Diode (LED) means a semiconductor device that emits incoherent monochromatic light when electrically biased in the forward direction. This effect is a form of electroluminescence. The colour depends on the semiconducting material used, and can be near-ultraviolet, visible or infrared. These LEDs are used to provide red, amber, green or green arrow, etc. indications in traffic signal heads.

Load Switch means a device used to switch 120-volt power to the traffic control signal heads. Load switches are normally semi-conductor devices, which are switched by low voltage signal from the controller unit.

Pedestrian Signal Head means a traffic signal head comprising of a "walk" and "don't walk" symbol.

Primary Signal Head means a traffic signal head mounted on the far right side of an intersection approach.

Secondary Signal Head means a traffic signal head mounted on the far left side or in the median of an intersection approach.

Signal Head means an assembly containing the signal face.

Special Signal Head means a traffic signal head comprised of a combination of sections with red, amber and green or green arrow indications.

Standard Signal Head means a traffic signal head with 200 mm diameter red, amber and green lenses.

620.05 MATERIALS

620.05.01 Traffic Signal and Pedestrian Heads

Each traffic signal head shall be provided with LED modules unless otherwise specified in the Contract Documents.

Each traffic signal head shall be a highway signal head unless otherwise specified in the Contract Documents.

Traffic signal heads and pedestrian heads shall be according to OPSS 2461.

620.05.02 Mast Arms, Brackets, Signal Hangers

Mast arms, brackets and signal hangers shall be according to OPSS 2460. Signal hangers shall be adjustable mid-section hanger or dual-end hanger as specified in the Contract Documents.

620.05.03 Traffic Signal Cables

Traffic signal cables shall be according to OPSS 2409.

620.05.04 Tape

Electrical insulating tape shall be according to CSA C22.2 No. 197, rated for -10 °C to 90 °C use, 600 V.

620.05.05 LED Modules

LED modules shall be according to OPSS 2461.

620.05.06 Conduits and Fittings

Rigid PVC conduits and fittings shall be according to CSA C22.2 No. 211.2. Rigid aluminum conduits and fittings shall be according to CSA C22.2 No. 45.2.

620.05.07 Wire Connectors

Wire connectors shall be of the insulated wing nut vibration proof spring type and shall be according to CSA C22.2 No 65.

620.05.08 Junction Boxes and Fittings

PVC junction boxes and fittings shall be according to CAN/CSA C22.2 No. 85.

620.05.09 Strapping

Stainless steel strapping and buckles shall have a minimum ultimate strength of 4.5 KN.

620.05.10 Traffic Signal Mounting Equipment

Fittings, accessories and hardware shall meet the requirements specified in the Contract Documents.

620.05.11 Grommets

Grommets shall be rubber or neoprene sized to suit the aperture metal thickness and cable diameter.

620.05.12 Grounding Materials

Grounding materials shall be according to OPSS 609.

620.07 CONSTRUCTION

620.07.01 Mast Arms

The attachment point of the mast arm shall be set on the pole to obtain the required clearance from finished grade to the bottom of the signal head. When two or more mast arms are mounted on the same pole, the primary head shall be set to obtain the required clearance height specified in the Contract Documents. Other mast arms, with secondary or auxiliary heads, shall be adjusted on the pole so that a minimum separation of one pole diameter is obtained between fittings or bolts touching the pole.

For wood pole mounting, holes shall be drilled to accommodate through bolts. Nuts shall be tightened to obtain a minimum wood compression of 3 mm under the washers.

Mast arm attachment to steel poles using "U" bolts or pole plates shall be tightened to a point where the pole just begins to deform.

Mast arms shall be installed perpendicular to the through lanes of traffic being served.

620.07.02 Traffic Signal Hangers

Traffic signal hangers shall be slip-fitted on the tenon of the mast arm and secured in position with the signal heads adjusted to vertical.

Installation of the signal hanger shall be according to the manufacturer’s instructions.

620.07.03 Double Arm Brackets

Double arm brackets shall be assembled on signal heads prior to pole mounting. The arm shall be installed in parallel alignment and all locknuts securely tightened.

Pole plates shall be mounted on the side of the pole so the bottom of the signal head meets the required clearance height from finished grade. Pole plates shall be secured with stainless steel strapping which shall not overlap or secure any other equipment on the pole.

620.07.04 Signal Heads

Signal heads shall be installed facing the direction of approaching traffic according to the legal drawing, Form PHM-125, approved for the intersection.

Signal heads shall be securely covered with an opaque covering and shall remain in place until all tests have been completed and the signal heads are put into operation. Pedestrian heads shall be turned to face the pole prior to operation.

Signal heads shall be adjusted for maximum visibility and focusing prior to final tightening or sealing of hardware. Unused hubs in signal heads shall be plugged with sealing caps, without a gasket.

620.07.05 Wiring Apertures

In metal poles, wiring apertures shall be drilled as required. Apertures shall be located clear of the vertical seam and overlapping sections of sectional steel poles. Apertures shall be de-burred and painted with grey zinc rich paint. Rubber grommets shall be installed after paint is dry.

620.07.06 Pole Mounted Conduit Systems

Pole mounted conduit systems including rigid PVC junction boxes and all necessary fittings and hardware shall be installed where traffic signal equipment is to be installed on concrete or wood poles. Conduit shall be installed in straight lengths to follow the taper of the pole using stainless steel strapping or galvanized lag screws at 1.5 m maximum spacing. Offset bends shall be used where required to avoid pole attachments and conduits shall be kept free of kinks or scorch marks.

620.07.07 Wiring

Traffic signal cable shall be installed between the signal head and either the pole handhole or the pole mounted PVC junction box. Wiring shall be run through the mast arms, signal hangers and the upper arm of double arm brackets. A minimum length of 600 mm of riser cable shall be left in pole handholes.

Drip loops shall be left on all external cable. Cable shall be protected with rigid PVC conduit where slack lengths of more than 450 mm are externally exposed. Aerial cable from the PVC junction box to the signal head shall be installed according to OPSS 604.

Riser cables shall be connected to LED modules via terminal blocks, or with insulated wing nut vibration proof spring connectors. Termination of spare conductors and handhole or junction box connections shall be made with insulated spring connectors. All insulated spring connectors shall be held in place with three half laps of electrical vinyl tape. Upon completion of connections, all conductors shall be neatly bundled together and secured with four wraps of electrical vinyl tape.

Metal signal heads shall be grounded according to OPSS 609 by use of the designated spare conductor in the riser cable, connected securely to the ground terminal in the signal head and either the pole ground stud or the system ground wire in PVC junction boxes.

620.07.08 Optically Directed Signal Heads

Optically directed signal heads shall be installed according to the manufacturer's instructions. Signal heads shall be adjusted to focus along the designated roadways or traffic lanes.

620.07.09 Aerial Mounted Equipment

All equipment and fittings, hardware, PVC junction boxes, and accessories necessary for the mounting of equipment on aerial messenger cable systems shall be installed as specified in the Contract Documents. All compression nuts, locknuts and fitting hardware shall be securely tightened to prevent shifting of equipment by natural elements (i.e. wind, rain, ice or snow, etc.)

620.07.10 Equipment Modifications

Removal of existing equipment shall be according to OPSS 610. Installation of new, refurbished or modified equipment shall be according to the requirements for installation of the particular items of equipment as described herein.

620.07.11 Quality Control

620.07.11.01 Pre-installation Testing and Inspection

Signal heads, mast arm, double arm brackets and connection components shall be inspected prior to installation to ensure that they are according to the Contract Documents.

A Request to Proceed shall be submitted to the Contract Administrator after completion of the pre-installation testing and inspection.

The next operation after the completion of the pre-installation testing and inspection shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

620.07.11.02 Proof of Performance Testing and Inspection

The work shall be inspected and tested to ensure that it meets the requirements of the Contract Documents and without limiting the foregoing, to ensure the following:

a) All components are installed, tested and proven according to the Contract Documents

b) All cables are energized and in working order prior to activating the traffic signals for public display.

A Request to Proceed shall be submitted to the Contract Administrator after completion of the proof of performance testing and inspection.

The next operation after the completion of the proof of performance testing and inspection shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

620.08 QUALITY ASSURANCE

The Contract Administrator may provide direction for the aiming of signal heads, optically directed lens assemblies and LED modules. At any time, the Contract Administrator may test-drive the controlled traffic lanes and notify the Contractor of any adjustments required.

620.09 MEASUREMENT FOR PAYMENT

620.09.01 Actual Measurement

620.09.01.01 Single Member Arms and Signal Hangers
Single Member Arms and Signal Hangers (Temporary)
Overbrace Arms and Signal Hangers
Overbrace Arms and Signal Hangers (Temporary)
Double Arm Brackets
Double Arm Brackets (Temporary)
Highway Type Signal Heads
Highway Type Signal Heads (Temporary)

Special Type Signal Heads
Special Type Signal Heads (Temporary)
Standard Type Signal Heads
Standard Type Signal Heads (Temporary)
Pedestrian Type Signal Heads
Pedestrian Type Signal Heads (Temporary)
Single Signal Head Section
Single Signal Head Section (Temporary)
Optically Directed Signal Heads
Optically Directed Signal Heads (Temporary)

For measurement purposes, a count shall be made of the number of arms, hangers, brackets, and signal heads installed.

620.09.01.02 Traffic Signal Equipment Modifications

For measurement purposes, a count shall be made of the number of intersection locations where traffic signal equipment modification is carried out.

620.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

620.10 BASIS OF PAYMENT

620.10.01
Single Member Arms and Signal Hangers - Item
Single Member Arms and Signal Hangers (Temporary) - Item
Overbrace Arms and Signal Hangers - Item
Overbrace Arms and Signal Hangers (Temporary) - Item
Double Arm Brackets - Item
Double Arm Brackets (Temporary) - Item
Highway Type Signal Heads - Item
Highway Type Signal Heads (Temporary) - Item
Special Type Signal Heads - Item
Special Type Signal Heads (Temporary) - Item
Standard Type Signal Heads - Item
Standard Type Signal Heads (Temporary) - Item
Pedestrian Type Signal Heads - Item
Pedestrian Type Signal Heads (Temporary) - Item
Single Signal Head Section - Item
Single Signal Head Section (Temporary) - Item
Optically Directed Signal Heads - Item
Optically Directed Signal Heads (Temporary) - Item
Traffic Signal Equipment Modifications - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

Ontario Provincial Standard Specifications (OPSSs)					
622	April 2017	April 2025	TBD	Rev: Construction Specification for Installation of Traffic Signal Controllers is implemented. The specification has been updated to new PROV format with no technical content changes. Applicable content from SSP 106S19 and 622F03 has been incorporated into OPSS 622.	Mike Pearsall
Standard Special Provisions (SSPs)					
106S19	April 2017	N/A	TBD	Can: SSP Amendment to Construction Specification for Installation of Traffic Signal Controllers is cancelled. Applicable content has been incorporated into OPSS 622.	Mike Pearsall
682F03	June 2020	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Traffic Signal Controllers is revised to reflect the new publication version of OPSS 622. Applicable content has been incorporated into OPSS 622.	Mike Pearsall
682S16	June 2017	April 2025	TBD	Rev: SSP Amendment to Construction Specification for Installation of Traffic Signal Controllers is revised to reflect the new publication version of OPSS 622.	Mike Pearsall

Note: The 622 implemented in April 2025 replaces 622, April 2017 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR THE INSTALLATION OF TRAFFIC SIGNAL CONTROLLERS

TABLE OF CONTENTS

622.01 SCOPE

This specification covers the requirements for the installation of traffic signal controllers and associated components.

~~622.01.01 Specification Significance and Use~~

~~This specification is written as a provincial-oriented specification. Provincial-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of the Ontario~~

~~Ministry of Transportation.~~

~~Use of this specification or any other specification shall be according to the Contract Documents.~~

~~**622.01.02 Appendices Significance and Use**~~

~~Appendices are not for use in provincial contracts as they are developed for municipal use, and then, only when invoked by the Owner.~~

~~Appendices are developed for the Owner's use only.~~

~~Inclusion of an appendix as part of the Contract Documents is solely at the discretion of the Owner. Appendices are not a mandatory part of this specification and only become part of the Contract Documents as the Owner invokes them.~~

~~Invoking a particular appendix does not obligate an Owner to use all available appendices. Only invoked appendices form part of the Contract Documents.~~

~~The decision to use any appendix is determined by an Owner after considering their contract requirements and their administrative, payment, and testing procedures, policies, and practices. Depending on these considerations, an Owner may not wish to invoke some or any of the available appendices.~~

622.02 REFERENCES

~~When the Contract Documents indicate that provincial-oriented specifications are to be used and there is a provincial-oriented specification of the same number as those listed below, references within this specification to an OPSS shall be deemed to mean OPSS.PROV, unless use of a municipal-oriented specification is specified in the Contract Documents. When there is not a corresponding provincial-oriented specification, the references below shall be considered to be to the OPSS listed, unless use of a municipal-oriented specification is specified in the Contract Documents.~~

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 501	Compacting
OPSS 603	Installation of Ducts
OPSS 609	Grounding
OPSS 610	Removal of Electrical Equipment
OPSS 623	Traffic Actuation Equipment

Ontario Provincial Standard Specifications, Material

OPSS 1350	Concrete - Materials and Production
OPSS 2475	Uninterruptible Power Supply Systems for LED Traffic Signals

Ontario Ministry of Transportation Publications:

Ontario Traffic Signal Control Equipment Specifications (OTSCES)

CSA Standards

C22.2 No. 65-13	Wire Connectors (Tri-national standard, with UL 486A-486B and NMX-J-543-ANCE)
C22.2 No. 75-14	Thermoplastic Insulated Wires and Cables (Tri-national standard, with UL 83 and NMX-J-010-ANCE-2010)
C22.2 No. 197-M1983 (R2013)	PVC Insulating Tape
C22.2 No. 211.2-06 (R2011)	Rigid PVC (Unplasticized) Conduit

International Municipal Signal Association (IMSA)

MTO 170/332 Training Manual

Others

Caltrans Transportation Electrical Equipment Specifications (TEES)

622.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

AC+ means 120 V AC, 60 Hz power bus.

AC- means 120 V AC, 60 Hz neutral bus, grounded at power source.

Conflict Monitor means a device for detecting and interrupting conflicts in the traffic signal output circuits.

Controller means a complete traffic signal control equipment package including cabinet, controller unit and all associated power control, actuation or interconnection devices.

Controller Cabinet means an outdoor enclosure used for the housing of the controller unit and all associated power, control, activation or interconnection devices.

Controller Unit means that portion of the controller assembly devoted to the selection and timing of traffic movements.

Detection means the operation of a detector sensor unit in registering the presence or passage of a vehicle or pedestrian.

Hold means a command to the controller unit which causes it to retain the existing traffic signal phase.

Interconnection means the system of cables and devices which operate traffic signal controllers at consecutive intersections in a fixed or preprogrammed timing sequence.

Interval means the part or parts of the signal cycle during which signal indications do not change.

Interval Sequence means the order of appearance of signal indications during successive intervals.

Interval Sequence Chart means a chart designating the order in which the signal phases occur and the associated signal display for each interval.

Light Emitting Diode (LED) means as defined in OPSS 620.

Microprocessor means a small, self-contained limited capability computer with the central processing unit on a single chip.

Motherboard means a printed circuit connector interface board with no active or passive components.

Phase Skip means a controller function used to provide omission of a phase in the absence of actuations on that phase.

Pre-emption means the transfer of the normal control of signals to a special control mode which may be required by railroad trains at crossings, emergency vehicles, mass transit vehicles, or other special needs.

Vehicle Extension means the time in seconds added to the green interval to permit additional green time upon actuation by a vehicle approaching the intersection.

622.05 MATERIALS

622.05.01 Conduits and Fittings

Rigid PVC conduits and fittings shall be according to CSA C 22.2 No. 211.2.

622.05.02 Low Voltage Cables

Low voltage cables single conductor, shall be stranded copper type TWH according to CSA C 22.2 No. 75.

622.05.03 Wire Connectors

Wire connectors shall be of the fork tongue compression type for terminal connections of the insulated wing nut vibration proof spring type for wire to wire connections and shall be according to CSA C 22.2. No. 65.

622.05.04 Electrical Insulating Tape

Electrical insulating tape shall be rated for 600 V at -10°C to 90°C working temperature and conform to CSA C22.2 No. 197.

622.05.05 Grounding Materials

Ground wire and connectors shall be according to OPSS 609.

622.05.06 Traffic Signal Controllers

A used traffic signal controller may be used for a temporary installation provided that it is in good condition and it complies with the requirements of the contract.

622.05.07 Concrete

Concrete shall be 30 MPa class according to OPSS 1350.

622.05.08 Solder

Solder shall be 60% tin and 40% lead mix resin core type.

622.05.09 Uninterruptible Power Supply (UPS) System

The UPS system shall be according to the OPSS 2475.

Used UPS systems may be used for temporary installations provided that they are in good condition and meet the requirements of the Contract Documents.

The information contained in this specification covers the UPS system to be used with a Model 332 controller cabinet. If the Contractor uses a different type of traffic signal controller cabinet, such as a NEMA cabinet, then the Contractor shall make all necessary modifications to suit the type of cabinet used.

Uninterruptible power supply systems for LED traffic signals shall include an Arc Flash and Shock Hazard warning label according to Figure 1. The warning sign shall be prominently displayed on the outside of each exterior door. The Contractor shall enter the location information in Figure 1 as indicated by the local MTO electrical coordinator.

The DC arc flash analysis and results in Figure 1 are applicable only to ministry traffic signal UPS systems with the following characteristics:

a) Application – DC system for back-up power for traffic signals

b) Nominal DC system voltage of 60 VDC or less.

c) DC system short circuit current of 5000 A or less.

d) Condition of electrical plant shall be in good condition and well maintained.

622.05.10 Forced Flash Relay

The forced flash relay shall be 10 Amp, 60 Hz, Double Pole Double Throw (DP DT) relay.

622.05.11 Heater/Fan Breaker

The heater/fan breaker shall be 15 Amp breaker mounted on the service panel.

622.07 CONSTRUCTION

622.07.01 Controller Supplied by the Owner

When the controller is supplied by the Owner, the controller shall be picked up and transported from the location specified in the Contract Documents. The Contractor shall ensure that all components are safely connected, secured or packaged prior to transporting the controller.

The Owner guarantees to the Contractor that the controller and all associated equipment is free of any defects.

622.07.02 Controller Supplied by the Contractor

When the Contractor supplies the controller, the Contractor shall carry out all pre-shipping shop tests specified in the Pre-installation Testing and Inspection clause.

Acceptable storage and testing facilities with temperature and humidity regulated environment shall be provided.

Each traffic signal controller cabinet shall be a model 332 traffic signal controller cabinet capable of 2 to 8 phase operation. Each traffic signal controller cabinet shall be complete with mounting pedestal base, uninterruptible power supply (UPS), 170 type traffic signal controller, conflict monitor, and all other equipment required to perform its intended function, either in standalone operation or as part of the ministry's traffic signal control system, according to the timing sheets, ~~PH-M~~PHM-125 drawing, and the Contract Documents. ~~-~~ Without limiting the foregoing, each traffic signal controller cabinet shall include the components listed in Table ~~-~~ 1.

All traffic signal control equipment shall be according to the Ontario Traffic Signal Control Equipment Specifications (OTSCES) or the Caltrans Transportation Electrical Equipment Specifications (TEES).

Each traffic signal controller cabinet shall be supplied fully assembled and tested. The testing shall be carried out according to the MTO Operation Guidelines and Procedures in the MTO 170/332 Training Manual. The MTO 170/332 Training Manual may be purchased from the Ontario Section of the International Municipal Signal Association.

All temporary traffic signal controllers shall be equipped with an UPS system.

622.07.03 Timing of Work

The controller shall be installed and the controller cabinet shall be energized within 48 hours of shipment from the place of storage.

622.07.04 Signal Controller Cabinet and UPS Cabinet

622.07.04.01 Pole Mounted Controller Cabinet

Cabinets shall be installed complete with all mounting brackets, hardware stainless steel strapping and pole mounted conduits and fittings.

Pole mounted controller cabinets shall be located such that:

a) A person operating the controls will be facing the intersection.

b) The edges of the cabinet do not protrude over a sidewalk or beyond the pole in the direction of the pavement.

c) Pole handholes and pedestrian push-buttons remain unobstructed.

622.07.04.02 Pad Mounted Controller Cabinet

The cabinet shall be installed complete with all hardware and accessories in an orientation that allows a person operating the controls to face the intersection.

The neoprene gasket shall be attached squarely and symmetrically on the bottom channel of the cabinet prior to installation, with holes for mounting bolts drilled where necessary.

Anchor bolts shall be secured in place in the locations specified in the manufacturer's instructions or where bolt holes have been provided.

Clear silicone shall be used as a sealant between the top of an extension and the bottom of the controller cabinet.

622.07.04.03 Pedestal Mounted Controller Cabinet

Pedestals for controller cabinet mounting shall be installed in an orientation that allows a person operating the controls to face the intersection.

In earth, where the excavation extends beyond the neat limits, concrete may be placed to the undisturbed ground or the concrete encasement may be formed.

The excavation shall be backfilled with native material and compacted according to OPSS 501.

Where bedrock is encountered, rock excavation shall be done such that a minimum of 600 mm length of steel pedestal can be installed in sound rock. The bottom of the pedestal shall be cut off to obtain the proper controller mounting height above finished grade. Rock excavation shall be according to OPSS 603.

The cabinet shall be installed complete with all hardware and accessories.

622.07.04.04 Power Connection

Low voltage feeder cables shall be connected to the controller cabinet. The neutral shall be connected to the AC- terminal bus.

622.07.04.05 Equipment Ground

Stranded copper ground cable shall be installed between the controller cabinet ground bus and the service ground bus. Connections shall be according to OPSS 609 and the manufacturer's drawings or instructions.

For microprocessor type controllers, the AC-terminal bus shall not be grounded to the cabinet or connected to logic ground.

622.07.04.06 Pad Mounted UPS Cabinet

The pad mounted UPS cabinet shall be installed on a pedestal manufactured of the same material as the traffic signal controller cabinet and supplied with the same lock and key. The pedestal shall be anchored to the pad and secured in place at the location specified according to the Contract Documents.

The UPS control unit and the UPS automatic switch shall be installed in the traffic signal controller cabinet according to the Contract Documents. A forced flash relay shall be installed in the traffic signal controller cabinet to allow flash operation when initiated by the UPS control unit. All wiring shall be according to the Contract Documents.

622.07.04.07 Pole Mounted UPS Cabinet

The pole mounted UPS cabinet including batteries and heating pads shall be installed complete with all mounting brackets, hardware, stainless steel strapping and pole mounting conduits and fittings.

The edges of the cabinet shall not protrude over a sidewalk or roadway pavement. The cabinet shall not obstruct access to the pole handhole and pedestrian pushbuttons.

The UPS control unit and the UPS automatic switch shall be installed in the signal controller cabinet according to the Contract Documents. A forced flash relay shall be installed in the traffic signal controller cabinet to allow flash operation when initiated by the UPS control unit. All wiring shall be according to the Contract Documents.

622.07.04.08 UPS Automatic Switch, Forced Flash Relay and Heater/Fan breaker

The UPS automatic switch, forced flash relay, heater/fan breaker and terminal block shall be installed in the signal controller cabinet according to the Contract Documents.

622.07.05 Installation of Controller Equipment

622.07.05.01 Shelf-mounted Equipment

Shelf-mounted controller equipment shall be neatly and suitably arranged on the shelves such that all preformed wiring harnesses are of adequate length to allow connections and may be trained to out-of-the-way locations. Similar items of equipment shall be grouped together. All equipment shall be installed with the front facing outward such that the main operational controls and switches are readily accessible.

622.07.05.02 Rack-mounted and Jack-mounted Equipment

Controller equipment shall be installed only in the racks or jacks intended for use with the particular item of equipment. Equipment shall be installed within the guide provided and shall be set snug so as to lock into any motherboard, channel or connection specified.

622.07.05.03 Cabinet Wall-mounted Equipment

Equipment shall be installed level and clear of nearby components. The equipment shall be bolted in place with 5 mm diameter stainless steel machine bolts, nuts and lock washers.

622.07.05.04 Identification of Equipment

Equipment used for different traffic phases or operations shall be identified by traffic phase with labels of plastic embossed tape.

622.07.05.05 Wiring and Connections

All connections to terminal boards or screw type equipment terminals shall be made with insulated fork-tongue compression connectors only when using stranded cable. All wiring to bulkhead connectors on equipment housings shall be made with military specification (MS) bayonet type connectors according to the Contract Documents or in the manufacturer's drawings.

All connector joints for use with extra-low voltage systems shall be soldered, with the joint metals preheated to the flow temperature of the solder.

Traffic signal cables shall be connected to the terminal board address as assigned on the Contract Drawings. The controller output circuit assigned shall match the proper traffic signal cable circuit. The traffic signal cable neutral(s) shall be securely connected to the AC-bus in the cabinet.

Extra-low voltage cables and interconnection cables shall have the outer jacket removed to expose approximately 150 mm of the shielding and/or drain wire. The shielding or drain wire for all cables serving a similar function shall be twisted together and soldered with a green #10 AWG minimum insulated ground lead securely connected to the cabinet ground bus.

Upon completion of wiring and connections, all incoming cables shall be bundled and held in place with nylon cable ties.

Unused conductors shall be terminated with insulated wing nut vibration proof spring connectors, leaving sufficient cable to reach terminal boards. Incoming cables shall be identified as follows:

a) Extra-low voltage cable shall be identified with PVC sleeve wire markers having the same number as the traffic phase served.

b) Traffic signal cable shall be identified with PVC sleeve wire markers placed over the outer multi conductor cable, naming the corner of the intersection that the cable is routed towards such as "northeast", "south-west", etc.

c) Interconnection cable shall be identified similar to traffic signal cable, naming the direction that the cable is routed towards such as "north", "south", etc.

622.07.05.06 Controller Security

The controller cabinet shall be kept locked during all non-working times. Upon completion of the work, the controller keys shall be given to the Contact Administrator.

622.07.06 Quality Control

622.07.06.01 Pre-installation Testing and Inspection

622.07.06.01.01 General

All tests shall be completed prior to transporting the controller to the Working Area.

Traffic signal controllers, UPS systems, and other components shall be tested and inspected prior to installation to ensure that they are according to the Contract Documents.

A Request to Proceed shall be submitted to the Contract Administrator after completion of all pre-installation testing and inspection.

The next operation after the completion of all pre-installation testing and inspection shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

622.07.06.01.02 Cabinet Assembly and Components

A visual check shall be made to ensure that all components necessary to the complete controller are present and that all pre-assembled equipment is securely mounted and connected.

622.07.06.01.03 Circuit Output

The output terminal board voltage shall be tested for 108 V minimum output from load switches and for proper terminal assignment according to the manufacturer's wiring diagram.

622.07.06.01.04 Interval Sequence

With the proper programming for the intersection in operation but with modified timing values suitable to test conditions, the controller unit shall be cycled through all phases for a minimum of six hours. Controller output shall be tested to ensure that the proper phases and phase intervals appear in the correct sequence by use of a 120 V test board with lamps or by use of a 24 V test board with LED or other appropriate indicators wired to the input side of the load switches. Test results shall be confirmed a minimum of six times.

622.07.06.01.05 Actuation

With an appropriate test board, the effect of detection devices and pedestrian push-buttons in entering a call to the controller unit shall be tested. All modes of detector sensor unit program and vehicle extension calls shall be tested. Tests shall confirm that all calls are registered, activated and are associated with the correct traffic phase.

622.07.06.01.06 Conflict Monitor

The conflict monitor shall be tested by removal of the monitor programming card or by methods recommended by the manufacturer. Diode breakouts in the monitor card shall be according to the signal operation required. All flash and reset functions shall be tested.

622.07.06.01.07 Flasher

The output of flasher units and flash transfer relays shall be tested for proper functioning over a two hour period.

622.07.06.01.08 Recall

Recall switch functions for each phase shall be tested to ensure that the controller recalls to the phase selected and remains on 'hold' in the absence of a call on an opposing phase.

622.07.06.01.09 Programming

With actual phase timing for the intersection operational, the controller programming or cam breakouts shall be tested to ensure that the intended operation is accomplished. This test shall include all possible combinations of actuation and recall settings together with any special features such as advance green, phase skip, pre-emption or co-ordination.

622.07.06.01.10 Manual Control

The manual over-ride controls shall be tested for proper operation under all possible switching combinations.

622.07.06.01.11 Environmental Protection

The heater element and circuitry shall be tested for continuity and proper resistance. The ventilation fan shall be checked for proper operation in conjunction with the thermostat control system. If the average temperature during the installation period is below 5□°C and falling, the cover plate shall be installed over the louvres and the heater circuit shall be prepared for operation.

622.07.06.~~01.12 UPS System~~02 Proof of Performance Testing and Inspection

~~Prior to the installation of the UPS system, the UPS system shall be tested and inspected to verify that it performs according the manufacturer's specifications and the Contract Documents. In particular, and without limiting the foregoing, the UPS system shall be operated and tested to verify the following:~~

~~a) Transfer time in case of power failure is less than 60 milliseconds.~~

~~b) Voltage regulation at 120 VAC is +/- 3 percent.~~

~~c) Frequency regulation at 60 Hz is +/- 3 Hz.~~

~~d) Thermostat controlled battery heating mats operate according to the manufacturer's specifications.~~

e) When powered by the batteries alone, the UPS system provides full signal operation at full load for a minimum of 4 hours, and then switches over to flashing operation and provides flashing operation for a further 6 hours.

Prior to installation, certification from the manufacturer stating that the product is according to the Contract Documents shall be submitted to the Contract Administrator. This certification shall include an explicit certification that, when powered by the batteries alone, the UPS system provides full signal operation at full load for a minimum of 4 hours, and then switches over to flashing operation and provides flashing operation for a further 6 hours.

622.07.06.02 Proof of Performance Testing and Inspection

622.07.06.02.01 General

All tests shall be completed prior to traffic signal activation.

The traffic signal control system, including traffic signal controllers, UPS systems, and other components, shall be tested and inspected prior to traffic signal activation to ensure that the traffic signal control system and all components are according to the Contract Documents.

The testing and inspection results shall be documented in a report and submitted to the Contract Administrator within 3 Days of completion of the testing and inspection.

A Request to Proceed shall be submitted to the Contract Administrator after completion of all proof of performance testing and inspection and submission of the test and inspection report.

The next operation after the completion of all proof of performance testing and inspection and submission of the test and inspection report shall not proceed until a Notice to Proceed has been received from the Contract Administrator.

622.07.06.02.02 Controller

These tests shall be performed upon installation of the controller. The controller shall be allowed to operate functionally only after all testing has been completed and all components are operational.

The Contract Administrator and ministry electrical staff shall be notified of the time and location of all testing 3 Business Days prior to the start of each test.

The work shall be inspected and tested 3 Business Days prior to the actual switch on of the signals to ensure that it according to the requirements of the Contract Documents and without limiting the foregoing, the Contractor shall ensure the following:

a) All components are installed, tested and proven as indicated in the Contract Documents.

b) All systems are energized and in working order

c) The signal timing is consistent and complete, without activating the traffic signals for public display.

The testing and inspection results shall be documented in a report and submitted to the Contract Administrator within 3 Days of completion of the testing and inspection.

622.07.06.02.~~03~~02 Signal Cable

All traffic signal cable circuits shall be tested disconnected for continuity and the absence of short circuits as determined by an ohmmeter test.

622.07.06.02.~~04~~03 120 V Test

The operation of all signal head lamps and the absence of short circuits shall be tested by progressively connecting each active signal cable conductor to the AC+ bus through a temporary 10A fuse bypassing the load switches.

622.07.06.02.~~05~~04 Interval Sequence

With the proper programming and timing functions in operation, the controller shall be cycled through all phases for a minimum of 1 hour with all signal circuits connected but with signal heads covered.

622.07.06.02.~~06~~05 Actuation

All calls shall be observed to be registered and activated. ~~-~~Actuation equipment shall be tested according to OPSS~~-~~ 623.

622.07.06.~~02.07 03~~ Testing of UPS System

The UPS system shall be activated according to the manufacturer's recommendations. The Contractor shall be responsible for all testing and documentation required to establish acceptance of the installation and operation of material supplied.

622.07.06.03.01 Pre-installation Testing and Inspection of UPS System

Prior to the installation of the UPS system, the UPS system shall be tested and inspected to verify that it performs according the manufacturer's specifications and the Contract Documents. In particular, and without limiting the foregoing, the UPS system shall be operated and tested to verify the following:

a) Transfer time in case of power failure is less than 60 milliseconds.

b) Voltage regulation at 120 VAC is +/- 3 percent.

c) Frequency regulation at 60 Hz is +/- 3 Hz.

d) Thermostat controlled battery heating mats operate according to the manufacturer's specifications.

e) When powered by the batteries alone, the UPS system provides full signal operation at full load for a minimum of 4 hours, and then switches over to flashing operation and provides flashing operation for a further 6 hours.

Prior to installation, certification from the manufacturer stating that the product is according to the Contract Documents shall be submitted to the Contract Administrator. This certification shall include an explicit certification that, when powered by the batteries alone, the UPS system provides full signal operation at full load for a minimum of 4 hours, and then switches over to flashing operation and provides flashing operation for a further 6 hours.

622.07.06.03.02 Proof of Performance Testing and Inspection

The UPS system and all components shall be tested and inspected to verify that it performs according to the manufacturer's specifications and the Contract Documents.

The proof of performance testing and inspection shall include all testing and inspection identified under the Pre-installation Testing and Inspection clause and verification that all UPSthe testing of grounding equipment has been grounded according to the manufacturer's specifications and OPSS 609.

In particular, and without limiting the foregoing, the Contractor shall ensure that all components are installed, tested and proven as specified in the Contract Documents. In addition, the Contractor shall perform visual inspection on the installed UPS system and perform all tests on grounding of equipment according to OPSS 609.

The testing and inspection results shall be documented in a report and submitted to the Contract Administrator within 3 Days of completion of the testing and inspection.

622.07.06.03 .03 Testing for New UPS System "Switch On"

A new UPS system installed at a location not previously equipped with a UPS system or to replace an existing UPS system shall be initially switched on for operation according to the following requirements:

a) The Contract Administrator shall be given a minimum of 3 Business Days notice of when the UPS system is to be installed or switched over, and 24 hours notice prior to the start of the work.

b) All repairs or replacement of defective components shall be completed prior to activation.

c) Switch on for operation of UPS shall not be permitted on Fridays, Saturdays, Sundays, Mondays, and statutory holidays.

d) Switch on for operation of UPS shall be under police supervision.

622.07.07 Traffic Signal Controller Modifications

Traffic signal controller modifications shall include the following:

a) Relocation, rearrangement repair or replacement of traffic signal controller components.

b) Modification to actuation equipment.

c) Modification to interconnection equipment.

d) Removal and salvage or disposal of components according to OPSS 610.

622.07.08 Traffic Signal Control Programming and Timing

Traffic signal interval timing as provided on the Generic Signal Timing Sheet specified in the Contract Documents shall be installed into the traffic signal controller only after verifying that it is complete and consistent and all controller and conflict monitor programming is installed and all timing controls, switches and programming controls are set.

The temporary traffic signals shall have full manual mode operation functionality to allow an operator to interrupt the other modes (e.g. fixed time or actuated) and return to the previous mode when finished.

When directed by the Contract Administrator, the traffic signal operation shall be manually overridden to operate in fixed/actuated or manual as required to reduce or eliminate queuing traffic. The date, start and end time of each manual override occurrence shall be recorded in a log book as specified elsewhere in the Contract Documents.

All routine and emergency maintenance work required for 24-hour operation of the temporary traffic signals shall be performed as specified in the Contract Documents.

622.08 QUALITY ASSURANCE

The testing of the traffic signal controller and UPS system performed by the Contractor shall be witnessed by the Contract Administrator and the Ministry electrical coordinator or inspector. The Contract Administrator shall also be in attendance during the "turn-on" of the traffic signal.

622.09 MEASUREMENT FOR PAYMENT

622.09.01 Actual Measurement

622.09.01.01 Traffic Signal Controllers

For measurement purposes, a count shall be made of the number of traffic signal controllers installed.

622.09.01.02 Traffic Signal Controllers Modifications

For measurement purposes, a count shall be made of the number of traffic signal controllers modified.

622.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

622.10 BASIS OF PAYMENT

622.10.01 Traffic Signal Controllers - Item

Payment at the Contract price for the above items shall be full compensation for all labour, Equipment, and Materials to do the work.

622.10.02 Traffic Signal Controller Modifications – Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Materials required to modify traffic signal controllers, and such work shall include the removal, salvage, installation, relocation, rearrangement, repair or replacement of components.

622.10.03 Rock Excavation

Payment for rock excavation shall be according to OPSS 603.

TABLE 1
Traffic Controller Components

Item Quantity	Description
-	Type 2070 - traffic signal controller
-1	Type 170 -type traffic signal controller
-	Type 170 - 412C Prom Module with McCain's MTO 233ON1.D local intersection control program
-	Type 170 - Communication board M33329 Rev B or later (Serial to Ethernet)
-	Type 170 - 412C Prom Module with McCain's MTO 245FM02.09.16 master control program local intersection control program
1	Conflict Monitor
1	412C Prom Module with McCain's MTO 233ON1.D local intersection control program
0	412C Prom Module with McCain's MTO 245FM02.09.16 field master control program local intersection control program
1	412C Prom Module with the latest MTO approved McCain PROM Chip
8	Loop Detector, Model 222
8	Load Switch, Model 200
8	DC Isolator, Model 242
1	AC Isolator, Model 252
1	Uninterruptible Power Supply (UPS) system
1	Bell Mobility Sierra GX400 Modem (with I/O module Note: To be supplied by the Owner.).
1	170 Communication board M33329 Rev B or later (Serial to Ethernet).
1	Cat 5E Ethernet Cable -– 2 metres
1	BMAX 824/1850 Antenna
1	The MobileMarkGPSPSM-MSMA/MSMA (stud mount) Antenna - LTM302-3C3C2C-WHT-48 base.

~~Figure~~FIGURE 1
Arc Flash and Shock Hazard Warning Label

Arc Flash and Shock Hazard

Location: _____

Arc Flash	**Shock**
Working distance: 460 mm (19 in.) Incident energy: 4.4 cal/cm^2 Arc Flash Boundary: 870 mm (35 in.)	Nominal system voltage: 60 VDC Limited approach: 1000 mm (40 in.) Restricted approach: 300 mm (12 in.)
Minimum PPE Requirements: PPE according to CSA Z462 Arc Flash PPE Category 2 and all other PPE required for protection from battery hazards	
Analysis Date: October 2015	

Note: The 622 implemented in April 2025 replaces 622, April 2017 with no technical content changes.

CONSTRUCTION SPECIFICATION FOR THE INSTALLATION OF TRAFFIC SIGNAL CONTROLLERS

TABLE OF CONTENTS

622.01 SCOPE

This specification covers the requirements for the installation of traffic signal controllers and associated components.

622.02 REFERENCES

This specification refers to the following standards, specifications or publications:

Ontario Provincial Standard Specifications, Construction

OPSS 501 Compacting
OPSS 603 Installation of Ducts
OPSS 609 Grounding
OPSS 610 Removal of Electrical Equipment
OPSS 623 Traffic Actuation Equipment

Ontario Provincial Standard Specifications, Material

OPSS 1350 Concrete - Materials and Production
OPSS 2475 Uninterruptible Power Supply Systems for LED Traffic Signals

Ontario Ministry of Transportation Publications:

Ontario Traffic Signal Control Equipment Specifications (OTSCES)

CSA Standards

C22.2 No. 65-13	Wire Connectors (Tri-national standard, with UL 486A-486B and NMX-J-543-ANCE)
C22.2 No. 75-14	Thermoplastic Insulated Wires and Cables (Tri-national standard, with UL 83 and NMX-J-010-ANCE-2010)
C22.2 No. 197-M1983 (R2013)	PVC Insulating Tape
C22.2 No. 211.2-06 (R2011)	Rigid PVC (Unplasticized) Conduit

International Municipal Signal Association (IMSA)

MTO 170/332 Training Manual

Others

Caltrans Transportation Electrical Equipment Specifications (TEES)

622.03 DEFINITIONS

For the purpose of this specification the following definitions apply:

AC+ means 120 V AC, 60 Hz power bus.

AC- means 120 V AC, 60 Hz neutral bus, grounded at power source.

Conflict Monitor means a device for detecting and interrupting conflicts in the traffic signal output circuits.

Controller means a complete traffic signal control equipment package including cabinet, controller unit and all associated power control, actuation or interconnection devices.

Controller Cabinet means an outdoor enclosure used for the housing of the controller unit and all associated power, control, activation or interconnection devices.

Controller Unit means that portion of the controller assembly devoted to the selection and timing of traffic movements.

Detection means the operation of a detector sensor unit in registering the presence or passage of a vehicle or pedestrian.

Hold means a command to the controller unit which causes it to retain the existing traffic signal phase.

Interconnection means the system of cables and devices which operate traffic signal controllers at consecutive intersections in a fixed or preprogrammed timing sequence.

Interval means the part or parts of the signal cycle during which signal indications do not change.

Interval Sequence means the order of appearance of signal indications during successive intervals.

Interval Sequence Chart means a chart designating the order in which the signal phases occur and the associated signal display for each interval.

Light Emitting Diode (LED) means as defined in OPSS 620.

Microprocessor means a small, self-contained limited capability computer with the central processing unit on a single chip.

Motherboard means a printed circuit connector interface board with no active or passive components.

Phase Skip means a controller function used to provide omission of a phase in the absence of actuations on that phase.

Pre-emption means the transfer of the normal control of signals to a special control mode which may be required by railroad trains at crossings, emergency vehicles, mass transit vehicles, or other special needs.

Vehicle Extension means the time in seconds added to the green interval to permit additional green time upon actuation by a vehicle approaching the intersection.

622.05 MATERIALS

622.05.01 Conduits and Fittings

Rigid PVC conduits and fittings shall be according to CSA C 22.2 No. 211.2.

622.05.02 Low Voltage Cables

Low voltage cables single conductor, shall be stranded copper type TWH according to CSA C 22.2 No. 75.

622.05.03 Wire Connectors

Wire connectors shall be of the fork tongue compression type for terminal connections of the insulated wing nut vibration proof spring type for wire to wire connections and shall be according to CSA C 22.2. No. 65.

622.05.04 Electrical Insulating Tape

Electrical insulating tape shall be rated for 600 V at -10°C to 90°C working temperature and conform to CSA C22.2 No. 197.

622.05.05 Grounding Materials

Ground wire and connectors shall be according to OPSS 609.

622.05.06 Traffic Signal Controllers

A used traffic signal controller may be used for a temporary installation provided that it is in good condition and it complies with the requirements of the contract.

622.05.07 Concrete

Concrete shall be 30 MPa class according to OPSS 1350.

622.05.08 Solder

Solder shall be 60% tin and 40% lead mix resin core type.

622.05.09 Uninterruptible Power Supply (UPS) System

The UPS system shall be according to the OPSS 2475.

Used UPS systems may be used for temporary installations provided that they are in good condition and meet the requirements of the Contract Documents.

The information contained in this specification covers the UPS system to be used with a Model 332 controller cabinet. If the Contractor uses a different type of traffic signal controller cabinet, such as a NEMA cabinet, then the Contractor shall make all necessary modifications to suit the type of cabinet used.

Uninterruptible power supply systems for LED traffic signals shall include an Arc Flash and Shock Hazard warning label according to Figure 1. The warning sign shall be prominently displayed on the outside of each exterior door. The Contractor shall enter the location information in Figure 1 as indicated by the local MTO electrical coordinator.

The DC arc flash analysis and results in Figure 1 are applicable only to ministry traffic signal UPS systems with the following characteristics:

a) Application - DC system for back-up power for traffic signals

b) Nominal DC system voltage of 60 VDC or less.

c) DC system short circuit current of 5000 A or less.

d) Condition of electrical plant shall be in good condition and well maintained.

622.05.10 Forced Flash Relay

The forced flash relay shall be 10 Amp, 60 Hz, Double Pole Double Throw (DP DT) relay.

622.05.11 Heater/Fan Breaker

The heater/fan breaker shall be 15 Amp breaker mounted on the service panel.

622.07 CONSTRUCTION

622.07.01 Controller Supplied by the Owner

When the controller is supplied by the Owner, the controller shall be picked up and transported from the location specified in the Contract Documents. The Contractor shall ensure that all components are safely connected, secured or packaged prior to transporting the controller.

The Owner guarantees to the Contractor that the controller and all associated equipment is free of any defects.

622.07.02 Controller Supplied by the Contractor

When the Contractor supplies the controller, the Contractor shall carry out all pre-shipping shop tests specified in the Pre-installation Testing and Inspection clause.

Acceptable storage and testing facilities with temperature and humidity regulated environment shall be provided.

Each traffic signal controller cabinet shall be a model 332 traffic signal controller cabinet capable of 2 to 8 phase operation. Each traffic signal controller cabinet shall be complete with mounting pedestal base, uninterruptible power supply (UPS), 170 type traffic signal controller, conflict monitor, and all other equipment required to perform its intended function, either in standalone operation or as part of the ministry's traffic signal control system, according to the timing sheets, PHM-125 drawing, and the Contract Documents. Without limiting the foregoing, each traffic signal controller cabinet shall include the components listed in Table 1.

All traffic signal control equipment shall be according to the Ontario Traffic Signal Control Equipment Specifications (OTSCES) or the Caltrans Transportation Electrical Equipment Specifications (TEES).

Each traffic signal controller cabinet shall be supplied fully assembled and tested. The testing shall be carried out according to the MTO Operation Guidelines and Procedures in the MTO 170/332 Training Manual. The MTO 170/332 Training Manual may be purchased from the Ontario Section of the International Municipal Signal Association.

All temporary traffic signal controllers shall be equipped with an UPS system.

622.07.03 Timing of Work

The controller shall be installed and the controller cabinet shall be energized within 48 hours of shipment from the place of storage.

622.07.04 Signal Controller Cabinet and UPS Cabinet

622.07.04.01 Pole Mounted Controller Cabinet

Cabinets shall be installed complete with all mounting brackets, hardware stainless steel strapping and pole mounted conduits and fittings.

Pole mounted controller cabinets shall be located such that:

a) A person operating the controls will be facing the intersection.

b) The edges of the cabinet do not protrude over a sidewalk or beyond the pole in the direction of the pavement.

c) Pole handholes and pedestrian push-buttons remain unobstructed.

622.07.04.02 Pad Mounted Controller Cabinet

The cabinet shall be installed complete with all hardware and accessories in an orientation that allows a person operating the controls to face the intersection.

The neoprene gasket shall be attached squarely and symmetrically on the bottom channel of the cabinet prior to installation, with holes for mounting bolts drilled where necessary.

Anchor bolts shall be secured in place in the locations specified in the manufacturer's instructions or where bolt holes have been provided.

Clear silicone shall be used as a sealant between the top of an extension and the bottom of the controller cabinet.

622.07.04.03 Pedestal Mounted Controller Cabinet

Pedestals for controller cabinet mounting shall be installed in an orientation that allows a person operating the controls to face the intersection.

In earth, where the excavation extends beyond the neat limits, concrete may be placed to the undisturbed ground or the concrete encasement may be formed.

The excavation shall be backfilled with native material and compacted according to OPSS 501.

Where bedrock is encountered, rock excavation shall be done such that a minimum of 600 mm length of steel pedestal can be installed in sound rock. The bottom of the pedestal shall be cut off to obtain the proper controller mounting height above finished grade. Rock excavation shall be according to OPSS 603.

The cabinet shall be installed complete with all hardware and accessories.

622.07.04.04 Power Connection

Low voltage feeder cables shall be connected to the controller cabinet. The neutral shall be connected to the AC-terminal bus.

622.07.04.05 Equipment Ground

Stranded copper ground cable shall be installed between the controller cabinet ground bus and the service ground bus. Connections shall be according to OPSS 609 and the manufacturer's drawings or instructions.

For microprocessor type controllers, the AC-terminal bus shall not be grounded to the cabinet or connected to logic ground.

622.07.04.06 Pad Mounted UPS Cabinet

The pad mounted UPS cabinet shall be installed on a pedestal manufactured of the same material as the traffic signal controller cabinet and supplied with the same lock and key. The pedestal shall be anchored to the pad and secured in place at the location specified according to the Contract Documents.

The UPS control unit and the UPS automatic switch shall be installed in the traffic signal controller cabinet according to the Contract Documents. A forced flash relay shall be installed in the traffic signal controller cabinet to allow flash operation when initiated by the UPS control unit. All wiring shall be according to the Contract Documents.

622.07.04.07 Pole Mounted UPS Cabinet

The pole mounted UPS cabinet including batteries and heating pads shall be installed complete with all mounting brackets, hardware, stainless steel strapping and pole mounting conduits and fittings.

The edges of the cabinet shall not protrude over a sidewalk or roadway pavement. The cabinet shall not obstruct access to the pole handhole and pedestrian pushbuttons.

The UPS control unit and the UPS automatic switch shall be installed in the signal controller cabinet according to the Contract Documents. A forced flash relay shall be installed in the traffic signal controller cabinet to allow flash operation when initiated by the UPS control unit. All wiring shall be according to the Contract Documents.

622.07.04.08 UPS Automatic Switch, Forced Flash Relay and Heater/Fan breaker

The UPS automatic switch, forced flash relay, heater/fan breaker and terminal block shall be installed in the signal controller cabinet according to the Contract Documents.

622.07.05 Installation of Controller Equipment

622.07.05.01 Shelf-mounted Equipment

Shelf-mounted controller equipment shall be neatly and suitably arranged on the shelves such that all preformed wiring harnesses are of adequate length to allow connections and may be trained to out-of-the-way locations. Similar items of equipment shall be grouped together. All equipment shall be installed with the front facing outward such that the main operational controls and switches are readily accessible.

622.07.05.02 Rack-mounted and Jack-mounted Equipment

Controller equipment shall be installed only in the racks or jacks intended for use with the particular item of equipment. Equipment shall be installed within the guide provided and shall be set snug so as to lock into any motherboard, channel or connection specified.

622.07.05.03 Cabinet Wall-mounted Equipment

Equipment shall be installed level and clear of nearby components. The equipment shall be bolted in place with 5 mm diameter stainless steel machine bolts, nuts and lock washers.

622.07.05.04 Identification of Equipment

Equipment used for different traffic phases or operations shall be identified by traffic phase with labels of plastic embossed tape.

622.07.05.05 Wiring and Connections

All connections to terminal boards or screw type equipment terminals shall be made with insulated fork-tongue compression connectors only when using stranded cable. All wiring to bulkhead connectors on equipment housings shall be made with military specification (MS) bayonet type connectors according to the Contract Documents or in the manufacturer's drawings.

All connector joints for use with extra-low voltage systems shall be soldered, with the joint metals preheated to the flow temperature of the solder.

Traffic signal cables shall be connected to the terminal board address as assigned on the Contract Drawings. The controller output circuit assigned shall match the proper traffic signal cable circuit. The traffic signal cable neutral(s) shall be securely connected to the AC-bus in the cabinet.

Extra-low voltage cables and interconnection cables shall have the outer jacket removed to expose approximately 150 mm of the shielding and/or drain wire. The shielding or drain wire for all cables serving a similar function shall be twisted together and soldered with a green #10 AWG minimum insulated ground lead securely connected to the cabinet ground bus.

Upon completion of wiring and connections, all incoming cables shall be bundled and held in place with nylon cable ties.

Unused conductors shall be terminated with insulated wing nut vibration proof spring connectors, leaving sufficient cable to reach terminal boards. Incoming cables shall be identified as follows:

a) Extra-low voltage cable shall be identified with PVC sleeve wire markers having the same number as the traffic phase served.

b) Traffic signal cable shall be identified with PVC sleeve wire markers placed over the outer multi conductor cable, naming the corner of the intersection that the cable is routed towards such as "northeast", "south-west", etc.

c) Interconnection cable shall be identified similar to traffic signal cable, naming the direction that the cable is routed towards such as "north", "south", etc.

622.07.05.06 Controller Security

The controller cabinet shall be kept locked during all non-working times. Upon completion of the work, the controller keys shall be given to the Contact Administrator.

622.07.06 Quality Control

622.07.06.01 Pre-installation Testing and Inspection

622.07.06.01.01 General

All tests shall be completed prior to transporting the controller to the Working Area.

Traffic signal controllers, UPS systems, and other components shall be inspected prior to installation to ensure that they are according to the Contract Documents.

622.07.06.01.02 Cabinet Assembly and Components

A visual check shall be made to ensure that all components necessary to the complete controller are present and that all pre-assembled equipment is securely mounted and connected.

622.07.06.01.03 Circuit Output

The output terminal board voltage shall be tested for 108 V minimum output from load switches and for proper terminal assignment according to the manufacturer's wiring diagram.

622.07.06.01.04 Interval Sequence

With the proper programming for the intersection in operation but with modified timing values suitable to test conditions, the controller unit shall be cycled through all phases for a minimum of six hours. Controller output shall be tested to ensure that the proper phases and phase intervals appear in the correct sequence by use of a 120 V test board with lamps or by use of a 24 V test board with LED or other appropriate indicators wired to the input side of the load switches. Test results shall be confirmed a minimum of six times.

622.07.06.01.05 Actuation

With an appropriate test board, the effect of detection devices and pedestrian push-buttons in entering a call to the controller unit shall be tested. All modes of detector sensor unit program and vehicle extension calls shall be tested. Tests shall confirm that all calls are registered, activated and are associated with the correct traffic phase.

622.07.06.01.06 Conflict Monitor

The conflict monitor shall be tested by removal of the monitor programming card or by methods recommended by the manufacturer. Diode breakouts in the monitor card shall be according to the signal operation required. All flash and reset functions shall be tested.

622.07.06.01.07 Flasher

The output of flasher units and flash transfer relays shall be tested for proper functioning over a two hour period.

622.07.06.01.08 Recall

Recall switch functions for each phase shall be tested to ensure that the controller recalls to the phase selected and remains on 'hold' in the absence of a call on an opposing phase.

622.07.06.01.09 Programming

With actual phase timing for the intersection operational, the controller programming or cam breakouts shall be tested to ensure that the intended operation is accomplished. This test shall include all possible combinations of actuation and recall settings together with any special features such as advance green, phase skip, pre-emption or co-ordination.

622.07.06.01.10 Manual Control

The manual over-ride controls shall be tested for proper operation under all possible switching combinations.

622.07.06.01.11 Environmental Protection

The heater element and circuitry shall be tested for continuity and proper resistance. The ventilation fan shall be checked for proper operation in conjunction with the thermostat control system. If the average temperature during the installation period is below 5°C and falling, the cover plate shall be installed over the louvres and the heater circuit shall be prepared for operation.

622.07.06.02 Proof of Performance Testing and Inspection

622.07.06.02.01 Controller

These tests shall be performed upon installation of the controller. The controller shall be allowed to operate functionally only after all testing has been completed and all components are operational.

The Contract Administrator and ministry electrical staff shall be notified of the time and location of all testing 3 Business Days prior to the start of each test.

The work shall be inspected and tested 3 Business Days prior to the actual switch on of the signals to ensure that it according to the requirements of the Contract Documents and without limiting the foregoing, the Contractor shall ensure the following:

a) All components are installed, tested and proven as indicated in the Contract Documents.

b) All systems are energized and in working order

c) The signal timing is consistent and complete, without activating the traffic signals for public display.

The testing and inspection results shall be documented in a report and submitted to the Contract Administrator within 3 Days of completion of the testing and inspection.

622.07.06.02.02 Signal Cable

All traffic signal cable circuits shall be tested disconnected for continuity and the absence of short circuits as determined by an ohmmeter test.

622.07.06.02.03 120 V Test

The operation of all signal head lamps and the absence of short circuits shall be tested by progressively connecting each active signal cable conductor to the AC+ bus through a temporary 10A fuse bypassing the load switches.

622.07.06.02.04 Interval Sequence

With the proper programming and timing functions in operation, the controller shall be cycled through all phases for a minimum of 1 hour with all signal circuits connected but with signal heads covered.

622.07.06.02.05 Actuation

All calls shall be observed to be registered and activated. Actuation equipment shall be tested according to OPSS 623.

622.07.06.03 Testing of UPS System

The UPS system shall be activated according to the manufacturer's recommendations. The Contractor shall be responsible for all testing and documentation required to establish acceptance of the installation and operation of material supplied.

622.07.06.03.01 Pre-installation Testing and Inspection of UPS System

Prior to the installation of the UPS system, the UPS system shall be tested and inspected to verify that it performs according the manufacturer's specifications and the Contract Documents. In particular, and without limiting the foregoing, the UPS system shall be operated and tested to verify the following:

a) Transfer time in case of power failure is less than 60 milliseconds.

b) Voltage regulation at 120 VAC is +/- 3 percent.

c) Frequency regulation at 60 Hz is +/- 3 Hz.

d) Thermostat controlled battery heating mats operate according to the manufacturer's specifications.

e) When powered by the batteries alone, the UPS system provides full signal operation at full load for a minimum of 4 hours, and then switches over to flashing operation and provides flashing operation for a further 6 hours.

Prior to installation, certification from the manufacturer stating that the product is according to the Contract Documents shall be submitted to the Contract Administrator. This certification shall include an explicit certification that, when powered by the batteries alone, the UPS system provides full signal operation at full load for a minimum of 4 hours, and then switches over to flashing operation and provides flashing operation for a further 6 hours.

622.07.06.03.02 Proof of Performance Testing and Inspection

The UPS system and all components shall be tested and inspected to verify that it performs according to the manufacturer's specifications and the Contract Documents.

The proof of performance testing and inspection shall include all testing and inspection identified under the Pre-installation Testing and Inspection clause and the testing of grounding equipment according to OPSS 609.

In particular, and without limiting the foregoing, the Contractor shall ensure that all components are installed, tested and proven as specified in the Contract Documents. In addition, the Contractor shall perform visual inspection on the installed UPS system and perform all tests on grounding of equipment according to OPSS 609.

The testing and inspection results shall be documented in a report and submitted to the Contract Administrator within 3 Days of completion of the testing and inspection.

622.07.06.03.03 Testing for New UPS System "Switch On"

A new UPS system installed at a location not previously equipped with a UPS system or to replace an existing UPS system shall be initially switched on for operation according to the following requirements:

a) The Contract Administrator shall be given a minimum of 3 Business Days notice of when the UPS system is be installed or switched over and 24 hours notice prior to the start of the work.

b) All repairs or replacement of defective components shall be completed prior to activation.

c) Switch on for operation of UPS shall not be permitted on Fridays, Saturdays, Sundays, Mondays, and statutory holidays.

d) Switch on for operation of UPS shall be under police supervision.

622.07.07 Traffic Signal Controller Modifications

Traffic signal controller modifications shall include the following:

a) Relocation, rearrangement repair or replacement of traffic signal controller components.

b) Modification to actuation equipment.

c) Modification to interconnection equipment.

d) Removal and salvage or disposal of components according to OPSS 610.

622.07.08 Traffic Signal Control Programming and Timing

Traffic signal interval timing as provided on the Generic Signal Timing Sheet specified in the Contract Documents shall be installed into the traffic signal controller only after verifying that it is complete and consistent and all controller and conflict monitor programming is installed and all timing controls, switches and programming controls are set.

The temporary traffic signals shall have full manual mode operation functionality to allow an operator to interrupt the other modes (e.g. fixed time or actuated) and return to the previous mode when finished.

When directed by the Contract Administrator, the traffic signal operation shall be manually overridden to operate in fixed/actuated or manual as required to reduce or eliminate queuing traffic. The date, start and end time of each manual override occurrence shall be recorded in a log book as specified elsewhere in the Contract Documents.

All routine and emergency maintenance work required for 24-hour operation of the temporary traffic signals shall be performed as specified in the Contract Documents.

622.08 QUALITY ASSURANCE

The testing of the traffic signal controller and UPS system performed by the Contractor shall be witnessed by the Contract Administrator and the Ministry electrical coordinator or inspector. The Contract Administrator shall also be in attendance during the "turn-on" of the traffic signal.

622.09 MEASUREMENT FOR PAYMENT

622.09.01 Actual Measurement

622.09.01.01 Traffic Signal Controllers

For measurement purposes, a count shall be made of the number of traffic signal controllers installed.

622.09.01.02 Traffic Signal Controllers Modifications

For measurement purposes, a count shall be made of the number of traffic signal controllers modified.

622.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

622.10 BASIS OF PAYMENT

622.10.01 Traffic Signal Controllers - Item

Payment at the Contract price for the above items shall be full compensation for all labour, Equipment, and Materials to do the work.

622.10.02 Traffic Signal Controller Modifications - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment, and Materials required to modify traffic signal controllers, and such work shall include the removal, salvage, installation, relocation, rearrangement, repair or replacement of components.

622.10.03 Rock Excavation

Payment for rock excavation shall be according to OPSS 603.

TABLE 1
Traffic Controller Components

Item Quantity	Description
1	170 type traffic signal controller
1	Conflict Monitor
1	412C Prom Module with McCain's MTO 233ON1.D local intersection control program
0	412C Prom Module with McCain's MTO 245FM02.09.16 field master control program local intersection control program
1	412C Prom Module with the latest MTO approved McCain PROM Chip
8	Loop Detector, Model 222
8	Load Switch, Model 200
8	DC Isolator, Model 242
1	AC Isolator, Model 252
1	Uninterruptible Power Supply (UPS) system
1	Bell Mobility Sierra GX400 Modem with I/O module Note: To be supplied by the Owner.
1	170 Communication board M33329 Rev B or later (Serial to Ethernet).
1	Cat 5E Ethernet Cable – 2 metres
1	BMAX 824/1850 Antenna
1	GPSPSM-MSMA/MSMA (stud mount) Antenna base.

FIGURE 1
Arc Flash and Shock Hazard Warning Label

Arc Flash and Shock Hazard

Location: _____

Arc Flash		**Shock**	
Working distance:	460 mm (19 in.)	Nominal system voltage:	60 VDC
Incident energy:	4.4 cal/cm^2	Limited approach:	1000 mm (40 in.)
Arc Flash Boundary:	870 mm (35 in.)	Restricted approach:	300 mm (12 in.)

Minimum PPE Requirements: PPE according to CSA Z462 Arc Flash PPE Category 2 and all other PPE required for protection from battery hazards

Analysis Date: October 2015

TRAFFIC SIGNAL CONTROLLERS - Item No.
TRAFFIC SIGNAL CONTROLLERS (TEMPORARY) - Item No.

Special Provision No. 622F03 ~~June 2020~~April 2025

Amendment to OPSS 622, April ~~2017~~2025

~~622.07.02 Controller Supplied by the Contractor~~

~~Subsection 622.07.02 of OPSS 622 is amended in that the third paragraph is deleted and replaced by the following:~~

~~Each traffic signal controller cabinet shall be a model 332 traffic signal controller cabinet capable of 2 to 8 phase operation. Each traffic signal controller cabinet shall be complete with mounting pedestal base and all other equipment required to perform its intended function, either in standalone operation or as part of the ministry's traffic signal control system, according to the timing sheets, PH-M-125 drawing, and the Contract Documents. Without limiting the foregoing, each traffic signal controller cabinet shall include the components listed in Table 1.~~

~~Table 1 of OPSS 622 is amended in that it is deleted and replaced by the following:~~

~~Table 1~~
~~Traffic Controller Components~~

~~Item Quantity~~	**~~Description~~**
~~-~~	~~Type 2070 - traffic signal controller~~
~~-~~	~~Type 170 - traffic signal controller~~
~~-~~	~~Type 170 - 412C Prom Module with McCain's MTO 233ON1.D local intersection control program~~
~~-~~	~~Type 170 - Communication board M33329 Rev B or later (Serial to Ethernet)~~
~~-~~	~~Type 170 - 412C Prom Module with McCain's MTO 245FM02.09.16 master control program local intersection control program~~
~~1~~	~~Conflict Monitor~~
~~8~~	~~Loop Detector, Model 222~~
~~8~~	~~Load Switch, Model 200~~
~~8~~	~~DC Isolator, Model 242~~
~~1~~	~~AC Isolator, Model 252~~
~~1~~	~~Uninterruptible Power Supply (UPS) system~~
~~1~~	~~Bell Mobility Modem (Note: To be supplied by the Owner.)~~
~~1~~	~~Cat 5E Ethernet Cable - 2 metres~~
~~1~~	~~The MobileMark Antenna - LTM302-3C3C2C-WHT-48~~

622.07 Construction

622.07.08 Traffic Signal Controller Programming and Timing

Subsection 622.07.08 of OPSS 622 is amended with the addition of the following clause:

622.07.08.01 Traffic Signal Controller Timing Sheet

Traffic signal timing for the controller shall be as specified in the Generic Signal Timing Sheet below:

GENERIC SIGNAL TIMING SHEET

ACTUATED ☐ PRE-TIMED ☐ SIGNAL TO BE MAINTAINED BY: _____

LOCATION: _____ SIGNAL TO BE OPERATED BY: _____

MAIN STREET (HWY): _____ TIMING DEVELOPED BY: _____

DATE TIMING DEVELOPED: _____

GENERIC TIMING IDENTIFIED HERE SHALL BE TRANSCRIBED ONTO "OFFICIAL" TIMING SHEETS FOR THE TRAFFIC SIGNAL CONTROLLER BEING USED AT THIS SIGNALIZED INTERSECTION. A COPY OF THE "OFFICIAL" LOCAL TIMING SHEETS AND COORDINATION SHEETS IF USED, SHALL BE ATTACHED TO THIS FORM AND FILED IN THE MTO REGIONAL TRAFFIC OFFICE.

OPERATIONAL NOTES:

1. All Protected/Permissive left turn movements shall be followed by parent through movements without exception.
2. If serving F2 and F6 the signal must cycle to F4 and/or F8 prior to serving a call for F1 and/or F5 if these left turn movements are protected/permissive.
3. If serving F4 and F8, the signal must cycle to F2 and/or F6 prior to serving a call for F3 and/or F7 if these left turn movements are protected/permissive.
4. Through Movements shall lag left turn movements unless otherwise specified.

FUNCTION/OPERATION	**MOVEMENT (FAZE)**							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
PERMITTED MOVEMENTS	-	-	-	-	-	-	-	-
RED LOCK	-	-	-	-	-	-	-	-
AMBER LOCK	-	-	-	-	-	-	-	-
VEHICLE RECALL	-	-	-	-	-	-	-	-
PEDESTRIAN RECALL	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
VEHICLE MAX RECALL	-	-	-	-	-	-	-	-
OVERLAP A	-	-	-	-	-	-	-	-
OVERLAP B	-	-	-	-	-	-	-	-
PROT/PERM LEFT TURN ARROW	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
PROT/PERM FAST FLASH ADVANCE GREEN	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
FULLY PROTECTED LEFT TURN	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
DISPLAY AMBER ON STARTUP	-	-	-	-	-	-	-	-
PLACE PEDESTRIAN CALLS ON STARTUP	-	-	-	-	-	-	-	-
PLACE VEHICLE CALLS ON STARTUP	-	-	-	-	-	-	-	-
REST IN WALK	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
MOVEMENTS MUST GAP OUT SIMUL'LY	-	-	-	-	-	-	-	-
DOUBLE ENTRY	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
EXCLUSIVE PHASING BY APPROACH	-	-	-	-	-	-	-	-

n/a --- not applicable

INTERVAL TIMES

	MOVEMENT (FAZE)							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
WALK	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
FLASHING DON'T WALK	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
MINIMUM GREEN	-	-	-	-	-	-	-	-
VEHICLE EXTENSION (PASSAGE TIME)	-	-	-	-	-	-	-	-
MAX GREEN (INCLUDES MIN GREEN)	-	-	-	-	-	-	-	-
MAX GREEN 2 (ALTERNATE MAX GREEN)	-	-	-	-	-	-	-	-
AMBER CLEARANCE	-	-	-	-	-	-	-	-
ALL RED CLEARANCE	-	-	-	-	-	-	-	-
MAX GAP (VEH. EXTENSION)	-	-	-	-	-	-	-	-
MIN GAP (VEH. EXTENSION)	-	-	-	-	-	-	-	-
REDUCE GAP BY	-	-	-	-	-	-	-	-
REDUCE GAP EVERY	-	-	-	-	-	-	-	-
MAX INITIAL GREEN TIME (VAR. INIT)	-	-	-	-	-	-	-	-
TIME ADDED/VEHICLE (VAR. INIT)	-	-	-	-	-	-	-	-

n/a --- not applicable

DETECTOR SETUP

	MOVEMENT (FAZE)							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
DELAY TIME ON PRESENCE DETECTION	-	-	-	-	-	-	-	-
DELAY TIME ON LONG DIST. DETECTION	-	-	-	-	-	-	-	-
CARRY-OVER ON PRESENCE DETECTION	-	-	-	-	-	-	-	-
CARRY-OVER ON LONG DIST. DETECTION	-	-	-	-	-	-	-	-

PRE-EMPTION

	MOVEMENT (FAZE)							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
1ST EMERG. PRE-EMPT MOVEMENTS	-	-	-	-	-	-	-	-
1ST EMERG. PRE-EMPT DELAY TIME	-	-	-	-	-	-	-	-
1ST EMERG. PRE-EMPT CLEARANCE TIME	-	-	-	-	-	-	-	-
2ND EMERG. PRE-EMPT MOVEMENTS	-	-	-	-	-	-	-	-
2ND EMERG. PRE-EMPT DELAY TIME	-	-	-	-	-	-	-	-
2ND EMERG. PRE-EMPT CLEAR'CE TIME	-	-	-	-	-	-	-	-
RR PRE-EMPT TRACK CLEAR'CE MV'MTS	-	-	-	-	-	-	-	-
RR PRE-EMPT CLEARANCE TIME	-	-	-	-	-	-	-	-
RR PRE-EMPT DELAY TIME	-	-	-	-	-	-	-	-
RR PRE-EMPT LIMITED SERVICE MV'NTS	-	-	-	-	-	-	-	-

TIME OF DAY	**TIME OF DAY**		**DAY OF WEEK**							**MOVEMENT (FAZE)**							
OPERATIONS	[START]	[END]	S	M	T	W	T	F	S	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
PHASE OMIT			-	-	-	-	-	-	-	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
MAX RECALL			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PED RECALL			-	-	-	-	-	-	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
MIN RECALL			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAX GREEN 2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REST IN WALK			-	-	-	-	-	-	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
AMBER LOCK			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RED LOCK			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

n/a --- not applicable

NOTES TO DESIGNER:

1) Designers should consult the Regional Traffic Office regarding its recommendations for filling in of the signal timing sheet.

2) Designers should consult the Regional Electrical Coordinator and Regional Traffic Office regarding its recommendations for which controller is used.

3) Designers should use the timing sheet consistent with the one that the municipality uses where it is intended that the controller will be part of the municipal Traffic Signal system.

WARRANT: Always with these tender items.

TRAFFIC SIGNAL CONTROLLERS - Item No.
TRAFFIC SIGNAL CONTROLLERS (TEMPORARY) - Item No.

Amendment to OPSS 622, April 2025

622.07 Construction

622.07.08 Traffic Signal Controller Programming and Timing

Subsection 622.07.08 of OPSS 622 is amended with the addition of the following clause:

622.07.08.01 Traffic Signal Controller Timing Sheet

Traffic signal timing for the controller shall be as specified in the Generic Signal Timing Sheet below:

GENERIC SIGNAL TIMING SHEET

ACTUATED ☐ PRE-TIMED ☐ SIGNAL TO BE MAINTAINED BY: _____

LOCATION: _____ SIGNAL TO BE OPERATED BY: _____

MAIN STREET (HWY): _____ TIMING DEVELOPED BY: _____

DATE TIMING DEVELOPED: _____

GENERIC TIMING IDENTIFIED HERE SHALL BE TRANSCRIBED ONTO "OFFICIAL" TIMING SHEETS FOR THE TRAFFIC SIGNAL CONTROLLER BEING USED AT THIS SIGNALIZED INTERSECTION. A COPY OF THE "OFFICIAL" LOCAL TIMING SHEETS AND COORDINATION SHEETS IF USED, SHALL BE ATTACHED TO THIS FORM AND FILED IN THE MTO REGIONAL TRAFFIC OFFICE.

OPERATIONAL NOTES:

1. All Protected/Permissive left turn movements shall be followed by parent through movements without exception.
2. If serving F2 and F6 the signal must cycle to F4 and/or F8 prior to serving a call for F1 and/or F5 if these left turn movements are protected/permissive.
3. If serving F4 and F8, the signal must cycle to F2 and/or F6 prior to serving a call for F3 and/or F7 if these left turn movements are protected/permissive.
4. Through Movements shall lag left turn movements unless otherwise specified.

FUNCTION/OPERATION	**MOVEMENT (FAZE)**							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
PERMITTED MOVEMENTS	-	-	-	-	-	-	-	-
RED LOCK	-	-	-	-	-	-	-	-
AMBER LOCK	-	-	-	-	-	-	-	-
VEHICLE RECALL	-	-	-	-	-	-	-	-
PEDESTRIAN RECALL	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
VEHICLE MAX RECALL	-	-	-	-	-	-	-	-
OVERLAP A	-	-	-	-	-	-	-	-
OVERLAP B	-	-	-	-	-	-	-	-
PROT/PERM LEFT TURN ARROW	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
PROT/PERM FAST FLASH ADVANCE GREEN	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
FULLY PROTECTED LEFT TURN	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
DISPLAY AMBER ON STARTUP	-	-	-	-	-	-	-	-
PLACE PEDESTRIAN CALLS ON STARTUP	-	-	-	-	-	-	-	-
PLACE VEHICLE CALLS ON STARTUP	-	-	-	-	-	-	-	-
REST IN WALK	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
MOVEMENTS MUST GAP OUT SIMUL'LY	-	-	-	-	-	-	-	-
DOUBLE ENTRY	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
EXCLUSIVE PHASING BY APPROACH	-	-	-	-	-	-	-	-

n/a --- not applicable

INTERVAL TIMES

	MOVEMENT (FAZE)							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
WALK	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
FLASHING DON'T WALK	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
MINIMUM GREEN	-	-	-	-	-	-	-	-
VEHICLE EXTENSION (PASSAGE TIME)	-	-	-	-	-	-	-	-
MAX GREEN (INCLUDES MIN GREEN)	-	-	-	-	-	-	-	-
MAX GREEN 2 (ALTERNATE MAX GREEN)	-	-	-	-	-	-	-	-
AMBER CLEARANCE	-	-	-	-	-	-	-	-
ALL RED CLEARANCE	-	-	-	-	-	-	-	-
MAX GAP (VEH. EXTENSION)	-	-	-	-	-	-	-	-
MIN GAP (VEH. EXTENSION)	-	-	-	-	-	-	-	-
REDUCE GAP BY	-	-	-	-	-	-	-	-
REDUCE GAP EVERY	-	-	-	-	-	-	-	-
MAX INITIAL GREEN TIME (VAR. INIT)	-	-	-	-	-	-	-	-
TIME ADDED/VEHICLE (VAR. INIT)	-	-	-	-	-	-	-	-

n/a --- not applicable

DETECTOR SETUP

	MOVEMENT (FAZE)							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
DELAY TIME ON PRESENCE DETECTION	-	-	-	-	-	-	-	-
DELAY TIME ON LONG DIST. DETECTION	-	-	-	-	-	-	-	-
CARRY-OVER ON PRESENCE DETECTION	-	-	-	-	-	-	-	-
CARRY-OVER ON LONG DIST. DETECTION	-	-	-	-	-	-	-	-

PRE-EMPTION

	MOVEMENT (FAZE)							
	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
1ST EMERG. PRE-EMPT MOVEMENTS	-	-	-	-	-	-	-	-
1ST EMERG. PRE-EMPT DELAY TIME	-	-	-	-	-	-	-	-
1ST EMERG. PRE-EMPT CLEARANCE TIME	-	-	-	-	-	-	-	-
2ND EMERG. PRE-EMPT MOVEMENTS	-	-	-	-	-	-	-	-
2ND EMERG. PRE-EMPT DELAY TIME	-	-	-	-	-	-	-	-
2ND EMERG. PRE-EMPT CLEAR'CE TIME	-	-	-	-	-	-	-	-
RR PRE-EMPT TRACK CLEAR'CE MV'MTS	-	-	-	-	-	-	-	-
RR PRE-EMPT CLEARANCE TIME	-	-	-	-	-	-	-	-
RR PRE-EMPT DELAY TIME	-	-	-	-	-	-	-	-
RR PRE-EMPT LIMITED SERVICE MV'NTS	-	-	-	-	-	-	-	-

TIME OF DAY	**TIME OF DAY**		**DAY OF WEEK**							**MOVEMENT (FAZE)**							
OPERATIONS	[START]	[END]	S	M	T	W	T	F	S	[NB LEFT]	[NB THRU]	[WB LEFT]	[WB THRU]	[SB LEFT]	[SB THRU]	[EB LEFT]	[EB THRU]
PHASE OMIT			-	-	-	-	-	-	-	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**
MAX RECALL			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PED RECALL			-	-	-	-	-	-	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
MIN RECALL			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAX GREEN 2			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REST IN WALK			-	-	-	-	-	-	-	**n/a**	-	**n/a**	-	**n/a**	-	**n/a**	-
AMBER LOCK			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RED LOCK			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

n/a --- not applicable

NOTES TO DESIGNER:

1) Designers should consult the Regional Traffic Office regarding its recommendations for filling in of the signal timing sheet.

2) Designers should consult the Regional Electrical Coordinator and Regional Traffic Office regarding its recommendations for which controller is used.

3) Designers should use the timing sheet consistent with the one that the municipality uses where it is intended that the controller will be part of the municipal Traffic Signal system.

WARRANT: Always with these tender items.

Amendment to OPSS 622, April ~~2017~~2025

622.05 MATERIALS

Section 622.05 of OPSS 622 is amended by the addition of the following subsections:

622.05.~~09~~12 Components

Cabinets shall meet the requirements of the current version of the Ontario Traffic Signal Control Equipment Specifications (OTSCES) except as noted below.

The Specifications section of Chapter 13 of the OTSCES for the digital thermostat panels is amended as follows:

Function	Description	Preset Value
Ht	Heater turn on temperature	+10.0
Ht.HS	Heater Hysteresis value	+5.5
Fn	Fan turn on temperature	+25.0
Fn.HS	Fan hysteresis value	+5.5
HI.Ct	High cut-off temperature of critical equipment	+55.0
HI.HS	High cut-off hysteresis	+2.0
LO.Ct	Low cut-off temperature of critical equipment	-10.0
LO.HS	Low cut-off hysteresis	+2.0
HI.FL	High cut-off count; the number of times the temperature has exceeded HI.Ct to a maximum of 999	0
LO.FL	Low cut-off count; the number of times the temperature has exceeded LO.Ct to a maximum of 999	0
HI.t	Highest temperature since last reset	+99.99
LO.t	Lowest temperature since last reset	-99.99

622.05.~~10~~13 Service Light

Lamps shall be 50W energy efficient rated for rough service.

The lamp shall be installed after the cabinet is mounted in the field.

622.05.~~11~~14 External Cable Access Enclosure

The external cable access enclosure shall be made of 3.175 mm thick aluminum with a polyester powder coat matching the cabinet colour. The enclosure dimension shall not exceed 305 mm W x 200 mm H x 100 mm D.

The enclosure shall have three 19 mm holes to provide access for cables of 10 mm in diameter and be able to accommodate one cable with a 12.5 mm connector. Space around the access holes shall allow for the installation of liquid-tight connectors. The enclosure shall be shipped from the factory with all access holes securely plugged with rubber type fittings designed for cable entry.

The door to the enclosure shall have a stainless steel hinge on one side and be configured with an internal catch that provides access from inside the cabinet only. An external locking mechanism for the enclosure shall not be provided.

The enclosure door shall not interfere with liquid tight connectors when closed. The enclosure shall be sealed to provide a NEMA 4 rating.

622.05.~~12~~15 Antenna Mount

The cabinet shall be supplied with an external antenna mount bracket suitable for mounting antennas with up to 16 mm diameter threaded bolt. The mounting bracket shall be “L” shaped with two holes and a cable slot on the top portion for the antenna and two holes on the side to secure the bracket to the cabinet. The bracket is to be stainless steel or aluminum with polyester powder coat matching the cabinet colour.

622.07 CONSTRUCTION

622.07.03 Timing of Work

Subsection 622.07.03 of OPSS 622 is amended by the addition of the following:

The controller cabinet shall be energized immediately following installation and all environmental equipment shall be operational.

622.07.04.05 Equipment Ground

Clause 622.07.04.05 of OPSS 622 is deleted and replaced with the following:

The controller cabinet ground shall be connected to the system ground at the power supply cabinet ground bus in accordance with the requirements of OPSS 609 or, the neutral cable shall be connected to the cabinet AC - terminal and kept independent of the grounding facilities.

622.07.04.06 Installation of External Cable Access Enclosure

The external cable access enclosure shall be mounted as specified in the Contract Documents

The enclosure shall be installed such that opening of the door is not obstructed by the adjacent power supply cabinet.

622.07.05.04 Identification of Equipment

Clause 622.07.05.04 of OPSS 622 is deleted in its entirety and replaced with the following:

622.07.05.04 Cabinet Identification

A laminated phenolic plastic nameplate shall be installed on the side of each cabinet facing traffic such that it can be easily seen from the highway. Nameplates shall be 450 mm x 70 mm with 50 mm high white lettering, 8 mm letter stroke width and 6 mm spacing between letters, on a black background. Letters shall be generated by an engraving machine.

In cases where cabinets are installed behind noise barriers, the nameplate shall be installed over or on the front door of the cabinet and an additional nameplate shall be installed on the highway side of the noise barrier, over the access door. Nameplates shall be fastened with four stainless steel self-tapping screws, with 'Robertson' No. 2 (red) heads. The nameplate information shall be confirmed with the Contract Administrator prior to manufacturing the nameplates.

The name plate shall contain the full 12 characters of the Universal Identifier including the highway name (Example: 401CE0420DEC).

622.07.06 Quality Control

Subsection 622.07.06 of OPSS 622 is deleted and replaced with the following:

The framework of the approval process shall be as specified elsewhere in the Contract Documents.

622.07.06.01 Pre-Installation Testing

The Contractor is required to perform quality control testing on 10% of cabinets and 100% of digital thermostats prior to delivering the cabinets and thermostats. The Contractor shall test each cabinet and thermostat to confirm that it meets the requirements of the Ontario Traffic Signal Control Equipment Specifications (OTSCES).

The quality control testing and test procedures shall include, but not be limited to the following:

Visual Inspection

The Contractor shall perform detailed visual inspection to confirm that the following aspects of the cabinet are in compliance with the requirements of the Ontario Traffic Signal Control Equipment Specifications (OTSCES) as applicable for the appropriate cabinet type:

General Appearance
Cabinet Dimensions
Finish
Locks
Door Handles
Door Frames
Latching Mechanism
Door Hinges, Pin and Bolts
Catches
Louvred Vents and Filters
Gaskets
Heater Bracket
Storage for Drawings
Front Face Plate
Fan Ventilation Area
Cabinet Pedestal
Output Files
Equipment Racks
Lifting Eyes
Trouble Lamp
Insulation
Ventilation Requirements
Heating Requirements
Side Panel
Input Panel
Service Panel
Labelling
Cabinet Wiring Diagram
Power Distribution Assembly
Conductors
Colour Coding
Terminal Blocks
24 Volt DC Power Supply
Power Supply Front Panel
Input Files
Digital Thermostat
Connectors and Harness
Screws

Functional Testing

The Contractor shall measure the following cabinet attributes:

Paint Thickness

The Contractor shall perform functional tests of the following components:

Trouble Lamp
Input Files Wiring
24 Volt DC Power Supply
Power Distribution Assembly
Fan
Heater
Main Power Disconnect
Digital Thermostat
Output Files Wiring

622.07.06.02 Proof of Performance Testing

The Contractor shall energize each cabinet and confirm proper operation of 24 VDC power supply, heaters, fans, thermostats and service lights.

622.07.06.03 System Integration Testing

The Contractor shall carry out System Integration Testing to ensure that the cabinets perform to the specified standards when operated as follows:

a) In operation with controller units, detector sensor units and actuation devices installed under the Contract.

b) In operation with existing control and actuation devices.

622.09 MEASUREMENT FOR PAYMENT

622.09.01.01 Actual Measurement

Clause 622.09.01.01 of OPSS 622 is amended by the addition of the following:

For measurement purposes, a count shall be of the number of controller cabinets installed.

622.10 BASIS OF PAYMENT

Clause 622.10.02 of OPSS 622 is amended by the addition of the following:

622.10.02.03 Controller Cabinets - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Materials required to do the work, except System Integration Testing which is paid for under a separate item.

WARRANT: Always with this tender item.

Amendment to OPSS 622, April 2025

622.05 MATERIALS

Section 622.05 of OPSS 622 is amended by the addition of the following subsections:

622.05.12 Components

Cabinets shall meet the requirements of the current version of the Ontario Traffic Signal Control Equipment Specifications (OTSCES) except as noted below.

The Specifications section of Chapter 13 of the OTSCES for the digital thermostat panels is amended as follows:

Function	Description	Preset Value
Ht	Heater turn on temperature	+10.0
Ht.HS	Heater Hysteresis value	+5.5
Fn	Fan turn on temperature	+25.0
Fn.HS	Fan hysteresis value	+5.5
HI.Ct	High cut-off temperature of critical equipment	+55.0
HI.HS	High cut-off hysteresis	+2.0
LO.Ct	Low cut-off temperature of critical equipment	-10.0
LO.HS	Low cut-off hysteresis	+2.0
HI.FL	High cut-off count; the number of times the temperature has exceeded HI.Ct to a maximum of 999	0
LO.FL	Low cut-off count; the number of times the temperature has exceeded LO.Ct to a maximum of 999	0
HI.t	Highest temperature since last reset	+99.99
LO.t	Lowest temperature since last reset	-99.99

622.05.13 Service Light

Lamps shall be 50W energy efficient rated for rough service.

The lamp shall be installed after the cabinet is mounted in the field.

622.05.14 External Cable Access Enclosure

The external cable access enclosure shall be made of 3.175 mm thick aluminum with a polyester powder coat matching the cabinet colour. The enclosure dimension shall not exceed 305 mm W x 200 mm H x 100 mm D.

The enclosure shall have three 19 mm holes to provide access for cables of 10 mm in diameter and be able to accommodate one cable with a 12.5 mm connector. Space around the access holes shall allow for the installation of liquid-tight connectors. The enclosure shall be shipped from the factory with all access holes securely plugged with rubber type fittings designed for cable entry.

The door to the enclosure shall have a stainless steel hinge on one side and be configured with an internal catch that provides access from inside the cabinet only. An external locking mechanism for the enclosure shall not be provided.

The enclosure door shall not interfere with liquid tight connectors when closed. The enclosure shall be sealed to provide a NEMA 4 rating.

622.05.15 Antenna Mount

The cabinet shall be supplied with an external antenna mount bracket suitable for mounting antennas with up to 16 mm diameter threaded bolt. The mounting bracket shall be “L” shaped with two holes and a cable slot on the top portion for the antenna and two holes on the side to secure the bracket to the cabinet. The bracket is to be stainless steel or aluminum with polyester powder coat matching the cabinet colour.

622.07 CONSTRUCTION

622.07.03 Timing of Work

Subsection 622.07.03 of OPSS 622 is amended by the addition of the following:

The controller cabinet shall be energized immediately following installation and all environmental equipment shall be operational.

622.07.04.05 Equipment Ground

Clause 622.07.04.05 of OPSS 622 is deleted and replaced with the following:

The controller cabinet ground shall be connected to the system ground at the power supply cabinet ground bus in accordance with the requirements of OPSS 609 or, the neutral cable shall be connected to the cabinet AC - terminal and kept independent of the grounding facilities.

622.07.04.06 Installation of External Cable Access Enclosure

The external cable access enclosure shall be mounted as specified in the Contract Documents

The enclosure shall be installed such that opening of the door is not obstructed by the adjacent power supply cabinet.

622.07.05.04 Identification of Equipment

Clause 622.07.05.04 of OPSS 622 is deleted in its entirety and replaced with the following:

622.07.05.04 Cabinet Identification

A laminated phenolic plastic nameplate shall be installed on the side of each cabinet facing traffic such that it can be easily seen from the highway. Nameplates shall be 450 mm x 70 mm with 50 mm high white lettering, 8 mm letter stroke width and 6 mm spacing between letters, on a black background. Letters shall be generated by an engraving machine.

In cases where cabinets are installed behind noise barriers, the nameplate shall be installed over or on the front door of the cabinet and an additional nameplate shall be installed on the highway side of the noise barrier, over the access door. Nameplates shall be fastened with four stainless steel self-tapping screws, with 'Robertson' No. 2 (red) heads. The nameplate information shall be confirmed with the Contract Administrator prior to manufacturing the nameplates.

The name plate shall contain the full 12 characters of the Universal Identifier including the highway name (Example: 401CE0420DEC).

622.07.06 Quality Control

Subsection 622.07.06 of OPSS 622 is deleted and replaced with the following:

The framework of the approval process shall be as specified elsewhere in the Contract Documents.

622.07.06.01 Pre-Installation Testing

The Contractor is required to perform quality control testing on 10% of cabinets and 100% of digital thermostats prior to delivering the cabinets and thermostats. The Contractor shall test each cabinet and thermostat to confirm that it meets the requirements of the Ontario Traffic Signal Control Equipment Specifications (OTSCES).

The quality control testing and test procedures shall include, but not be limited to the following:

Visual Inspection

The Contractor shall perform detailed visual inspection to confirm that the following aspects of the cabinet are in compliance with the requirements of the Ontario Traffic Signal Control Equipment Specifications (OTSCES) as applicable for the appropriate cabinet type:

General Appearance
Cabinet Dimensions
Finish
Locks
Door Handles
Door Frames
Latching Mechanism
Door Hinges, Pin and Bolts
Catches
Louvred Vents and Filters
Gaskets
Heater Bracket
Storage for Drawings
Front Face Plate
Fan Ventilation Area
Cabinet Pedestal
Output Files
Equipment Racks
Lifting Eyes
Trouble Lamp
Insulation
Ventilation Requirements
Heating Requirements
Side Panel
Input Panel
Service Panel
Labelling
Cabinet Wiring Diagram
Power Distribution Assembly
Conductors
Colour Coding
Terminal Blocks
24 Volt DC Power Supply
Power Supply Front Panel
Input Files
Digital Thermostat
Connectors and Harness
Screws

Functional Testing

The Contractor shall measure the following cabinet attributes:

Paint Thickness

The Contractor shall perform functional tests of the following components:

Trouble Lamp
Input Files Wiring
24 Volt DC Power Supply
Power Distribution Assembly
Fan
Heater
Main Power Disconnect
Digital Thermostat
Output Files Wiring

622.07.06.02 Proof of Performance Testing

The Contractor shall energize each cabinet and confirm proper operation of 24 VDC power supply, heaters, fans, thermostats and service lights.

622.07.06.03 System Integration Testing

The Contractor shall carry out System Integration Testing to ensure that the cabinets perform to the specified standards when operated as follows:

a) In operation with controller units, detector sensor units and actuation devices installed under the Contract.

b) In operation with existing control and actuation devices.

622.09 MEASUREMENT FOR PAYMENT

622.09.01.01 Actual Measurement

Clause 622.09.01.01 of OPSS 622 is amended by the addition of the following:

For measurement purposes, a count shall be of the number of controller cabinets installed.

622.10 BASIS OF PAYMENT

Clause 622.10.02 of OPSS 622 is amended by the addition of the following:

622.10.02.03 Controller Cabinets - Item

Payment at the Contract price for the above tender item shall be full compensation for all labour, Equipment and Materials required to do the work, except System Integration Testing which is paid for under a separate item.

WARRANT: Always with this tender item.