



**MATERIAL SPECIFICATION FOR
STEEL POLES, BASE MOUNTED**

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2423.01 SCOPE

This specification covers the requirements for base mounted galvanized steel poles maximum 15.1 m in length.

2423.01.01 Specification Significance and Use

This specification is written as a municipal-oriented specification. Municipal-oriented specifications are developed to reflect the administration, testing, and payment policies, procedures, and practices of many municipalities in Ontario.

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

2423.01.02 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.

2423.02 REFERENCES

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

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

Ontario Provincial Standard Specifications, Construction

OPSS 906 Structural Steel for Bridges
OPSS 911 Coating Structural Steel Systems

Ontario Ministry of Transportation Publication

Designated Sources for Materials (DSM)
Structural Manual

Canadian General Standards Board (CGSB)

48.9712-14 Non-Destructive Testing – Qualification and Certification of NDT Personnel

CSA Standards

G40.20-13/G40.21-13 (R2018) General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
S6-19 Canadian Highway Bridge Design Code
W47.1-19 Certification of Companies for Fusion Welding of Steel
W59-18 Welded Steel Construction
W178.1-18 Certification of Welding Inspection Organizations
W178.2-18 Certification of Welding Inspectors

American Association of State Highway and Transportation Officials (AASHTO)

LTS-5-M Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 5th Edition, Interim Revisions (2010)

ASTM International

A123/A123M-17 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

2423.04 DESIGN AND SUBMISSION REQUIREMENTS

2423.04.01 Design Requirements

All poles shall be designed to support the required traffic signal and lighting system components and shall be according to CSA S6 and MTO Structural Manual. All poles shall be according to CSA S6 and AASHTO LTS-5-M for fatigue requirements, AASHTO Fatigue Importance Category 2.

2423.04.01.01 Wind Loading

Wind loading shall be based on the maximum wind pressure for Ontario according to CSA S6.

2423.04.01.02 Ice Loading

Ice loading shall be based on the maximum ice loading in Ontario according to CSA S6.

2423.04.01.03 Supported Load Parameters

Design calculations shall employ force and dimensions for various items of equipment to be mounted on the poles as shown in Table 2 and 3.

2423.04.02 Submission Requirements

2423.04.02.01 Working Drawings

Working Drawings shall be prepared for the fabrication of steel poles.

Three sets of Working Drawings shall be submitted to the Contract Administrator at least 14 Days prior to commencement of fabrication of the steel poles, for information purposes only. The seals and signatures of the design Engineer shall be affixed on the Working Drawings prior to submission.

Where multi-discipline engineering work is depicted on the same Working Drawing and the design or design-checking Engineer or both are unable to seal and sign the Working Drawing for all aspects of the work, the drawing shall be sealed and signed by as many additional design and design-checking Engineers as necessary.

As a minimum, the Working Drawings shall include the following information:

- a) Detailed dimensions.
- b) Plans, elevations, sections, and details to show pole structural details.
- c) Equipment layout.
- d) Anchor bolt locations.

- e) Exact pole weight.
- f) Detailed bill of materials.
- g) Details of equipment nameplates.

A copy of the Working Drawings shall be retained for 7 years.

2423.04.02.02 Mill Test Certificates

Mill test certificates shall be submitted according to OPSS 906.

2423.05 MATERIALS

2423.05.01 General

All steel used in the production of poles shall be according to CSA G40.21, grade 300W, for pole shafts, and grade 300WT, for base plates.

All steel shall be galvanized according to ASTM A123M.

2423.07 PRODUCTION

2423.07.01 General

The length of poles shall be as specified in the Contract Documents.

Shafts shall be round or octagonal in cross-section as specified in the Contract Documents and taper uniformly inwards from the base for the length of the pole. Shafts shall be fabricated to meet the supported load parameters.

Shafts shall have one or two longitudinal automatically electrically welded joints from top to bottom.

All welding shall be according to CSA W59.

All welds, except for fillet welds, shall be ground smooth.

The maximum permitted number of circumferential welded joints shall be as shown in Table 1.

The pole sections shall be joined by an electrical weld.

After fabrication, poles shall be galvanized.

Sweep shall not exceed 3.2 mm per 4.57 m, and the overall sweep shall not be greater than:

$$(\text{Pole length (m)}/4.57 \text{ m}) \times 3.2 \text{ mm}$$

The pole shall be supplied with a one-piece fabricated rolled steel base plate.

The base shall telescope the butt end of the shaft and be secured with one continuous weld on the inside of the base at the end of the shaft and another continuous weld on the outside at the top of the base. All welding at the base shall be made in such a manner that the welded connection develops the same strength of the adjacent shaft section to resist any bending action.

After fabrication, the underside of the base plate shall be true, distortion free, and perpendicular to the centreline of the pole shaft.

A removable galvanized steel or aluminum top cap shall be supplied with the shaft. The cap shall blend with the general pole design to present an overall neat appearance. The cap shall be secured rigidly to the shaft by a hexagonal head stainless steel set screw.

Wiring apertures at the bracket mounting level and at the handhole shall be accurately positioned on the pole. Wiring apertures, complete with neoprene grommets, shall provide a smooth cable entrance.

Handholes shall be complete with covers and shall be reinforced with a steel handhole frame of such strength and cross section that the strength of the shaft is not reduced.

2423.07.02 Fabrication Outside of Canada and USA

For steel poles fabricated in a production facility outside of Canada and USA, the manufacturer shall be listed in the MTO DSM or the following requirements shall apply:

- a) Fabrication of steel poles shall not begin until the information on the mill test certificates is verified by testing at a Canadian laboratory according to OPSS 906. The mill test certificates by the Canadian laboratory shall be stamped with the name of the laboratory and state that the material is according to the specified Contract requirements. Two copies of these stamped mill test certificates shall be submitted to the Contract Administrator.
- b) All steel poles fabricated outside of Canada and USA shall be shipped to a facility in Canada certified in accordance with CSA W47.1, Division 1 or 2 for quality verification.
- c) Shipped steel poles shall be accompanied by reports containing the results of all inspection and testing performed in the production facility outside of Canada and USA demonstrating compliance with the Quality Control subsection of this specification.
- d) Prior to galvanizing or coating, steel poles shall be in a condition that permits inspection and testing.
- e) The manufacturer shall hire an independent welding inspection company to perform quality verification of shipped steel poles according to the Quality Control subsection of this specification. All costs incurred to perform inspection and testing at a Canadian facility shall be the responsibility of the Contractor.
- f) Acceptance of steel poles shall be based on satisfactory inspection of one randomly selected complete pole from a lot. The size of a lot shall consist of a maximum five poles. All of the components of the pole shall be inspected and tested according to the Quality Control subsection of this specification. Reports accompanying the shipment shall also be reviewed by the welding inspector. Inspection, testing, and reporting shall be done on each shipment received.
- g) The welding inspector shall ensure that traceability of all structural steel has been maintained by:
 - i. Correlation of heat numbers on steel poles to the mill test certificates.
 - ii. Review of mill test certificates, verifying that materials used conform to the contract requirements.
- h) If the inspection or testing performed on the steel poles demonstrate that they do not meet the requirements of the Contract Documents, all poles in that lot shall be rejected.

2423.07.03 Mounting Plate for Grounding

The mounting plate for the grounding post shall be welded to the shaft in such a manner as to present a smooth surface on the exterior of the shaft.

A mounting plate with a bronze split-bolt type ground connector suitable for two No. 6 AWG wires shall be welded to the inside of each pole. The bronze ground connector shall be attached to the mounting plate prior to shipment.

2423.07.04 Marking

Each pole shall have the following identification markings located approximately 100 mm above the top of the handhole:

- a) Manufacturer's name or trademark.
- b) Fabrication plant location.
- c) Length.
- d) Gauge of steel.
- e) Bolt circle diameter.
- f) Designation OPSS 2423.
- g) Date of manufacture (i.e., yyyy-mm-dd).

These markings shall be on a corrosion-resistant metal plate securely attached to the surface of the pole.

2423.07.05 Packaging and Shipping

Each pole shall be shipped complete with hardware suitably packaged to ensure that all parts are delivered as an entity.

The grounding connector shall be assembled inside the pole prior to shipment.

The Owner shall be advised of the shipping date 3 Business Days prior to delivery.

2423.07.06 Quality Control

The Contract Administrator shall be notified of the fabrication, testing, and delivery dates.

2423.07.06.01 Certification

2423.07.06.01.01 Welding Inspection Company

The company undertaking welding inspection shall be certified under the Bridges category in accordance with CSA W178.1. Certification shall include visual inspection as well as all non-destructive testing methods required to fulfill the inspection and testing requirements of this specification.

2423.07.06.01.02 Welding Inspectors for Visual Inspection and Non-Destructive Testing

Visual inspection of steel poles shall be performed by welding inspectors certified in accordance with CSA W178.2. Certification shall be to either CWB level 2 or CWB level 3.

Non-destructive testing of the steel poles shall be performed by an ultrasonic or radiographic technician, or both, certified in accordance with CAN/CGSB 48.9712, to either CGSB level 2 or CGSB level 3 for the method used.

2423.07.06.01.03 Coating Inspectors

Coating inspectors shall have successfully completed National Association of Corrosion Engineers Coating Inspection Program (NACE CIP) Level 1 and Level 2 with a minimum of 3 years of proven coating inspection experience.

2423.07.06.02 Inspection, Testing, and Reporting

2423.07.06.02.01 Welding Inspection and Testing

The welding inspector shall inspect and test steel poles as follows:

a) Visual Inspection

The fabrication of steel components shall be visually inspected to ensure material, dimensions, fit-up, and welding are according to specifications. Certification of conformance by the welding inspector for each phase of the fabrication shall be based on the applicable Working Drawings, codes, and specifications.

The welding inspector shall witness the trial-assembly of the pole sections to ensure compliance with the Contract Documents.

When the steel poles have been delivered to the Working Area and prior to installation, the inspector with the required credentials shall inspect them to ensure that all the components of the steel poles are according to the Contract Documents.

b) Non-Destructive Testing

All complete penetration groove welds, including shaft to base welds, circumferential splices in shaft and welds at slip joints, shall be 100% tested. Longitudinal welds at the bottom of the shaft shall be tested for a length of 2.0 m from the base plate. All testing of groove welds shall be by radiographic or ultrasonic test method and shall be according to CSA W59 for cyclically loaded structures. Any weld repairs shall be tested by appropriate methods as determined by an Engineer.

2423.07.06.02.02 Coating Inspection

The coating inspector shall inspect each phase of the cleaning and coating work for compliance with the Contract Documents prior to proceeding to the next phase. Acceptance of the surface preparation and coating thickness measurements shall be according to OPSS 911.

2423.07.06.02.03 Reporting

Prior to shipping the steel poles to the site, the Contractor shall submit 2 copies of the inspection reports, containing the results of all the inspection and testing performed during fabrication, welding, and coating work, to the Contract Administrator. The inspection reports shall be completed and certified by the applicable inspector and signed and sealed by an Engineer.

2423.08 QUALITY ASSURANCE

2423.08.01 Inspection

All work is subject to an inspection by the Owner's representative prior to shipment.

The Owner shall be notified a minimum of 1 Business Day in advance of the date that the fabrication of the poles is to commence.

The Owner's representative shall have free access to the place of fabrication for the purpose of inspecting and examining plant records; certificates; materials used; fabrication process, including welding and galvanizing; and to make any tests as may be considered necessary, while the poles are being fabricated.

2423.09 OWNER PURCHASE OF MATERIAL

2423.09.01 Working Drawings and Shipment

Within 30 Days of receipt of a purchasing order to supply steel poles, the supplier shall submit 3 copies of Working Drawings, as described in the Submission Requirements subsection, to the Owner.

The supplier shall advise the Owner of the shipping date 3 Business Days prior to delivery.

2423.09.02 Measurement and Payment

For measurement purposes, a count shall be made of the number of steel poles delivered and accepted.

Payment at the price specified in the purchasing order shall be for the supply of the steel poles delivered to the destination on the date and time specified.

The cost of all testing, except that performed in the Owner's laboratory, shall be included in the price.

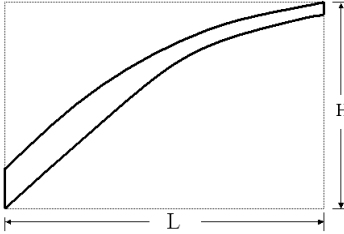
**TABLE 1
Circumferential Welded Joints**

Pole Length m	Maximum Number of Welds
6.0	1
7.5	1
9.0	1
10.5	2
12.0	2
13.6	2
15.1	3

**TABLE 2
Lighting Poles**

Item of Equipment	Dimensions mm	Projected Area m²	Weight N
Roadway Lighting Luminaire	990 L x 380 H	0.22	107
Roadway Lighting Bracket (Aluminum)	1800 L x 909 H	0.15	112
	2400 L x 1200 H	0.15	112
Bracket (Steel)	1965 L x 837 H	0.12	378
	2865 L x 990 H	0.15	556
<p>Notes:</p> <p>1. Each pole shall accommodate two brackets at 90-degree orientation.</p> <p>L = Total Length H = Total Height</p>			

**TABLE 3
Joint Use Poles (Lighting and Signals)**

Item of Equipment	Dimensions mm	Projected Area m ²	Weight N
Roadway Lighting Luminaire	990 L x 380 H	0.22	107
Roadway Lighting Bracket (Aluminum)	2400 L x 1200 H (tapered)	0.15	112
Double Arm Brackets (Aluminum)	400 L x 42 Dia. (2 per set)	0.04	24
Mast Arm (Aluminum) 	610 L x 250 H (tapered)	0.04	78
	1200 L x 530 H (tapered)	0.10	91
	1800 L x 610 H (tapered)	0.15	114
	2400 L x 840 H (tapered)	0.19	65
	3000 L x 610 H (tapered)	0.23	94
	3600 L x 840 H (tapered)	0.38	113
	4600 L x 1070 H (tapered)	0.47	216
	5500 L x 910 H (tapered)	0.70	324
Traffic Signal Heads (Aluminum: 4-Section)	1650 H x 610 W	1.01	123
Pedestrian Heads (Aluminum: 2-Section)	690 H x 345 W	0.23	78
Traffic Signs	Varies	1.50 (Note 1)	23
Street Name Sign	Varies	0.97 (Note 2)	54
Notes: 1. Traffic signs shall be split to give 0.25 m ² mounted on the mast arm beside the signal head and 0.5 m ² mounted at 2.75 m height above the pole base plate. 2. Street name or roadway identification sign shall have a maximum height of 0.45 m and a maximum size of 0.97 m ² . The sign shall be mounted on each mast arm or pole and the distance between the centre of the sign and the surface of the pole shall not exceed half the length (L) of the mast arm. Pole mounted street name signs shall be mounted at the same height as the mast arm mounted signs or at the top of the pole, whichever is less.			

**Appendix 2423-A, April 2022
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

The designer should specify the following in the Contract Documents:

- Steel pole lengths and round or octagonal shafts. (2423.07.01)

The designer should ensure that the General Conditions of Contract and the 100 Series General Specifications are included in the Contract Documents.

Related Ontario Provincial Standard Drawings

OPSD 2415.011	Steel Pole, Base Mounted
OPSD 2416.011	Steel Pole, Concrete Barrier Base Mounted