



MATERIAL SPECIFICATION FOR ALUMINUM POLES, BASE MOUNTED

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2452.01 SCOPE

This specification covers the requirements for base mounted aluminum poles maximum 15.1 m in length with cast shoe bases.

2452.01.01 Specification Significance and Use

This specification has been developed for use in municipal oriented Contracts. The administration, testing, and payment policies, procedures, and practices reflected in this specification correspond to those used by many municipalities in Ontario.

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

2452.01.02 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.

2452.02 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:

CSA Standards

S6-19 Canadian Highway Bridge Design Code
W47.2-11 (R2015) Certification of Companies for Fusion Welding of Aluminum

Ontario Ministry of Transportation Publication

Structural Manual

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

B108/B108M-19 Aluminum-Alloy Permanent Mold Castings
B221-14 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes

2452.04 DESIGN AND SUBMISSION REQUIREMENTS

2452.04.01 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.

2452.04.01.01 Wind Loading

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

2452.04.01.02 Ice Loading

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

2452.04.01.03 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 1 and 2.

2452.04.02 Submission Requirements

2452.04.02.01 Working Drawings

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

The Contractor shall submit 3 sets of Working Drawings to the Contract Administrator at least 14 Days prior to commencement of fabrication of the aluminum poles, for information purposes only. Prior to making a submission, the Contractor shall ensure the seals and signatures of a design Engineer and a design-checking Engineer are affixed on the Working Drawings.

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.

2452.05 MATERIALS

2452.05.01 General

Aluminum used in the production of pole shafts shall be according to ASTM B221, alloy 6063-T4.

Aluminum used in the production of base castings shall be according to ASTM B108, alloy A 356.0-T6.

2452.07 PRODUCTION

2452.07.01 General

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

The completed pole assembly shall be tempered to T6 condition and have a minimum yield strength of 165 MPa and a minimum ultimate tensile strength of 193 MPa.

Shafts shall be round in cross-section and taper from bottom to top.

Shafts shall be fabricated from a single tube with a wall thickness suitable to meet the supported load parameters.

Welded joints shall not be permitted for shafts.

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 cast shoe base complete with 8 gussets and a factory installed dampener for poles over 9.0 m in length.

After fabrication, the underside of the cast shoe base shall be true, distortion free, and perpendicular to the centreline of the pole shaft. When the cast shoe base is in contact with concrete, a cold tar epoxy coating shall be applied to the underside.

A removable aluminum top cap shall be supplied with the shaft. 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.

All welding shall be according to CSA W47.2.

The handhole shall be formed by extrusion or other appropriate method and be designed such that the strength and cross-section of the shaft is not reduced.

Handhole covers shall be provided complete with a neoprene gasket, secured with stainless steel fasteners, aluminum back bar, and stainless steel inserts.

The shaft shall be rotary sanded and protective wrapped for shipment.

2452.07.02 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 2 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.

2452.07.03 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) Length.
- c) Wall thickness.
- d) Bolt circle diameter.
- e) Designation OPSS 2452.
- f) Date of manufacture (i.e., yyyy-mm-dd).

These markings shall be on an aluminum plate securely attached to the surface of the pole.

2452.07.04 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 Contractor shall advise the Owner of the shipping date 3 Business Days prior to delivery.

2452.08 QUALITY ASSURANCE

2452.08.01 Inspection

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

The Owner shall be notified 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 to make any tests as may be considered necessary, while the poles are being fabricated.

2452.09 OWNER PURCHASE OF MATERIAL

2452.09.01 Working Drawings and Shipment

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

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

2452.09.02 Measurement and Payment

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

Payment at the price specified in the purchasing order shall be for the supply of aluminum 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
Lighting Poles**

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)	1800 L x 909 H 2400 L x 1200 H	0.15 0.15	112 112
Bracket (Steel)	1965 L x 837 H 2865 L x 990 H	0.12 0.15	378 556

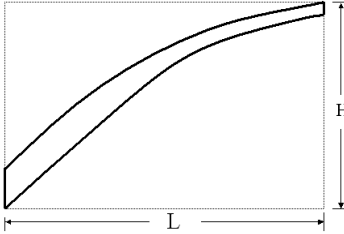
Notes:

- Each pole shall accommodate two brackets at 90-degree orientation.

L = Total Length

H = Total Height

**TABLE 2
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 2452-A, November 2021
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:

- Aluminum pole lengths. (2452.07.01)

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 2428.010 Frangible Bases
OPSD 2432.010 Aluminum Pole, Base Mounted