MATERIAL SPECIFICATION FOR SECTIONAL STEEL POLES

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2453.01 SCOPE

This specification covers the requirements for sectional steel poles.

2453.01.01 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.

2453.01.02 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.

2453.02 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 Ministry of Transportation Publications

Ontario Traffic Manual (OTM):
Book 12 - Traffic Signals

Structural Manual

CSA Standards

G40.21-13	General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
S6-14	Canadian Highway Bridge Design Code
W59-13	Welded Steel Construction (Metal Arc Welding)

ASTM International

A 123/A 123M-15	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

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)

2453.03 DEFINITIONS

For the purpose of this specification, the following definitions apply:

Product Drawings means drawings prepared by the manufacturer that have been approved by the Owner for use with the product.

2453.04 DESIGN AND SUBMISSION REQUIREMENTS

2453.04.01 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.

2453.04.01.01 Wind Loading

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

2453.04.01.02 Ice Loading

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

2453.04.01.03 Geometric Parameters

Latitude of design and fabrication details is at the discretion of the supplier and is subject to approval of the design by the Owner.

2453.04.01.04 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.

2453.04.01.05 Sectional Steel Poles

Sectional steel poles used for traffic signal or combination of traffic signal and lighting system shall be base mounted and shall be capable of bearing the loads associated with configurations shown in Table 2.

Direct buried sectional steel poles shall be capable of bearing the loads associated with the equipment shown in Table 3.

Flasher/sign poles shall be capable of bearing the loads associated with the equipment shown in Table 4.

2453.04.01.06 Location of Equipment

Mast arms shall be solidly attached to the pole at a height above the pole base plate as given by:

H_A = 5,650 mm - H

Where:

H_A = mast arm height above the pole base plate
H = mast arm height from Table 1

When more than one mast arm is considered, the shorter arm shall be attached to the pole at a point 300 mm above that of the longer arm.

Pedestrian heads shall be mounted as specified in the Contract Documents.

Luminaire brackets shall be mounted at a point 150 mm from the top of the pole.

2453.04.02 Submission Requirements

2453.04.02.01 Product Drawings

The sectional steel pole manufacturer shall submit the product drawings and the design assumptions and calculations for the poles to the Contract Administrator.

As a minimum, the product drawings shall include the following information:

a) Material properties and standards.

b) Dimensions.

c) Hardware requirements.

d) Plans, elevations, sections, and details to show pole structural details.

e) Anchor bolt locations.

f) Welds.

g) Joining method for sectional steel poles sections.

The product drawings and calculations shall bear the seals and signatures of the design and design-checking Engineers.

2453.04.02.02 Working Drawings

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

Three sets of Working Drawings shall be submitted to the Contract Administrator at least 14 Days prior to the commencement of fabrication of the sectional steel poles for information purposes only. An Engineer shall affix his or her seal and signature on the Working Drawings verifying that the Working Drawings are consistent with the Contract Documents and sound engineering practices.

When multi-discipline engineering work is depicted on the same Working Drawing and a single Engineer is unable to seal and sign the Working Drawing for all aspects of the work, the drawing shall be signed and sealed by as many additional 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.

2453.05 MATERIALS

2453.05.01 General

All steel used in the production of poles shall be according to CAN/CSA G40.21, Grade 300WT, Category 2, for pole shafts, base plates, and gussets.

All welding shall be according to CSA W59.

2453.07 PRODUCTION

2453.07.01 General

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

The pole base plate for any height of pole shall be made with mounting holes suitable for the anchor rod or anchorage assembly.

The underside of the anchor base shall be true, distortion free, and perpendicular to the centreline of the pole shaft after fabrication.

A waterproof, removable galvanized steel top cap shall be furnished with the pole. The cap shall blend with the general pole design to present a neat overall appearance. The cap shall be rigidly secured to the top of the pole 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.

All wiring apertures shall provide a smooth cable entrance and be complete with rubber grommets.

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

2453.07.01.01 Galvanizing

All components shall be hot dip galvanized according to ASTM A 123.

2453.07.02 Steel Sections

2453.07.02.01 General

The following covers types and lengths of sectional steel poles:

a) Base mounted: 7.00, 8.70, and 10.50 m

b) Direct buried: 5.25, 7.00, 8.70, 10.25, and 12.00 m

c) Flasher/sign: 3.30 m

Pole sections shall be of round tapered construction so that a number of sections may be assembled by means of an overlapping press fit to form a tapered steel pole of the desired length.

Each section shall have one longitudinal automated electrically welded joint from top to bottom.

Each section shall be stencilled with O-L and graduations in one inch increments. O-L represents the nominal overlap requirement for each section.

2453.07.02.02 Base Mounted and Direct Buried Poles, 5.25 m and Longer

For lighting applications, a wiring aperture, complete with 28.5 mm ID rubber grommet shall be drilled 300 mm from the top of the pole.

Each base mounted pole shall be supplied with a reinforced 180 x 300 mm handhole, complete with cover. Each direct buried pole shall be supplied with a reinforced 100 x 200 mm handhole, complete with cover. A 6 x 38 x 250 mm long plate shall be welded inside the pole opposite the handhole. A ground connector shall be mounted on the plate. The ground connector shall be suitable for No. 6 AWG wire.

The centre of the handhole on base mounted poles shall be 1.1 m from the bottom of the pole and on direct buried poles the centre of the handhole shall be 2.75 m from the bottom of the pole.

Base mounted poles shall have a steel plate anchor base with 4 holes on a 449 mm bolt circle, suitable for mounting on 32 mm diameter studs.

Direct buried sectional steel poles shall have 65 x 300 mm wiring apertures on each side of the pole, the centre of the apertures shall be 1.25 m from the bottom of the pole.

2453.07.02.03 Flasher Poles

The flasher pole shall be comprised of two pole sections totalling 2.3 m in length with a 1.2 m length of 50 mm IPS Schedule 40 pipe inserted 230 mm into the top and welded in place to provide a total length of 3.3 m.

The top end of the extension shall be threaded and the thread cleaned after galvanizing.

Each pole shall be supplied with a 75 x 100 mm handhole, complete with cover. The bottom edge of the handhole shall be 150 mm from the bottom of the pole.

A ground terminal shall be provided in the handhole.

The flasher pole shall be supplied with a steel plate anchor base with 4 holes on a 150 mm bolt circle, suitable for mounting on 16 mm diameter studs.

2453.07.03 Marking

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

a) Manufacturer's name or trademark.

b) Length.

c) Designation OPSS 2453.

d) Manufacturer's catalogue number.

e) Date of manufacture (i.e., yyyy-mm-dd).

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

2453.07.04 Ground Bar

A ground bar with a bronze ground connector suitable for No. 6 AWG wire shall be welded to the inside of each pole. The bronze ground connector shall be attached to the ground bar before shipment.

2453.07.05 Packaging and Shipping

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

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

2453.08 QUALITY ASSURANCE

2453.08.01 Inspection

All work is subject to an inspection by the Contract Administrator prior to shipment.

The supplier shall notify the Contract Administrator of the date that the fabrication of the poles is to commence.

The Contract Administrator shall have free access to the place of fabrication of the poles for the purpose of inspecting and examining plant records and certificates while work on the poles is being performed; materials used; process of fabrication, including welding and galvanizing; and to make any tests as may be considered necessary.

2453.09 OWNER PURCHASE OF MATERIAL

2453.09.01 Working Drawings and Shipment

Within 30 Days of receipt of a purchasing order to supply sectional steel poles, the supplier shall submit 3 copies of pole 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.

2453.09.02 Measurement and Payment

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

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

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

TABLE 1
Supported Load Parameters

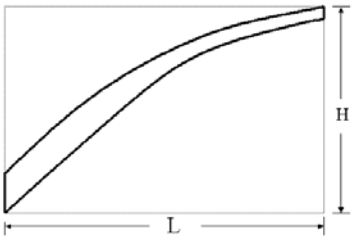
Item of Equipment	Dimensions mm	Projected Area m^2	Weight N
Roadway Lighting Luminaire (Ovuloid)	990 L x 380 H	0.22	107
Roadway Lighting Bracket (Aluminum)	2400 L x 1200 H (tapered)	0.15	112
Double Arm Brackets (Aluminum)	400 L x 42 Dia. (2 per set)	0.04	24
Mast Arm (Aluminum) 	610 L x 250 H (tapered)	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: see Table 2	1.50	23

TABLE 2
Base Mounted Sectional Steel Pole Configurations

Pole Height m	Luminaire and Bracket set	Longest Mast Arm with Head m	Maximum Mast Arm Total Length (Note 1) m	Number of Pedestrian Heads (Note 2)	Traffic Signs (Note 3) m^2	Street Name Sign (Note 4) m^2
7.00	1	5.5	11.0	2	0.75	0.97
8.70	1	5.5	11.0	2	0.75	0.97
10.50	1	5.5	11.0	2	0.75	0.97

Notes:

1. Mast arm total length applies to the sum of the lengths of two mast arms at 90-degree orientation.

2. Two pedestrian heads at 90-degree orientation include a set of double arm brackets for each.

3. 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.

4. Street name or roadway identification sign shall have a maximum height of 0.45 m and a maximum length of 2.10 m. 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.

TABLE 3
Direct Buried Sectional Steel Pole Configurations

Pole Height **m**	**Luminaire and Bracket** (Note 1) **set**	**Supply Control Cabinet Type 1** (Note 2) **each**
5.25	2	N/A
5.25	N/A	2
7.00	2	N/A
7.00	N/A	2
8.70	2	N/A
8.70	N/A	2
10.25	2	N/A
10.25	N/A	2
12.00	2	N/A
12.00	N/A	2

Notes:

1. See Table 1.

2. Each supply control cabinet shall have maximum dimensions of 865 mm H x 465 mm W x 250 mm D and a maximum weight of 700 N.

TABLE 4
Flasher/Sign Pole Configurations

Pole Height **m**	**Beacons** (Note 1) **each**	**Traffic Signal Head** **(3 display sections)** (Note 1) **each**	**Traffic Signs** **m^2**
3.3	2	N/A	0.5
3.3	N/A	1	0.5

Note:

1. Each beacon or traffic signal display shall be a 300 mm display according to OTM Book 12 and the total weight of the beacons or the three section traffic signal head shall be a maximum of 200 N.

Appendix 2453-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.