MATERIAL SPECIFICATION FOR SECTIONAL STEEL HIGH MAST LIGHTING POLES

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2471.01 SCOPE

This specification covers the requirements for base mounted sectional steel high mast lighting poles 25, 30, 35, 40, and 45 metres in height with a multisided cross-section.

2471.01.01 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.

2471.01.02 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.

2471.02 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
OPSS 911	Coating Structural Steel Systems

Ontario Ministry of Transportation Publications

Structural Manual

CSA Standards

B95-1962 (R2002)	Surface Texture (Roughness, Waviness and Lay)
G40.20-13/G40.21-13 (R2018)	General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
G164-18	Hot Dip Galvanizing of Irregularly Shaped Articles
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
W178.2-14	Certification of Welding Inspectors

ASTM International

A500/A500M-21a	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

Canadian General Standards Board (CGSB)

48.9712-2014 Non-Destructive Testing - Qualification and Certification of NDT Personnel

American Association of State Highway and Transportation Officials (AASHTO)

LTS-5-12 Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 5th Edition, 2011 Interim Revisions

Others

Federal Standard 595C Color Standards

2471.03 DEFINITIONS

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

Multisided means having either eight or twelve sides as specified in the Contract Documents.

2471.04 DESIGN AND SUBMISSION REQUIREMENTS

2471.04.01 Design Requirements

2471.04.01.01 Sectional Steel High Mast Lighting Poles

Sectional steel high mast lighting poles shall be according to CSA S6, MTO Structural Manual, AASHTO LTS-5, and as specified in the Contract Documents. Each pole shall be capable of supporting a total maximum load of 2,000 kg with a combined effective projected area of all the luminaires, shroud, and shields not exceeding 4.0 m^2.

2471.04.02 Submission Requirements

2471.04.02.01 Working Drawings

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

Three sets of Working Drawings shall be submitted to the Contract Administrator 14 Days prior to commencement of fabrication of the sectional steel high mast lighting poles, for information purposes only. The manufacturer shall have an Engineer affix their seal and signature on the Working Drawings verifying that the Working Drawings are consistent with the Contract Documents and sound engineering practices.

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

A copy of the Working Drawings shall be retained at the fabricator's plant during and after pole fabrication.

The Working Drawings shall contain all information necessary to fabricate the sectional steel high mast lighting poles including:

a) Dimensioned drawings, including lengths, sizes, cross-sections, and details of the sectional steel pole, and exact weights of pole sections.

b) Final forces for field assembly of pole sections.

c) Details for the mounting supports of the winch assembly, the head frame assembly, and the electrical panel assembly.

d) Details of access opening and of access door.

e) Welding details, including welding procedures to be used for each joint.

f) Detailed bill of materials.

g) Details of identification nameplates.

2471.04.02.02 Mill Test Certificates

Mill test certificates shall be submitted according to OPSS 906.

2471.04.02.03 Welding Procedures

Welding procedure data sheets for each joint configuration to be welded shall be prepared according to CSA W59, stamped with Canadian Welding Bureau's (CWB) acceptance, and available for review during fabrication of the sectional steel high mast lighting poles. The Contractor shall submit three sets of welding procedures to the Contract Administrator 14 Days prior to commencement of fabrication of the sectional steel high mast lighting poles, for information purposes only.

2471.04.02.04 Welder's Qualification

Welders shall have valid CWB issued qualification cards indicating the welding processes and the positions for which they are qualified to weld. Prior to the commencement of fabrication, the Contractor shall submit three copies of the Welders' and Welding Operators' current qualification cards to the Contract Administrator.

2471.05 MATERIALS

2471.05.01 Steel

All structural steel shall be CSA G40.20/G40.21, Grade 350 WT, Category 3.

Steel for tenon pipe shall be CSA G40.20/G40.21, Grade 300W, or A 500M Grade C.

For pole masts, silicon content shall be less than or equal to 0.06%.

2471.05.02 Electrodes

Electrodes and flux used for welding shall have a low hydrogen content and shall be as specified in the fabricator's CWB approved welding procedures.

2471.05.03 Paint Coatings

Paint coatings shall be according to OPSS 911 and the Contract Documents.

The colour of the finish coat shall be equivalent to 16307 grey according to Federal Standard 595C.

2471.07 PRODUCTION

2471.07.01 General

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

Fabrication shall be according to CSA S6 and CSA W59 and the Working Drawings.

2471.07.02 Tolerances

Fabrication shall be according to the dimensions on the sealed and signed Working Drawings.

The dimensions of the assembled high mast lighting pole shall be within the following tolerances:

a) Overall height of pole mast: 5 mm for every 1 m in height.

b) Cross-sectional width of shaft across flats:

   i) 1.0%, for widths less than 500 mm,
   ii) 0.75% for widths greater than 500 mm.

c) Maximum sweep of the pole mast on its overall length measured from a chord joining the extremities and the centreline of the mast shall not exceed 0.2% of its overall length.

d) Maximum deviation from straight of the shaft wall on any 3 m length of pole mast shall not exceed 5 mm.

e) Offset between the centreline of the top section of the pole and the centreline of the bottom section of the pole shall not exceed 150 mm.

f) Offset between the centreline of the base plate and the centre of the pole mast at base shall not exceed 5 mm.

g) Wall thickness shall be within the tolerance permitted in CSA G40.20/G40.21 and ASTM A500M.

2471.07.03 Fabrication

The pole mast shall be cold formed from steel plate and each section shall be fabricated with one or two continuous longitudinal welds. If two welds are used, they shall be on opposite sides of the pole shaft.

One circumferential shop splice per section shall be permitted. Where possible, the shop splice shall be completed prior to forming the pole cross-section.

In the area of the lap splice there shall be no protrusions preventing proper alignment of one section with the next. Any excess weld material shall be removed by grinding to form a smooth surface maintaining a uniformly tapered section.

Each pole shall be supplied with a reinforced handhole complete with a cover. The cover shall have provision for padlocking and shall be fitted with a silicone rubber gasket such that, upon locking, the cover shall be tightly fitted to the handhole.

Each pole shall be supplied with the appropriate mounting plate, brackets, and other attachments required for the installation of the raising and lowering equipment. The mounting plate, brackets, and other attachments shall be attached to the shaft wall by welds as specified in the Contract Documents. Nuts for securing the electrical panel shall be welded to the back of the mounting plate at each mounting hole as specified in the Working Drawings.

The head frame shall be assembled to the pole by means of a tenon mounting system. The tenon shall be compatible with the head frame and raising and lowering device.

In the tenon mounting system, a circular plate with nominal thickness of 12 mm shall be welded to the top of pole as specified in the Contract Documents. The plate shall have a circular opening through its centre, equal to the outside diameter of the tenon, through which the tenon shall be inserted.

The pole section joints shall be slip fitted connections as specified in the Contract Documents. Joint details shall not interfere with the raising or lowering of the luminaire assembly.

The maximum overlap shall be such that the height of the completed mast complies with the permitted overall tolerances.

Shop trial-assembly shall be carried out to check the fit of the sections. The manufacturer shall determine the necessary compressive assembly forces and lap lengths to be achieved during the pre-assembly operation to ensure the final field assembly shall meet the requirements of the Contract Documents. Sections shall be match-marked to facilitate the field assembly. The markings shall be permanent and the location, size, and marking medium shall not interfere with the slip joint.

All cut edges of the base plate shall have a surface finish not greater than 1,000 as defined in CSA B95. All corners shall be ground to a radius of 3 mm.

2471.07.04 Welding

All welding shall be according to CSA W59, including its provisions for cyclically loaded structures, and shall be undertaken by a manufacturer certified by CWB according to CSA W47.1, division 2.1 or better.

During fabrication, upon request the Contractor shall make available to the inspector the CWB approved qualification cards for each, Welder and Welding Operator to be employed on the work.

Welds for circumferential splices shall be full strength complete joint penetration.

The longitudinal seam welds shall be single V and shall be made from the outside of the structure. Throat thickness shall be according to CSA W59, to ensure a minimum of 60% joint penetration.

Welds within the lap of the slip joints plus an additional 150 mm extending from the slip joint shall be full strength complete penetration groove welds, and shall be ground smooth.

The section of weld that does not meet the acceptance standards shall be removed, re-welded, and re-examined.

2471.07.05 Coating

2471.07.05.01 Galvanizing

All steel components of sectional steel high mast lighting poles shall be hot dip galvanized according to OPSS 911.

2471.07.05.02 Paint Coating

After galvanizing and prior to paint coating, each component of the sectional steel high mast lighting pole shall be checked for continuity and smoothness of the galvanized coating. Any deficiencies in galvanized coating shall be corrected according to OPSS 911.

Components specified to be paint coated shall then be paint coated after surface preparation according to OPSS 911, using one of the paint coating systems specified in the Contract Documents. The dry film thickness of galvanized coating after surface preparation by sweep blasting shall be at least 87 μm.

During trial-assembly care shall be taken not to damage the coatings of the pole. Any damage to the coatings that occur during the trial-assembly or any other operations shall be repaired according to OPSS 911.

2471.07.06 Identification Nameplate

Each sectional steel high mast lighting pole shall have an identification nameplate as specified in the Contract Documents.

The nameplate shall be made of stainless steel and shall be securely attached to the outside upper part of the handhole cover by rivets. A neoprene or rubber gasket shall be placed between the handhole cover and the nameplate to prevent corrosion effects.

2471.07.07 Quality Control

The Contractor shall notify the Contract Administrator of the fabrication, testing, and delivery dates.

The manufacturer shall issue a certificate of compliance certifying that the sectional steel high mast lighting poles comply with the Contract Documents.

2471.07.07.01 Inspection, Testing, and Reporting

The manufacturer's welding inspector shall inspect and test the sectional steel high mast lighting 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 inspector for each phase of the fabrication shall be based on the applicable Working Drawings, codes, and specifications.

The manufacturer's inspector shall witness the trial assembly of the pole sections to ensure compliance with contract requirements.

Each phase of the cleaning and coating work shall be inspected to ensure conformity to 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, CSA G164, and the applicable The Society for Protective Coatings (SSPC) standards.

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

(b) Non-Destructive Testing

All full penetration groove welds, including shaft to base welds, circumferential splices in shaft and welds at slip joints, shall be 100% examined. Longitudinal welds at the bottom of the shaft shall be tested 100% 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 repair welds shall be tested by appropriate methods as determined by the manufacturer's Engineer.

(c) Reporting

Prior to installation of the poles, the Contractor shall submit two copies of the manufacturer's inspection reports, containing the results of all the inspection and testing performed during welding, fabrication and coating work, to the Contract Administrator. The inspection report shall be completed and certified by the manufacturer's inspector and approved by the manufacturer's Engineer.

2471.07.07.02 Certification of the Welding Inspection Company

The company undertaking welding inspection shall be certified under the Bridges category according to CSA W178.1. The certification shall encompass at least the following methods: visual, radiograph, ultrasonic, dye penetrant, and magnetic particle.

2471.07.07.03 Certification of Welding inspectors for Visual Inspection and Non-Destructive Testing

Visual inspection of the sectional steel high mast lighting poles shall be performed by welding inspectors certified by CWB according to CSA W178.2. The certification shall be to Level II or III.

Non-destructive testing of the sectional steel high mast lighting poles shall be performed by an ultrasonic or radiographic technician or both, certified to Level II or Level III according to CAN/CGSB 48.9712.

2471.07.07.04 Certification of Coating Inspectors

Each Coating Inspector shall have:

a) 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;

or,

b) Successfully completed NACE CIP Level 1, or be a graduate of the MTO's Coating Course and be working under the direct technical supervision of a currently Certified NACE CIP Level 3 inspector.

2471.08 QUALITY ASSURANCE

2471.08.01 Inspection

Sectional steel high mast lighting poles are subject to inspection by the Contract Administrator at any time during the course of fabrication and installation. The Contractor shall notify the Contract Administrator of the fabrication, testing, and delivery dates.

Welding is subject to inspection by the Contract Administrator using both visual and non-destructive testing procedures and techniques according to CSA W59 for cyclically loaded structures.

The surface preparation and coating of sectional high mast steel lighting poles are subject to inspection by the Contract Administrator during the coating work. Acceptance of the work shall be based on the applicable OPS specification and SSPC standards.

Appendix 2471-A, April 2023
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:

- Coating requirements. (2471.05.03)

- Shaft wall attachment requirements. (2471.07.02)

- Paint coating system. (2471.07.04.02)

- Sectional steel high mast lighting pole requirements. (2471.07.06)

The designer should determine if the following is required and, if it is, specify it in the Contract Documents:

- Additional pole design requirements. (2471.04.01)

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 2450.011	High Mast Lighting Pole 25, 30, and 35 m 8-Sided Pole
OPSD 2450.021	High Mast Lighting Pole 40 and 45 m 12-Sided Pole
OPSD 2453.010	High Mast Lighting Pole Cable Holder and Storage Hook Details
OPSD 2453.020	High Mast Lighting Pole, Handhole Cover Hinges, Latches, and Padlock
OPSD 2453.050	High Mast Lighting Pole Nameplate Details