MATERIAL SPECIFICATION FOR TRAFFIC SIGNAL ARMS, BRACKETS, HANGERS, FITTINGS, AND HARDWARE

TABLE OF CONTENTS

2460.01 SCOPE

This specification covers the requirements for single member arms, aluminum pipe arms, double arm brackets, traffic signal hanger assemblies, and traffic signal mounting hardware and accessories.

2460.01.01 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.

2460.01.02 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.

2460.02 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, Material

OPSS 2461 Signal Heads

CSA Standards

G40.20-13/G40.21-13	General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
S157-05/S157.1-05 (R2015)	Strength Design in Aluminum
W47.2-11 (R2015)	Certification of Companies for Fusion Welding of Aluminum
W59-13	Welded Steel Construction (Metal/Arc Welding)

American National Standards Institute (ANSI)

B18.2.1-2012	Square, Hex, Heavy Hex, and Asken Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
B18.2.2-2015	Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)
B18.21.1-2009	Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers (Inch Series)

ASTM International

A 123/A 123M-15	Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A 307-14e1	Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
A 563-15	Carbon and Alloy Steel Nuts
B 108/B108M-15	Aluminum-Alloy Permanent Mold Castings
F 593-13ae1	Stainless Steel Bolts, Hex Cap Screws, and Studs
F 594-09 (2015)	Stainless Steel Nuts

2460.04 DESIGN AND SUBMISSION REQUIREMENTS

2460.04.01 Design Requirements

2460.04.01.01 Traffic Signal Arms, Brackets, Hangers, Fittings, and Hardware

All traffic signal equipment shall be designed to accommodate a five section signal head with 300 mm lenses complete with backboard according to OPSS 2461.

2460.04.01.02 Aluminum Components

Structural design shall be according to CAN/CSA S157.

2460.04.02 Submission Requirements

2460.04.02.01 Working Drawings

When specified in the Contract Documents, the Contractor shall submit 4 sets of Working Drawings to the Contract Administrator at least 14 Days prior to the commencement of fabrication operations, for information purposes only. Prior to making a submission, an Engineer's seal and signature shall be affixed on the Working Drawings verifying that the drawings are consistent with the Contract Documents.

Where 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 sealed and signed by as many additional Engineers as necessary.

Once fabrication of the equipment has commenced, materials and dimensions shown on the submitted Working Drawings shall not be changed.

2460.05 MATERIALS

2460.05.01 Structural Steel

Structural steel shall be according to CSA G40.20/G40.21, minimum yield strength 300 MPa.

2460.05.02 Steel Hardware

Steel bolts shall be according to ANSI B18.2.1 and ASTM A 307, Grade A, minimum yield strength 400 MPa. Steel nuts shall be according to ANSI B18.2.2 and ASTM A 563, Grade A, minimum yield strength 400 MPa. Steel washers shall be according to ANSI B18.21.1.

Stainless steel bolts shall be according to ASTM F 593 with head marking F593C. Stainless steel nuts shall be according to ASTM F 594. Stainless steel washers shall be fabricated from 18.8 alloy.

2460.05.03 Cast Alloy Materials

Fittings cast from non-ferrous alloys shall be according to ASTM B 108 and strength requirements compatible with other components and the design requirements. Fittings shall be cast with aluminum alloy, grade A356.2 or G6290. Castings shall be F or T6.

2460.05.04 Aluminum Pipe and Tube

Aluminum pipe shall be 38 mm (1½″) diameter, schedule 40, 6061-T6, and strength requirements compatible with other components and the design requirements.

Aluminum tubes shall be fabricated from 6063 alloy.

2460.07 PRODUCTION

2460.07.01 General

2460.07.01.01 Galvanizing

All structural steel, steel hardware, and cast ferrous components shall be hot dip galvanized according to ASTM A 123.

2460.07.01.02 Welding

All welding of steel shall be according to CSA W59.

All welding of aluminum shall be according to CSA W47.2.

2460.07.02 Single Member Arms

Single member arms shall be fabricated by tapering and bending aluminum tube to the required dimensions. The end of the arm shall be provided with a 50 mm IPS (iron pipe size) tenon, 100 mm long for mounting of a hanger. The tenon shall be horizontal when the arm is mounted on a vertical surface. After fabrication, arms shall be heat treated to T-6 temper.

The vertical rise of the mast arm shall be according to Table 1.

The pole attachment assembly shall be fabricated from structural steel complete with:

a) Flat steel pole straps with four hex head bolts, nuts, and lock washers for mounting on metal or concrete poles.

b) Four 20 mm diameter bolt holes for mounting on wooden poles.

The pole plate collar attachment to the aluminum arm shall be retained by hex head bolts with nuts and lock washers. The number of hex head bolts shall be according to Table 1.

Pole attachment assemblies for use with wooden, metal, or concrete poles shall be fabricated to suit arms and pole diameters.

Pole plate assemblies for use with wooden poles shall be fabricated to suit arms and pole diameters.

The completed aluminum signal member arm shall be as specified in the Contract Documents.

2460.07.03 Aluminum Pipe Arms

Aluminum pipe arms shall be fabricated from 50 mm IPS aluminum pipe. The pipe shall be bent such that the tenon end is horizontal when the arm is mounted on a vertical surface to give the vertical rise, as measured from the top of the pole plate to the centre of the tenon according to Table 2.

The pole plate for attachment of the mast arm shall be a cast alloy universal plate with adjustment set screws permitting adjustment of the angle of the mast arm over a range of 15° and shall be complete with two 20 mm diameter bolt holes for mounting on wooden poles and with a lipped portion, top and bottom, suitable for attachment of pole attachments.

Pole attachment assemblies shall be fabricated from flat structural steel complete with pole plate straps, 12.7 mm diameter U bolts, nuts, lock washers, and round washers for mounting on metal or concrete poles. Pole attachment assemblies shall be provided for aluminum pipe arm pole plates and be fabricated to suit pole diameters.

2460.07.04 Double Arm Brackets

Double arm brackets shall be fabricated from 38 mm IPS schedule 40, aluminum pipe to the length specified in the Contract Documents. Each bracket shall consist of a cast aluminum 90° flanged street elbow, pole plate, and hexagonal or octagonal locknut and a neoprene washer. The cast pole plate shall be provided with four 16 mm diameter bolt holes for mounting on wooden poles and with lipped edges, top and bottom, suitable for use with 16 mm wide stainless steel strapping. The completed double arm bracket shall be as specified in the Contract Documents.

2460.07.05 Traffic Signal Hanger Assemblies

Traffic signal hanger assemblies shall be of the following types, as specified in the Contract Documents:

a) cushion hanger

b) adjustable mid-section hanger

c) dual-end hanger

Traffic signal hanger assemblies shall be fully adjustable to provide the required signal visibility.

2460.07.06 Signal Mounting Hardware, Fittings, and Accessories

Signal mounting hardware, fittings, and accessories for aerial installation shall be as specified in the Contract Documents.

2460.07.07 Packaging

Aluminum arms shall be wrapped in heavy paper to protect the finish.

Steel components shall be strapped together with external corners protected with packing material. Small components, hardware, fittings, and accessories shall be packaged securely in cardboard containers and protected with packing material.

2460.08 QUALITY ASSURANCE

2460.08.01 Inspection

The Contract Administrator shall be notified a minimum of 3 Business Days prior to the start of fabrication for the traffic signal arms, brackets, and hangers.

The Contract Administrator shall have free access to the place of manufacture of the traffic signal arms, brackets, and hangers for the purpose of inspecting and examining plant records and certificates; materials used; process of manufacturing, including welding and galvanizing; and to make any tests as may be considered necessary, while the traffic signal arms, brackets, and hangers are being fabricated.

The Contract Administrator shall be notified when the traffic signal arms, brackets, and hangers are ready for inspection.

All traffic signal arms, brackets, and hangers may be subject to an inspection by the Contract Administrator prior to shipment.

2460.09 OWNER PURCHASE OF MATERIAL

2460.09.01 Packaging and Shipment

The supplier shall provide 4 sets of Working Drawings, when required by the Owner. Working Drawings shall include all detailed dimensions and a complete list of components, materials, and accessories.

If the supplier has previously submitted this information and the Owner has previously approved it, only reference to the original submission is required.

The supplier is responsible for loading, delivery, and off-loading of traffic signal arms, brackets, and hangers to designated areas. Traffic signal arms, brackets, and hangers shall be subject to inspection during and on completion of off-loading. If any damage to the traffic signal arms, brackets, and hangers is encountered during the inspection, the supplier shall be responsible for the necessary corrective measures, which are subject to the approval of the Owner.

The supplier shall advise the Owner 3 Business Days prior to the shipping date of the intent to deliver and confirm that arrangements for off-loading have been made.

2460.09.02 Measurement and Payment

For payment purposes, a count shall be made of the number of traffic signal arms complete with brackets, hangers, fittings, and hardware delivered and accepted.

Payment at the price specified in the purchasing order shall be for the supply of traffic signal arms delivered to the destination at 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
Aluminum Single Member Arm Requirements

Arm Length m (Note 1)	Arm Rise m	Number of Hex Head Bolts for Pole Plate Collar Attachment
1.2	0.53	2
1.8	0.61	2
2.4	0.84	2
3.0	0.61	3
3.6	0.84	3
4.6	1.07	3
5.5	0.91	3
6.1	1.07	3
6.7	1.14	3
7.6	1.20	3

Notes:

1. Measured from the centre of the pole plate to the centre of the tenon.

TABLE 2
Aluminum Pipe Arm Dimensions

Arm Length m	Arm Rise m
0.6	0.25
1.2	0.25

Appendix 2460-A, November 2018
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:

- Details of the completed aluminum signal member arms. (2460.07.02)

- Length of double arm brackets. (2460.07.04)

- Details of the completed double arm brackets. (2460.07.04)

The designer should ensure the traffic signal arms and arm lengths being specified are compatible with the poles.

For Owner purchase of material, the following technical information should be given to the supplier in the purchasing order:

a) Type and length of mast arm.

b) Type and diameter of pole for mast arm mounting.

c) Length of double arm brackets.

d) General description of aerial hardware, fittings, and accessories.

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 2502.010	Traffic Signal, Adjustable Mid-Section Hanger
OPSD 2502.011	Traffic Signal, Dual-End Hanger
OPSD 2522.010	Traffic Signal, Cushion Hanger
OPSD 2524.010	Traffic Signal, Double Arm Bracket
OPSD 2540.100	Aerial Suspension Mounting Bracket, Pre-Emption Unit