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

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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.

2460.02 REFERENCES

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)

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

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)

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

Four sets of Working Drawings shall be submitted to the Contract Administrator at least 14 Days prior to the commencement of fabrication. An Engineer shall review and sign the Working Drawings verifying that the 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 sign the Working Drawing for all aspects of the work, the drawing shall be 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) adjustable mid-section hanger

b) 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.

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