



Traffic Engineering Specification For: **Fabrication and Delivery of Structural Supports for Traffic Signals and Luminaires**

1. GENERAL

This specification covers the fabrication and delivery of structural supports (standards) for traffic signals and luminaires.

2. STRUCTURE CONFIGURATIONS

2.1 General

Standard details forming part of this Specification include the following Drawings:

Drawing	Component	Description
S1	E-016 C	Light Series 2.9 m Straight Post Top Signal Standard
S2	E-016 X	Light Series 5.0 m Straight Standard
S3	E-016 P	Light Series Davit
S4	E-016 F	Light Series Davit Stub
S5	E-016 G	Light Series Davit Extension Arm
S6	E-016 Y	Medium Series Double Cantilever
S7	E-016 H	Medium Series Combination Cantilever Vertical Shaft
S8	E-016 J	Medium Series Combination Cantilever Arms
S9	E-016 W	Heavy Series Combination Cantilever Vertical Shaft
S10	E-016 R	Heavy Series Combination Cantilever Advance Warning Sign Arms
S11	E-016 S	Heavy Series Combination Cantilever Traffic Signal Arms
S12	E-016 E	Luminaire Davit Arm
S13	E-016 L	Luminaire Extension Shafts
S14	E-016 T	Hydro Luminaire Adaptor
S15	E-016 A	Details: Access Panel AP1
S15	E-016 B	Details: Handhole H1
S15	E-016 Z	Details: Tenon Cap TC1
S16	E-016 D	Straight Stub Extensions

The details shown on the Drawings shall not be changed unless approved in writing by the Engineer. Care shall be taken to ensure flange connections remain interchangeable.



2.2. Type of Standards


Standards shall be as follows:

Type	Use	Arm Reach (m)	Component Number(s)
Light Series Straight Standard	Traffic Signal - 2.9, 5.0 m high	N/A	E-016C, E-016X
Light Series Davit	Traffic Signal	2.5, 5.0	E-016P, E-016F, E-016G
	Pedestrian Corridor	5.0	E-016F, E-016G
Medium Series Combination Cantilever	Traffic Signal	5.0, 6.0, 7.5	E-016H, E-016J
	Pedestrian Corridor	5.5, 7.0	
Medium Series Double Cantilever	Pedestrian Corridor	4.5 each side	E-016Y
Heavy Series Combination Cantilever	Advance Warning Sign	7.5, 9.0, 10.5, 15.0	E-016W, E-016R
	Traffic Signals	7.5, 9.0, 10.5, 15.0	E-016W, E-016S
Luminaire Davit Arm	Luminaire - 3.8 m high	3.0	E-016E
Luminaire Shafts	Luminaire Shafts - 5.4, 8.4 m high	N/A	E-016L
Hydro Luminaire Adaptor	Luminaire Adaptor	N/A	E-016T
Straight Stub Extensions	Luminaire Extension Stubs - 1.5, 3.0, 4.5, 6.1 m high	N/A	E-016D

All extension arms shall be one piece without any flanges, except where the arm is attached to the vertical member.

Each tubular component shall be fabricated in one piece, except where joints are indicated on the Drawings.

Access panel, handhole and tenon cap details are provided in Drawing S15.

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3. SHOP DRAWINGS

The supplier shall submit to the Traffic Engineering Branch, shop drawings sealed by a Professional Engineer, registered or licensed to practice in the Province of Manitoba, in triplicate for approval prior to any fabrication. Shop drawings shall be complete and shall include all information such as material specifications, weld sizes, bills of material, welding procedures, design criteria, etc. within one week from award of contract.

Approval of shop drawings by the Traffic Engineering Branch will be for general agreement only and in no case will the supplier be relieved of the responsibility for completeness or adequacy of fabrication materials and procedures.

No fabrication shall commence until shop drawings have been reviewed and returned to the supplier. All costs resulting from any changes or due to failure to have shop drawings so reviewed shall be borne by the supplier.

Shop drawings shall indicate the total weight and center of gravity of each component for lifting and rigging purposes.

4. MATERIALS

4.1 General

The Contractor shall be responsible for the supply, safe storage, and handling of all materials set forth in this Specification.

All materials used for fabrication of traffic signal and pedestrian corridor standards shall be **new**, previously unused material.

4.2 Handling and Storage of Materials

All materials shall be handled in a careful and workmanship-like manner, to the satisfaction of the Engineer. Storage of materials shall be in accordance with the requirements of CSA Standard A23.1, except as otherwise specified herein.

During fabrication and surface preparation work, the structures shall be lifted and handled in a careful and workmanlike manner. Significant nicks or scratches caused by improper lifting and handling shall be grounds for repair or rejection at the sole discretion of the Engineer.



Following galvanizing, protective sleeves shall be used on metallic lifting chains or forklift forks coming in contact with the structures. Nicks or scratches in the galvanizing coating will be grounds for repair or rejection at the sole discretion of the Engineer.

Structures shall be stored on wood blocking at all times. The structures should be kept free from contact with the debris, mud and standing water at all times.

4.3 Structural Steel

Structural steel shall be in accordance with CSA G40.21. The grade supplied shall be in accordance with the grades shown on the Drawings.

For purposes of hot-dip galvanizing, the silicon content in the steel shall be controlled as follows:

- a) For monotubular steel shafts, to within 0 to 0.03% or within 0.15 to 0.22%
- b) For base, flange and gusset plates and other miscellaneous steel: below 0.30%.


The Supplier is advised that copies of mill test certificates showing the chemical and physical properties of all structural steel to be supplied under this Specification must be submitted to the Engineer. The mill test certificates shall be submitted **prior to commencement of product fabrication** for acceptance by the Engineer.

Steel shall not be acceptable unless the mill test certificate states the grade to be in accordance with the grades stated on the Drawings. Lower grade steel shall not be acceptable (despite favourable published mill test yield results), and items fabricated without steel certification shall be rejected.

All costs resulting from any changes or due to failure to have submissions reviewed shall be borne by the Supplier.

4.4 Hot-Dip Galvanizing

Hot-dip galvanizing shall be in accordance with ASTM A123 - 09 to a net minimum retention of 600 g/m².

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4.5 Galvanizing Repair

Galvanizing repair materials shall meet the requirements of Section 5.5.2 of this Specification. Zinc paint shall be Zinga or equal as approved by the Engineer.

4.6 Welding Consumables

The selection, supply, and storage of electrodes for all processes shall be according to CSA W59 requirements (latest edition) and CSA W48 (latest edition). Only controlled hydrogen designation electrodes and low hydrogen wire consumables shall be used for the SMAW and flux-cored arc welding processes, respectively.

Electrodes and fluxes shall be strictly stored and maintained as required by CSA W59, section 5.2.

4.7 Connection Bolts

Connection bolts shall be ASTM A325 high strength bolts each with one grade DH nut and one hardened washer, all hot-dip galvanized in accordance with ASTM F2329.

The galvanized nuts shall be overtapped to the minimum amount required for fastener assembly. The nuts shall be lubricated with a lubricant containing a visible dye. The lubricant shall be clean and dry to the touch.

4.8 Stainless Steel Hardware

Stainless steel hardware shall be in accordance with ASTM A276 Type 316 stainless steel unless otherwise shown on the Drawings.

4.9 Miscellaneous Materials

Miscellaneous material incidental to this work shall be as approved by the Engineer.

5. CONSTRUCTION METHODS

5.1 General Requirements

- a) Holes in the base plates shall be sized as indicated on the Drawings.
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- b) Adequate venting and drainage holes shall be provided in enclosed sections for hot-dip galvanizing. The galvanizing facilities shall be consulted regarding the size and location of these holes. Holes shall be provided by drilling, not burning.
- c) Prior to fabrication, the dimensional limitations on the size and shape imposed by the galvanizing facilities shall be determined for hot-dip galvanizing all individual components of the traffic signal and pedestrian corridor standards.

5.2 Fabrication

All fabrication shall be carried out in accordance with this Specification and the Contract Drawings, as well as AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals – 2009, plus all subsequent revisions.

The punching of identification marks on the members will not be allowed.

Any damage to members during fabrication shall be brought to the attention of the Engineer in order that the Engineer may approve remedial measures.

All portions of the work shall be neatly finished. Shearing, cutting, clipping and machining shall be done neatly and accurately. Finished members shall be true to line, free from twists, bends, sharp corners, and edges.

Cut edges shall be true and smooth and free from excessive burrs or ragged breaks. Re-entrant cuts shall be avoided wherever possible. If used, they shall be filleted by drilling prior to cutting.

All holes shall be free of burrs and rough edges.

5.3 Welding

Welding shall be in accordance with CSA W59, "Welded Steel Construction" (latest edition).

The proposed welding procedures and welding consumable certificates shall be submitted to the Engineer for approval at least two (2) days prior to the scheduled commencement of any fabrication.



All seams shall be continuously welded and free from any slag and splatter. Longitudinal welds shall be a minimum of 70% penetration, except those within 200 mm of baseplates, flanges, end openings, access openings, and circumferential welds, which shall be 100% penetration. All circumferential groove welds shall be 100% penetration, and where circumferential welds are used at a butt joint, an internal backup strip shall be provided.

Longitudinal seam welds in davit arms and extensions shall be located at the bottom of the horizontal members. Only one longitudinal seam is permitted in each member.

Welds joining monotubular column or arm elements to base or flange plates shall be unequal leg welds, with the long leg of the fillet weld along the column or arm. The termination of the longer weld leg shall contact the shaft's surface at approximately a 30° angle.

All welds shall be ground smooth and flush with the adjacent surface prior to hot-dip galvanizing.

5.4 Surface Preparation and Cleaning


Surface preparation and cleaning of materials prior to hot-dip galvanizing shall be in accordance with ASTM A153 and SSPC Specification SP:6 "Commercial Blast Cleaning", unless otherwise specified herein. The Contractor shall ensure that the exterior of all individual components of the standards are blast cleaned prior to pickling to achieve the minimum zinc coating mass of 600 g/m². All welding and provision of holes is to be completed prior to surface preparation and cleaning, except where shown on the Drawings.

The sandblasting and cleaning of all components shall be done in the shop.

After sandblasting, the inside and outside of the structure shall be cleaned free of all sand and sandblasting debris by means of blowing with compressed air and/or vacuuming to the satisfaction of the Engineer.

After the fabricated components have been sandblasted and cleaned, an inspection agency appointed by the Department will carry out a visual inspection of the components in the shop before they are shipped to the galvanizing plant.

Following sandblasting, the structures shall be galvanized as soon as practical. If significant surface rusting should develop on the structures before they are galvanized, they shall be re-sandblasted as directed by the Engineer.

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5.5 Hot-Dip Galvanizing

5.5.1 General

The hot-dip galvanizing plant shall be a Regular Member of the American Galvanizers Association, Inc.

Hot-dip galvanizing shall be in accordance with ASTM A123 - 09 to a net minimum retention of 600 g/m². The contractor shall safeguard against embrittlement of the fabricated steel in accordance with ASTM A143 - 07 "Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement".


All outside surfaces and interior surfaces of all individual components of the traffic signal and pedestrian corridor standards shall be hot-dip galvanized in accordance with the requirements of this Specification.

The galvanizing coating on outside surfaces of the structures shall be generally smooth and free of blisters, lumpiness and runs. In particular, the outside surfaces of the bottom 2.5 m of the vertical support members shall have a smooth finish equal to the finish on hot-dipped galvanized handrails.

The aesthetic appearance of the structure after hot-dip galvanizing will be a criterion in the acceptance or rejection of the galvanized coating. The galvanized coating on the entire structure shall have a uniform "silver" colour and luster. Galvanizing with parts of the structure having dull grey coating or streaks or mottled appearance will not be acceptable. If the galvanizing is rejected for aesthetic reasons, the Contractor shall rectify the appearance by applying spray-on molten zinc metallizing with 85/15 zinc/aluminum alloy. The metallizing shall be carried out in the shop before the structure is installed.

To prevent problems with aesthetic appearance of structures after hot-dip galvanizing, the Contractor shall be responsible for ensuring that the silicon content in the steel used for fabricating the structures is controlled as specified herein.

Defects in the galvanizing coating shall be repaired in accordance with Section 5.5.2 of this Specification. The Engineer shall be consulted before repairs are made. Other defects and contaminants in the galvanizing coating, such as heavy dross protrusions, flux inclusions and ash inclusions shall be grounds for rejection of the galvanizing coating system.

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The Contractor shall verify the thickness of galvanized coatings as directed by the Engineer and have these readings available for review.

All threaded attachments and couplings shall be re-threaded after the sign structures have been hot-dip galvanized.

All external galvanizing vent and drain holes shall be filled with either aluminum or plastic tapered plugs.

5.5.2 Repair of Damaged Galvanizing

In the event that repairs to the galvanizing coating are required, repair materials and practices shall be supplied and performed in accordance with ASTM A780 - 09 "Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings".


6. IDENTIFICATION

Each structure will be provided with a "raised stock code" welded to the component, as indicated on the Drawings. Each character of the stock code shall be approximately 25 mm wide by 40 mm tall, with a 10 mm space provided between each character. The weld profile shall be a smooth half round bead approximately 2 mm tall by 3 mm wide.

For horizontal (arm type) components, the raised stock code shall be provided approximately 500 mm from the flange plate and located on the top-side of the arm.

For vertical (shaft and stub type) components, the raised stock code shall be provided approximately 500 mm from the base plate and located on the access panel side of the shaft.

Horizontal (arm type) components shall be marked with a raised "T" welded to the top face of the arm approximately 250 mm away from the flange plate. The raised weld shall conform to the requirements of the "raised stock code" described above.

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7. QUALITY CONTROL

7.1 General

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Department, including all operations from the selection and production of materials, through to final acceptance of the work. The Contractor shall be wholly responsible for the control of all operations incidental thereto notwithstanding any inspection approval that may have been previously given. The Department reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.

The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Contract. All material shall be free of surface imperfections and other defects.

7.2 Welding Qualifications

The Contractor shall produce evidence that the plant has recently been fully approved by the C.W.B. to the requirements of CSA W47.1 Division 2.1 for welding of steel structures.


Approved welding procedures shall be submitted to the Engineer prior to fabrication of any steel items.

7.3 Inspection

7.3.1 General

The Department will appoint an inspection agency to carry out inspections and testing of work in this Specification. The inspection agency shall report to the Department based on plant inspections of welds, material, fabrication procedures, quality control, mill test certificates, etc. The inspections will include the following:

- a) Inspection of all material and proposed fabrication procedures prior to the start of manufacturing.
 - b) Inspection of all fabricated components prior to surface preparation.
 - c) Inspection of all fabricated components prior to hot-dip galvanizing.
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- d) A final inspection following hot-dip galvanizing, prior to shipment from the manufacturer's plant.

The inspection agency shall carry out the following welding inspections and testing:

- a) Circumferential Welded Splices

100% of circumferential welds used to join pole sections together shall be inspected. Inspection shall be performed by radiography or ultrasonics, or by destructive tests acceptable to the Engineer. Only one time repair of circumferential welds is allowed without written permission of the Engineer.

- b) Longitudinal Seam Welds

100% of full penetration welds and a random 25% of partial penetration welds of longitudinal seams shall be inspected. Full penetration weld inspections shall be performed by radiography or ultrasonics. In addition, partial penetration welds may be inspected by magnetic particle. Both types of weld may be tested by destructive methods acceptable to the Engineer.


- c) Base Connection and Flange Plate Connection Welds

A random 25% of all base connection and flange plate connection welds shall be inspected. Full penetration weld inspection may be performed by radiography or ultrasonics. Fillet welds may be inspected by magnetic particle. Both types of weld may be tested by destructive methods acceptable to the Engineer. Only one time repair of base connection or flange plate connection welds is allowed without written permission of the Engineer.

Welds that are found by any of the inspection methods to be inadequate and unsatisfactory shall be repaired in accordance with CSA W59 and then re-tested. The cost of the repairs and the cost of the re-test shall be paid for by the Contractor.

No repair shall be made until agreed to by the Engineer.

The Contractor shall fabricate the components (pieces) in batches such that one inspection can be carried out at each stage (fabrication, surface preparation, galvanizing) for each batch. Batches shall consist of a minimum of 10 components. Where practical, batches should include all the items of a particular stock code. A batch shall not be separated or recombined with other batches such that there are less than 10 items in the resulting batch. The inspection agency reserves the right to

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refuse inspection of components in the event that the minimum batch requirements are not met.

The Contractor shall only carry out the next step in the fabrication process (e.g. fabrication, surface preparation, galvanizing) only after the completed previous step has been duly inspected.

7.4 Unacceptable Work

Any welding work found to be unacceptable shall be corrected in accordance with CSA W59. No repair shall be made until agreed to by the Engineer.

8. DELIVERY

Standards shall be delivered F.O.B. Warehouse Stores, 1550 Dublin Avenue, Winnipeg, Manitoba, R3E 0L4.

Standards shall be inspected by the Director of Traffic Engineering or his representative upon receipt, before acceptance by this Department.

The Director of Traffic Engineering shall be informed 48 hours in advance of the anticipated delivery date.

A Bill of Lading shall be prepared by the Contractor and clearly identify all components being delivered.

All fasteners and miscellaneous hardware shall be bundled separately for each structure type. Each bundle shall be clearly marked indicating to which items the fasteners and miscellaneous hardware correspond.

9. GUARANTEE

The Supplier shall guarantee all material against defects in quality or workmanship for a period of one year after final acceptance by the Department.



10. METHOD MEASUREMENT

Fabrication of standard components will be measured on a unit basis for each stock code. The number of units to be paid for shall be the total number of standard components of each stock code fabricated in accordance with this Specification and accepted by the Engineer.

11. BASIS OF PAYMENT

Fabrication of standard components will be paid for at the Contract Unit Price per unit for the "Items of Work" listed below, measured as specified herein, which price shall be payment in full for supplying all materials and performing all operations herein described, and all other terms incidental to the Work included in this Specification.

Items of Work:

Fabrication of Standards

1. Stock code 17896 – Light Series 2.9 m Straight Standard
 2. Stock code 17936 – Light Series 5.0 m Straight Standard
 3. Stock code 17918 – Light Series Davit
 4. Stock code 17909 – Light Series Davit Stub
 5. Stock code 40373 – 2.5 m Corridor Arm
 6. Stock code 17910 – 2.5 m Signal Arm
 7. Stock code 58522 – Medium Series Double Cantilever Vertical Shaft
 8. Stock code 58525 – 4.5 m Corridor Arm
 9. Stock code 58523 – Medium Series Cantilever Vertical Shaft
 10. Stock code 58519 – 5.0 m Signal Arm
 11. Stock code 58520 – 6.0 m Signal Arm
 12. Stock code 58521 – 7.5 m Signal Arm
 13. Stock code 58526 – 5.5 m Corridor Arm
 14. Stock code 58527 – 7.0 m Corridor Arm
 15. Stock code 58524 – Heavy Series Cantilever Vertical Shaft
 16. Stock code 58528 – 7.5 m Advance Warning Arm
 17. Stock code 58529 – 9.0 m Advance Warning Arm
 18. Stock code 58530 – 10.5 m Advance Warning Arm
 19. Stock code 58531 – 15.0 m Advance Warning Arm
 20. Stock code 58516 – 7.5 m Traffic Signal Arm
 21. Stock code 58517 – 9.0 m Traffic Signal Arm
 22. Stock code 58518 – 10.5 m Traffic Signal Arm
 23. Stock code 58515 – 15.0 m Traffic Signal Arm
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- 24. Stock code 17971 – Luminaire Davit Arm
- 25. Stock code 17900 – 5.4 m Luminaire Extension Shaft
- 26. Stock code 17901 – 8.4 m Luminaire Extension Shaft
- 27. Stock code 17899 – 1.5 m Straight Stub Extension
- 28. Stock code 17919 – 3.0 m Straight Stub Extension
- 29. Stock code 17920 – 4.5 m Straight Stub Extension
- 30. Stock code 17921 – 6.1 m Straight Stub Extension

"Original Signed By"

Approved: _____

Glenn Cuthbertson, P. Eng.
Director, Traffic Engineering Branch

