CONSTRUCTION SPECIFICATION FOR SIGN SUPPORT STRUCTURES

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915.01 SCOPE

915.01.01 General

This specification covers the requirements for the design and construction of the tri-chord, cantilever tri-chord, cantilever, variable message, pole mounted variable message, monotube overhead, bridge mounted, and roadside breakaway and non-breakaway sign support structures, including their footings.

915.01.02 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.

915.01.03 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.

915.02 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 501	Compacting
OPSS 603	Installation of Ducts
OPSS 609	Grounding
OPSS 902	Excavating and Backfilling - Structures
OPSS 903	Deep Foundations
OPSS 904	Concrete Structures
OPSS 905	Steel Reinforcement for Concrete
OPSS 906	Structural Steel for Bridges
OPSS 907	Structural Wood Systems
OPSS 911	Coating Structural Steel Systems
OPSS 919	Formwork and Falsework

Ontario Provincial Standard Specifications, Material

OPSS 1010	Aggregates - Base, Subbase, Select Subgrade, and Backfill Material
OPSS 1350	Concrete - Materials and Production
OPSS 1440	Steel Reinforcement for Concrete
OPSS.PROV 1601	Wood - Preservative Treatment and Shop Fabrication

Ontario Ministry of Transportation Publications

Sign Support Manual
Structural Manual

CSA Standards

G40.20-13/G40.21-13 (R2023)	General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel
S6-19 (R2024)	Canadian Highway Bridge Design Code
S157-17/S157.1-17 (R2022)	Strength Design in Aluminum / Commentary on CSA S157-17 Strength Design in Aluminum
W47.2-11 (R2020)	Certification of Companies for Fusion Welding of Aluminum
W59:24	Welded Steel Construction (Metal Arc Welding)
W59.2:24	Welded Aluminum Construction
W178.1:18 (R2023)	Certification of Welding Inspection Organizations
W178.2:18 (R2023)	Certification of Welding Inspectors

ASTM International

A123/A123M	Hot Dip Galvanized) Coatings on iron and Steel Products
A307-21	Carbon Steel Bolts and Studs and Threaded Rod 60,000 PSI Tensile Strength
A500/A500M-23	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
B209/B209M-21a	Aluminum and Aluminum Alloy Sheet and Plate
B221M-21	Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
F593-24	Stainless Steel Bolts, Hex Cap Screws, and Studs
F3125-M23	High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi, 144 ksi, and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength

American Association of State Highway and Transportation Officials (AASHTO)

LTS-6-I4 Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals, 6th Edition.

Canadian General Standards Board (CGSB)

48.9712-2022 Non-Destructive Testing-Qualification and Certification of Personnel

International Organization for Standardization/International Electrotechnical Commission (ISO/IEC)

17025-2017 General Requirements for the Competence of the Testing and Calibration Laboratories

915.03 DEFINITIONS

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

Bridge Mounted Sign Support Structure means a static sign support structure attached to the side of a bridge.

Cantilever Sign Support Structure means an overhead sign support structure consisting of horizontal members mounted to one side, both sides, or centre mounted, to a single vertical leg.

Cantilever Tri-Chord Sign Support Structure means a static sign support structure consisting of a galvanized steel overhead truss constructed in the form of a three-chord system mounted to a single vertical leg.

Column means the vertical member of a roadside sign support structure that has the base section of the member buried below grade and the upper section connected to a sign or sign support.

Crank Location means the joint in the end panel of a variable message sign support structure where the horizontal chords meet the sloping chords.

Leg means the vertical member of an overhead sign support structure that connects to the sign support footing.

Manufacturers Certificate of Conformance means a form issued by an Engineer confirming that the specified components of the Work are in general conformance with the Contract Documents..

Overhead Monotube Sign Support Structure means an overhead sign support structure consisting of two vertical single steel tubing legs spanned by a single steel tubing member.

Overhead Sign Support Structure means a structure for supporting signs over a roadway.

Pole Mounted Variable Message Sign Support Structure means an overhead sign support structure consisting of a variable message board centre mounted to a single vertical galvanized steel pole.

Proposal means a Contractor's submission for which engineering design is required that provides a written:

a) Alternative to requirements specified by the Owner in the Contract Documents.

b) Course of action or undertaking, as delegated by the Owner in the Contract Documents.

Roadside Sign Support Structure means a timber or steel, breakaway or non-breakaway, sign support structure, consisting of two or more columns on the side of the Roadway.

Sign means a variable message board or a signboard.

Sign Support Structure means an overhead sign support structure or a roadside sign support structure.

Sweep means the deviation from straightness of a member or any portion of a member with respect to its minor axis.

Tri-Chord Sign Support Structure means a static sign support structure consisting of a galvanized steel overhead truss constructed in the form of a three-chord system and having two tubular legs.

Variable Message Sign Support Structure means an overhead sign support structure with two steel legs, consisting of a pair of trussed members, and an aluminum truss spanning the Roadway.

915.04 DESIGN AND SUBMISSION REQUIREMENTS

915.04.01 Design Requirements

915.04.01.01 Sign Support Structure

Sign support structure design shall be according to CSA S6, AASHTO LTS-6, the Sign Support Manual, the Structural Manual, and the requirements of this specification.

The catwalk grating shall be designed for a live load of 5 kPa.

Welding design shall be according to CSA W59.2M for aluminum and CSA W59 for steel.

915.04.02 Submission Requirements

915.04.02.01 General

Working Drawings and erection procedures shall be as specified in the Contract Documents. An Engineer's seal and signature shall be affixed on the Working Drawings and erection procedures verifying that they are consistent with the requirements of the Contract Documents.

All submissions shall be as specified to the appropriate clause.

When other authorities are involved in the approval of the design or construction of a highway structure, the submission shall be made at least 5 weeks prior to commencement of work and one additional copy of the required submission shall be provided for each other authority.

915.04.02.02 Working Drawings for Sign Support Structures

Three sets of Working Drawings shall be submitted to the Contract Administrator at least 7 Days prior to commencement of fabrication of overhead sign support structures, for information purposes only.

The fabricator shall have a sealed and signed copy of the Working Drawings at the manufacturing facility during fabrication. Working Drawings shall include at least the following information:

a) Fabrication details.

b) Specifications of the material to be used.

c) Design, assembly, and detail drawings including welding procedures according to CSA W59.2-M for aluminum and CSA W59 for steel.

d) Fastener torquing values and methods.

e) For variable message sign support structures, structural details of the sign, including the catwalk, aluminum skin, and attachment to the sign support structure.

f) Coating requirements.

915.04.02.03 Delivery Schedule for Overhead Sign Support Structures

The delivery schedule of overhead sign support structures and their components to the galvanizing or painting facility or both, and to the site, shall be provided to the Contract Administrator not less than 7 Days before shipping begins.

915.04.02.04 Rock Excavation

If rock is present within the depth of the footing specified in the Contract Documents, a proposed method of rock excavation shall be submitted to the Contract Administrator at least 14 Days prior to the commencement of excavation, for information purposes only.

915.04.02.05 Erection Procedures for Overhead Sign Support Structures

Three copies of the erection procedures shall be submitted to the Contract Administrator at least 7 Days prior to the commencement of overhead sign support structure erection, for information purposes only.

A copy of the erection procedures shall be provided at the site during erection. The erection procedures shall include at least the following:

a) Proposed method and sequence of erection.

b) Weight and lifting points of the members.

c) Locations and lifting capacities of the cranes to be used to lift the members.

d) Details of temporary bracing and temporary supports used during construction, including time and sequence of removal.

e) Calculations.

f) Fastener torquing values and methods.

g) Method of maintaining the columns and anchorages vertical and in the specified location in the footings until the concrete has set.

h) Erection tolerance between the end diagonal and the corbel for the tri-chord sign support structure truss.

915.04.02.06 Proposals

Five copies of any proposal shall be submitted to the Contract Administrator at least 14 Days prior to commencement of the work for review. Proposals shall bear the seals and signatures of a design Engineer and a design-checking Engineer. Work shall not proceed with the changes until the Contract Administrator has accepted the proposal.

915.04.02.07 Mill Test Certificates

Prior to the use of any material in fabrication, two copies of the mill test certificates for that material shall be submitted to the Contract Administrator confirming that the material is as specified in the Contract Documents.

Verification that bolts, nuts, and washers meet the chemical composition, mechanical properties, dimensions, workmanship, and head burst as required by the appropriate ASTM specification specified in the Contract Documents shall also be submitted to the Contract Administrator.

Copies of the mill test certificates for all material to be used in the fabrication shall be available for review at the fabricating plant during fabrication. The certificates shall show that the material is as specified in the Contract Documents.

If the material cannot be identified by mill test certificates, coupons shall be taken and tested and these test certificates shall be made available.

When mill test certificates originate from a mill outside Canada or the United States of America, the information on the mill test certificate shall be verified by testing by a Canadian laboratory. This laboratory shall be certified by an organization accredited by the Standards Council of Canada to comply with the requirements of ISO/IEC 17025 for the specific tests or type of tests required by the material standard specified on the mill test certificate. The mill test certificates shall be stamped with the name of the Canadian laboratory and appropriate wording stating that the material is in conformance with the requirements specified in the Contract Documents. The stamp shall include the appropriate material specification number, testing date (i.e., yyyy-mm-dd), and the signature of an authorized officer of the Canadian laboratory.

915.04.02.08 Inspection Company and Inspector Information

Names of the inspection company and the inspectors, together with proof of certification, shall be submitted to the Contract Administrator a minimum of 7 Days prior to commencement of fabrication of overhead sign support structures, for information purposes only.

915.05 MATERIALS

915.05.01 General

All material used shall be appropriate for its end use and shall be compatible with the sign structure metal.

915.05.02 Aluminum

Extruded aluminum tubing shall be 6061-T6 alloy according to ASTM B221M.

Aluminum sheet and plate shall be 6061-T6 alloy according to ASTM B209M.

Dissimilar metal shall not come in contact with aluminum.

915.05.03 Anchorage Assembly

Bolts, studs, struts, and coils shall be as specified in the Contract Documents. The anchorage assembly shall be hot dip galvanized according to ASTM A123/A123M. The anchorage assembly shall be supplied with the fasteners installed in a rigid template.

915.05.04 Clamps

Clamps shall be as specified in the Contract Documents.

915.05.05 Coatings

Paint and metallic coatings shall be as specified in the Contract Documents and according to OPSS 911.

915.05.06 Concrete

Concrete shall have a nominal minimum 28-Day compressive strength as specified in the Contract Documents and shall be according to OPSS 1350.

A superplasticizer shall be used to attain a slump of 150 mm $\pm$ 30 mm.

915.05.07 Electrical

Ducts and fittings for electrical work shall be as specified in the Contract Documents and according to OPSS 603.

Electrical grounding posts at handholes shall be according to OPSS 609.

915.05.08 Fasteners

Stainless steel fasteners shall be according to ASTM F593, Alloy 304 or 316.

Lock nuts shall be nylon insert type.

Galvanized steel fasteners shall be according to ASTM A307, ASTM F1325, or ASTM F3125M as specified in the Contract Documents and the requirements of the High Strength Bolts, Nuts, and Washers subsection of OPSS 906.

915.05.09 Granular Backfill

Granular backfill shall be as specified in the Contract Documents and according to OPSS 1010.

915.05.10 Primer and Locking Compound

The thread-locking compound shall be a removable medium strength, single component anaerobic thread locking material that allows disassembly with hand tools. The primer shall be as recommended by the manufacturer of the locking compound.

915.05.11 Reinforcing Steel

Reinforcing steel shall be a minimum Grade 400W steel and shall be according to OPSS 1440.

915.05.12 Steel

Steel shall be according to CSA G40.20/G40.21, ASTM A500, OPSS 906, and as specified in the Contract Documents.

915.05.13 Wood

Wood shall be grade No. 1 Coast Douglas Fir, or grade No. 1 Jack Pine - Beam and Stringer Grade, or Post and Timber Grade categories, as specified in the Contract Documents, and shall be according to OPSS 1601.

Wood shall be pressure preservative treated according to OPSS 1601.

915.07 CONSTRUCTION

915.07.01 Fabrication

915.07.01.01 Aluminum Sign Support Structures

915.07.01.01.01 General

The aluminum fabrication shall be according to CSA W59.2M.

Cutting shall be done by shearing, sawing, milling, or plasma arc. Flame cutting of components is not permitted. In straightening out parts, only plastic or rubber hammers shall be used. All sharp edges and burrs shall be removed. Components cracked or ruptured at any time shall be replaced.

915.07.01.01.02 Welding

The company performing the welding shall be certified according to CSA W47.2, Division 1 or Division 2.1. Qualification for welding and workmanship shall be according to the requirements of CSA W59.2.

Welding jigs and fixtures shall be used to hold the connector assemblies in position during fabrication.

All areas to be welded shall be free of grease and cleaned with grease free aluminum or stainless steel brushes. All Welds shall be made using MIG process according to CSA S157, Section 26.12. All welds shall be cleaned of soot.

Components to be joined by fillet welding shall have a separation no greater than 1.5 mm.

Unless noted on the Working Drawings or otherwise approved in writing by the Contract Administrator, field welding shall not be permitted. When field welding is permitted, it shall be done by a welder certified for all position welding according to CSA W47.2.

915.07.01.01.03 Bridge Mounted Sign Support Structures

When the location of attachment on a structure is not specified in Contract Documents, the attachment to the structure shall be located to minimize the fatigue affects on the support structure as determined by the Contract Administrator.

For anchors, the Contractor shall prepare, clean, and place adhesive in the drill holes as per the manufacturer's recommendations. Prior to drilling holes, the Contractor shall locate existing steel reinforcement, Utility ducts, post tensioning hardware, and any unsound concrete in the vicinity of the dowel locations. The Contractor's installation operations shall not damage the steel reinforcement, the surrounding concrete, or any other embedments.

915.07.01.02 Steel Sign Support Structures

915.07.01.02.01 General

The steel fabrication shall be according to the Working Drawings and OPSS 906, except as specified in this specification.

Circular structural tubing shall have no more than one longitudinal weld. Octagonal legs shall have no more than two longitudinal welds. Longitudinal welds in legs shall be full penetration and done using an automatic welding process. Longitudinal welds in legs shall be in a plane through the centroid of the section that is parallel to the signboard.

If an octagonal cross section is used for the legs, it shall be produced by mechanically bending the material. The centroid of the octagonal section shall be coincident with the specified circular shape.

915.07.01.02.02 Welding

Welding shall be according to CSA W59. All accessible welds, except fillet welds, shall be ground smooth.

915.07.01.02.03 Steel Monotube Overhead Sign Support Structures

The members shall be octagonal in cross-section and when tapered, the taper shall be uniform. Legs shall have one or two longitudinal automated electrically welded joints along their full length.

Circumferential welds shall be full penetration welds and shall be ground flush on the exterior face. The maximum permitted number of circumferential welded joints in a member length, as measured between the connections shall be as follows:

a) Up to and including 9 m - one weld.

b) Greater than 9 m - two welds.

Circumferential welds shall not be located less than 2.7 m from a bolted connection and all welding shall be carried out prior to galvanizing.

Sweep, in millimetres, shall not exceed:

a) (Total Length of Member in Metres / 15) x 10.4 mm

All welding at flange plates shall develop the full strength of the adjacent shaft section.

The column base plates shall be flush with the bottom of the columns. The base plates shall be positioned perpendicular to the centreline of the columns. The flange plates shall be positioned to provide the specified camber of the horizontal member after erection. After fabrication, the faces of the base plates and flange plates shall be true and free from distortion.

A waterproof removable galvanized steel top cap shall be furnished with each leg. The caps shall blend with the general column design to present a neat overall appearance. Each cap shall be rigidly secured to the column by a hexagonal head stainless steel set screw. The flange plates, handholes, access nipples for wiring, grounding lugs, and mounting brackets shall be accurately positioned on the members. The wiring apertures shall provide a smooth cable entrance into the members.

915.07.01.02.04 Coating

All steel components of steel sign support structures, including the anchorage assembly, shall be hot dip galvanized according to OPSS 911.

Legs of sign supports only, shall be subsequently coated with an approved paint system according to OPSS 911.

915.07.01.03 Mechanical Access for Electrical Work

Legs adjacent to the power source shall be fabricated with handhole frames complete with covers and gaskets. The strength of the leg at the section through the handhole shall not be less than the original section. When specified in the Contract Documents, grounding lugs, fuse clips, and access nipples for wiring shall be installed during shop fabrication.

915.07.01.04 Identification of Overhead Sign Support Structures

Each sign support structure shall have a site identification marking located approximately 1 m above the footing showing the following information:

a) Site identification number.

b) Manufacturer's name or trademark.

c) Date of manufacture.

d) Maximum sign area.

e) Design wind pressure.

The marking shall be on a corrosion resistant plate securely attached by means of stainless steel band clamps. The plate shall be attached on the right leg viewed in the direction of traffic. The maximum size of plate shall be 150 x 150 mm.

The site identification number, maximum sign area, and design wind pressure for each sign support structure shall be as specified in the Contract Documents.

915.07.01.05 Shipment of Sign Support Structures and Their Components

915.07.01.05.01 General

Each sign support structure shall be shipped, complete with hardware, suitably packaged to ensure that all components are delivered together with tags attached noting the site identification number. The fuse connector clip and grounding post shall be assembled inside the leg before shipment.

915.07.01.05.02 Transporting, Unloading, Storing, and Handling Components

The components shall only be handled at the lifting points specified in the Working Drawings using non-metallic lifting slings.

The components that are to receive a paint coating after galvanizing shall be identified when delivered to the

galvanizing plant.

All work necessary to ensure safe loading, delivery, unloading, and storage of components at the specified site shall be performed. Components shall be loaded for shipping in a manner that they can be transported and unloaded at its destination without being overstressed or damaged. When stored, components shall be stockpiled to avoid permanent deformation or damage.

Advertising by means of removable signing is permitted on elements only while in transit to the specified site. Painting of advertisements directly on elements is not permitted.

915.07.01.05.03 Storage of Signboard Chord Clamps

When the Contract Documents do not include the installation of the signboard for each overhead sign structure, the chord clamps required for fastening the sign shall be placed in burlap bags with tags marked with the size of clamps and the identification number of the sign structure on which they are to be used. Chord clamps prepared in this manner shall be delivered to the Owner for storage as specified in the Contract Documents.

915.07.02 Footings for Overhead Sign Support Structures

915.07.02.01 General

The footings shall be constructed plumb to within 1H:100V.

The tolerance for the location of the centre of the constructed footing shall be 75 mm from the location specified in the Contract Documents.

915.07.02.02 Excavation

The excavation shall be to the lines and grades specified in the Contract Documents and according to OPSS 902.

Cylindrical shaft footings for overhead sign support structures shall be constructed as caisson piles according to OPSS 903.

When soil with unexpected very low bearing capacity or unexpected rock is encountered at a depth less than the full depth of the footing, the excavation shall be stopped, and the Contract Administrator shall be notified immediately.

915.07.02.03 Formwork

Formwork shall be according to OPSS 919.

The footing shall be formed to a minimum of 150 mm below finish grade. Formwork shall be removed to a minimum depth of 150 mm below finished grade prior to placing granular backfill.

915.07.02.04 Reinforcing Steel

Reinforcing steel shall be placed according to OPSS 905.

915.07.02.05 Anchorage Assembly

The anchorage assembly shall be installed level to the tolerances specified in the Contract Documents. The tolerance for the location of the centre of the anchorage assembly shall be 50 mm from the centre of the footing. Anchorage assemblies shall be securely tied to the reinforcing steel and provided with supports to maintain its position during the placing of concrete. The anchorage assembly shall not be welded to the reinforcing cage and shall remain plumb to within 1H:200V. The anchorage assembly setting templates shall remain in place until after the curing period of the concrete.

The tolerance for the centre to centre of the anchorage assemblies for the following structure types shall be according to the following:

Tri-chord sign support structure:	- 25 mm to + 50 mm
Variable message sign support structure:	± 25 mm
Monotube overhead sign support structure:	± 25 mm

A primer and locking compound shall be applied to the anchor bolts during erection of the overhead sign structure.

Bedding grout shall not be used under the base plates of tri-chord, cantilever tri-chord, cantilever, pole mounted variable message, and monotube overhead sign support structures.

915.07.02.06 Electrical Ducts and Fittings

All work for electrical ducts and fittings shall be according to OPSS 603.

When rigid duct sleeves in footings are specified in the Contract Documents, they shall be located to suit incoming duct or cable systems and shall be securely tied to steel reinforcement, prior to placing concrete.

All rigid duct sleeves shall be cut off cleanly above the footing ensuring a minimum projection of 150 m above the base plates. Rigid duct sleeves shall be temporarily plugged or sealed until the ducts or cable systems are installed.

915.07.02.07 Concrete

Concrete work shall be according to OPSS 904.

Concrete shall be placed against undisturbed soil and the top of the footing shall be float finished level to a tolerance of ± 0.1 degree in any direction and within ± 10 mm of the elevation specified in the Contract Documents. The top surfaces shall be finished free of depressions. The concrete surface in contact with the base plate shall be steel float finished.

Concrete shall be cured according to the following:

a) Curing of the formed sign support footings shall be a minimum of 96 hours.

b) Wet burlap shall be applied to the top unformed surface of the footing immediately after completion of the finishing operation without damaging or marring the surface of the concrete and maintained in a wet condition for the minimum curing period.

c) When the formwork is left in place for 96 hours or more, no additional curing of the formed concrete surface is required.

d) When the formwork is removed in less than 96 hours, the formed concrete surface shall be cured with burlap and water for the remainder of the minimum curing period.

e) When white-pigmented membrane is used as a curing compound on an adjacent concrete barrier, a minimum of one coat of the curing compound shall be applied to the concrete footing immediately after completion of the curing cycle for the footing for colour uniformity. Additional curing compound shall be applied, as necessary, to ensure colour uniformity.

f) The curing compound shall only be used on the exposed surfaces of the footings. No curing compound shall be applied onto construction joints.

Prior to the erection of the sign support structure, curing of the footing shall be complete and the concrete shall be at a minimum compressive strength of 25 MPa.

915.07.03 Erection of Overhead Sign Support Structures

915.07.03.01 General

The Contract Administrator shall be notified in writing a minimum of 5 Business Days prior to the commencement of field operations and erection work.

Components shall be erected using appropriate lifting equipment, temporary bracing, guy-wire, and stiffening devices so that the components are at no time overstressed, unstable, unsafe, or damaged.

The fully assembled truss of the variable message sign support structure shall be erected in one lift.

Legs of structures with rigid corners shall not be forced into position on to the anchorage bolts.

915.07.03.02 Legs

Legs of structures shall be erected plumb to within a tolerance of 1H:200V.

915.07.03.03 Field Cutting

Field cutting of material is not permitted.

915.07.03.04 Attachments to Sign Support Structures

Attachments to the sign support structure shall only be made with clamps. Welding shall not be used for any attachment to the sign support structure.

915.07.03.05 Field Splices

Bolted field splices specified in the Contract Documents shall have full contact bearing when assembled and shall not have a separation exceeding 0.5 mm for at least 75% of the entire contact area. The separation of any remaining portion shall not exceed 1 mm.

915.07.03.06 Fastener Torquing

Fasteners shall be torqued as specified in the Contract Documents.

915.07.04 Breakaway and Non-Breakaway Roadside Sign Support Structures

915.07.04.01 General

The excavation for the footings of the steel columns and the installation of the wood columns shall be augered in undisturbed soil to the dimensions and at the locations specified in the Contract Documents. The elevation of the bottom of the excavation shall be as specified in the Contract Documents or as determined by the Contract Administrator. Sidewall stability shall be maintained throughout the excavation, concrete placement for steel columns, and installation of the wood columns. The formation of cavities in the wall and the flow of soil or water into the excavation shall be prevented. All loose material shall be removed from the bottom of the excavation and the excavation shall be inspected and accepted by the Contract Administrator prior to continuing the work.

When soil with unexpected very low bearing capacity or unexpected rock is encountered at a depth less than the full depth of the footing, the excavation shall be stopped and the Contract Administrator shall be notified immediately.

Centreline of the columns and column stubs shall be within 50 mm of the centreline of the as-built footing.

Centre to centre spacing of columns, column stubs, or column assemblies shall be $\pm$ 50 mm.

Height of signboard attachment holes shall be ± 10 mm.

915.07.04.02 Steel Roadside Sign Support Structures

915.07.04.02.01 Footings

Concrete for the footing shall be placed against undisturbed soil. The top of the footing shall be shaped to a dome with the top of the dome a minimum of 25 mm above the surrounding ground. The concrete shall be cured with curing compound, except in cold weather. In cold weather concrete shall be placed and protected according to OPSS 904.

Minimum edge distance of the column components from the edge of concrete footing shall be 75 mm.

915.07.04.02.02 Column Erection

The columns shall be maintained vertical to within a tolerance of 1H:200V and oriented within the tolerances specified in the Contract Documents until the concrete has set.

For the transverse alignment of the columns, the column components shall be installed so that the faces in contact with the cross-arms shall line up and be coplanar. The cross-arms and sign panels shall not be distorted.

The assembled elements constituting the column shall be straight and concentric with a maximum offset from the vertical axis of 5 mm at any joint.

Shims shall not be used in the assembly of the columns and joints, except at the column stub to lower column connection.

915.07.04.02.03 Breakaway Type Columns

The top surface of the friction plate on the column stub shall be installed level at the elevation specified in the Contract Documents and maintained in this position during the placing and setting of the concrete. The contact areas of the friction plate, fuse plate, and column flange shall be smooth; clean; and free of galvanized beads, runs, and other imperfections that may impair the sliding action.

915.07.04.03 Wood Roadside Sign Support Structures

915.07.04.03.01 Footings

The columns shall be maintained vertical to within a tolerance of 1H:200V and within the tolerances specified in the Contract Documents until the backfill has been completed.

Granular backfill shall be compacted according to OPSS 501. The top layer shall extend 100 mm above the surrounding ground and shall be sloped away from the column to provide water run off.

The backfill operation shall be completed prior to the attachment of the signs.

915.07.04.03.02 Field Installation

Field erection and cut surface treatment shall be according to OPSS 907.

The pressed steel shear plates shall be installed in grooves according to manufacturer’s recommendations.

The splice surfaces shall be flat and perpendicular to the centreline of the post to ensure full plate contact and shall be used as templates for drilling the holes.

915.07.05 Site Trimming Around Footings

The area surrounding the footing shall be trimmed and finished as specified in the Contract Documents.

915.07.06 Attachment of Signboards

915.07.06.01 General

The signboards shall be installed at the locations specified in the Contract Documents using fasteners appropriate for the application.

All signboards, overlays, and tabs to be installed on all new sign support structures will be supplied by the Owner.

Tabs and overlays placed on signboards shall be installed with self-tapping screws, #3 Teks screws, with a minimum distance between screws of 300 mm.

915.07.06.02 Sign Ordering

A list of required signboards, overlays, and tabs shall be submitted to the Contract Administrator a minimum of 12 weeks prior to the date of installation and shall contain the quantity, sign details, and the date for pick-up.

915.07.06.03 Sign Pick-Up

All ordered signboards, overlays, and tabs shall be picked up at the location provided in the “Schedule of Materials to be Supplied by the Owner” within 10 Business Days of receiving notice from the Contract Administrator that the signs are ready for pick-up.

915.07.06.04 Sign Confirmation and Inspection

Confirmation in writing shall be provided to the Contract Administrator within 5 Business Days upon receipt stating that all the supplied signs were received according to the list of required signboards, overlays, and tabs. The Owner shall be responsible for the cost of replacing any incorrect signs identified. Replacing any damaged, missing, or incorrect signs shall be replaced at no additional cost to the Owner.

915.07.07 Quality Control

915.07.07.01 General

The quality control of all fabrication processes shall be according to OPSS 906, except as modified in this specification.

An inspector performing the visual inspection shall be certified according to CSA W178.2. Certification shall be to either Level II or III for the methods used.

A testing company shall be employed to do the non-destructive testing of welds and shall be an independent testing organization that is certified by the Canadian Welding Bureau to the requirements of CSA W178.1 for testing of industrial structures by radiographic, ultrasonic, magnetic particle, and liquid penetrant test methods.

Testing shall be carried out by a non-destructive testing technician certified by the Canadian Welding Bureau according to CGSB 48.9712. Certification shall be either Level II or III for the methods used.

The technician and the testing company shall not be changed without the prior approval of the Contract Administrator.

Visual inspection and non-destructive testing of steel components shall be according to CSA W59 and as specified in this specification. The acceptance standards of CSA W59 for dynamically loaded structures shall apply.

Visual inspection and non-destructive testing of aluminum components shall be according to CSA W59.2M and as specified in this specification. The acceptance standards of CSA W59.2M for dynamically loaded structures shall apply.

915.07.07.01.02 Inspection and Testing Reports

Four copies of all inspection and testing reports shall be submitted to the Contract Administrator within 7 Days after inspection.

Inspection reports shall bear the seal and signature of an Engineer.

915.07.07.02 Fabrication, Inspection, and Testing

Prior to fabrication, the materials used shall be certified to be according to the requirements specified in the Material section.

Upon completion of fabrication, all welds in the structure shall be visually inspected and the following welds and connections shall be tested to confirm the acceptability of the fabrication:

a) The following steel connections shall be tested by magnetic particle testing:

   i. All column to base plate, stiffeners to column, and stiffeners to base plate for the cantilever, tri-chord, cantilever tri-chord, variable message, pole mounted variable message, and overhead monotube sign support structures.
   ii. All arm to leg connection plates, stiffeners to arm connection plate, and stiffeners to leg connection plate for cantilever and cantilever tri-chord sign support structures.

b) The following welds shall be tested using ultrasonic testing methods:

   i. All longitudinal groove welds in the first 2 m of the leg measured from the base plate of the tri-chord, pole mounted variable message, and overhead monotube sign support structures.
   ii. All longitudinal groove welds along the full length of the legs of cantilever tri-chord and cantilever sign support structures.
   iii. All circumferential welds.
   iv. All full penetration groove welds at the eight inclined chord / horizontal aluminum chord node locations of the end panels of variable message sign support structures.

Upon completion of the galvanizing of tri-chord, cantilever tri-chord, and cantilever sign support structures; the truss portion of the structure shall be visually inspected to confirm that the elements have not been damaged due to the galvanization process.

A written inspection and testing report shall be prepared for the Owner.

915.07.07.03 Field Inspection

915.07.07.03.01 Erected Sign Structure Inspection

An inspector shall be provided and in attendance to observe the erection operation and to report on compatibility of anchor layout and holes in the base plate and the general alignment, fit up, and bolting, including confirmation that the tolerance specified in the Contract Documents between the first diagonal and the corbel is maintained in the tri-chord sign support structure.

The inspector shall visually inspect all components for dents, cracks, ruptures, and loose or improperly fitted clamps and fasteners, including tensioning of fasteners, as well as the presence of all drain and vent holes specified in the Contract Documents.

A written inspection report of the observations shall be prepared for the Owner.

915.07.07.03.02 Concrete Inspection

The concrete shall be according to the submitted mix design and meet the specification requirements for air content, slump, temperature, concrete strength, and delivery time.

Testing of concrete for air content, slump, and temperature; concrete strength; and casting of cylinders shall be carried out according to OPSS 904.

When early strength of the concrete is to be established, additional cylinders shall be cast.

A written inspection report of the observations shall be prepared for the Owner.

915.07.07.04 Coating Inspection

Coating inspection shall be according to OPSS 911.

A written inspection report of the observations shall be prepared for the Owner.

915.07.08 Inspection after the Fabrication and Coating of the Overhead Sign Support Structure

915.07.08.01 General

A Manufacturer's Certificate of Conformance and a Request to Proceed shall be submitted to the Contract Administrator upon completion of the fabrication and coating of the overhead sign support structure, and prior to shipping from the plant.

The overhead sign support structure shall not be delivered from the plant until the Contract Administrator has received a Manufacturer's Certificate of Conformance, Request to Proceed, and issued to the Contractor a Notice to Proceed.

915.07.08.02 Interim Inspection After Construction of Footings

Upon completion of the construction of the footings, and prior to erection of overhead sign support structures, an Engineer shall conduct an interim inspection of the work to verify that the footings have been constructed in general conformance with the Working Drawings and as specified in the Contract Documents, including requirements for the location, top of footing elevation, anchorage layout, and surface finished to the specified tolerances, and issue written permission to proceed with the work to the Contract Administrator.

915.07.08.03 Interim Inspection After Fabrication of Components

Upon completion of fabrication of overhead sign support structure components, and prior to erection, an Engineer shall conduct an interim inspection of the work to verify that the fabrication of the sign support structure components has been carried out in general conformance with the Working Drawings and as specified in the Contract Documents.

For tri-chord, cantilever tri-chord, and cantilever static sign support structures only, the interim inspection shall include inspection after galvanizing.

After the interim inspection, the Engineer shall issue a written permission to proceed with the work to the Contract Administrator.

915.07.09 Repair of Sign Support Structures

915.07.09.01 General

Repair of sign support structures shall only apply to rehabilitation and refurbishment of existing sign support structures.

915.07.09.02 Steel

Salvaged steel components may be used as specified in the Contract Documents. A written certification bearing the seal and signature of an Engineer shall be submitted to the Contract Administrator certifying that salvaged components are defect free and are according to the Contract Documents.

915.07.09.03 Aluminum

Cracked or ruptured welds may be repaired. Distorted, cracked, or ruptured members or components shall be replaced subject to approval by the Contract Administrator as specified in the Contract Documents. Salvaged members shall not be used.

915.07.09.04 Inspection

An inspection of the repairs and replaced components shall be completed as specified in the Quality Control subsection.

915.07.10 As-Built Drawings

For overhead sign support structures, as-built drawings shall be prepared and submitted to the Contract Administrator in a reproducible format prior to final acceptance of the work and shall include the following information:

a) All work incorporated in the completed structure that required the submission of Working Drawings.

b) All changes that have been made from the original Contract Documents.

The as-built drawings shall bear the seal and signature of an Engineer.

915.07.11 Management of Excess Material

Management of excess material shall be according to the Contract Documents.

915.08 QUALITY ASSURANCE

915.08.01 General

The Owner, at its discretion, may choose to do inspection, testing, and sampling in the fabricating shop and field to confirm that the materials supplied, the fabrication, and the erection have been completed as specified in the Contract Documents.

The Contractor shall provide a free and safe access, and protection from the weather for inspection and testing of materials and structural components, shall be provided during all aspects of the fabrication, delivery, and erection of the sign support structures, at no additional cost to the Owner.

915.09 MEASUREMENT FOR PAYMENT

915.09.01 Actual Measurement

915.09.01.01 Sign Support Footings

For measurement purposes, a count shall be made of the number of sign support footings installed.

915.09.01.02 Sign Support Structures

For measurement purposes, a count shall be made of the number of sign support structures installed.

915.09.01.03 Attachment of Signs

For measurement purposes, a count shall be made of the number of signboards, overlays and tabs installed.

915.09.02 Plan Quantity Measurement

When measurement is by Plan Quantity, such measurement shall be based on the units shown in the clauses under Actual Measurement.

915.10 BASIS OF PAYMENT

915.10.01 **Concrete in Ground Mounted Static Sign Support Footings, Tri-Chord and Cantilever - Item**
Concrete in Median Mounted Static Sign Support Footings Tri-Chord and Cantilever - Item
Cantilever Tri-Chord Static Sign Support Structures, Class - Item
Concrete in Ground Mounted Variable Message Sign Support Footings - Item
Concrete in Median Mounted Variable Message Sign Support Footings - Item
Concrete in Steel Monotube Overhead Sign Support Footings - Item
Concrete in Steel Column Breakaway Sign Support Footings - Item
Concrete in Steel Column Non-Breakaway Sign Support Footings - Item
Tri-Chord Static Sign Support Structures, Span in Metres - Item
Cantilever Static Sign Support Structures, Class - Item
Pole Mounted Variable Message Sign Support Structures - Item
Steel Monotube Overhead Sign Support Structures, Span in Metres - Item
Variable Message Sign Support Structures, Span in Metres - Item
Steel Column Breakaway Sign Support Structures - Item
Steel Column Non-Breakaway Sign Support Structures - Item
Wood Column Breakaway Sign Support Structures - Item
Wood Column Non-Breakaway Sign Support Structures - Item
Aluminum Bridge Mounted Sign Support Structures - Item
Repair of Existing Structure - Item
Attachment of Signboards - Item

Payment at the Contract price for the above tender items shall be full compensation for all labour, Equipment, and Material to do the work.

For payment purposes, the fabrication and delivery of the sign support structures to the work site shall constitute 60% of the work of the tender item.

Replacement of aluminum components that were cracked, ruptured, or damaged during fabrication or erection shall be at no additional cost to the Owner.

Appendix 915-A, April 2025
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:

- Presence of rock within depth of footing. (915.04.02.04)
- Galvanized steel fastener requirements. (915.05.08)
- Standard for galvanized fasteners. (915.05.03)
- Clamp details. (915.05.04)
- Standard for steel. (915.05.12)
- Concrete compressive strength. (915.05.06)
- Grade of wood. (915.05.13)
- Anchorage assembly bolt, stud, strut, coil, and galvanizing requirements. (915.05.03)
- Electrical duct and fitting requirements. (915.05.07)
- Granular backfill type. (915.05.09)
- Coating requirements. (915.05.05, 915.07.01.02.04)
- Installation of grounding lugs, fuse clips, and access nipples for wiring during shop fabrication. (915.07.01.02)
- Site identification number, maximum sign area, and design wind pressure for each sign support. (915.07.01.04)
- Delivery of chord clamps for storage. (915.07.01.05.03)
- Footing locations. (915.07.02.01)
- Excavation lines and grades. (915.07.02.02)
- Anchorage assembly level tolerances. (915.07.02.05)
- Rigid duct requirements in footings. (915.07.02.06)
- Concrete footing elevations. (915.07.02.07)
- Bolted field splices. (915.07.03.05)
- Fastener torque requirements. (915.07.03.06)
- Roadside sign support footing locations, dimensions, and elevations. (915.07.04.01)
- Steel column tolerances. (915.07.04.02.02)

- Steel column breakaway type top surface of the friction plate elevation. (915.07.04.02.03)

- Wood column tolerances. (915.07.04.03.01)

- Site trimming and finishing around footings. (915.07.05)

- Locations of signboards to be installed. (915.07.06)

- Drain and vent hole locations. (915.07.07.03.01)

- Use of salvaged steel components. (915.07.09.02)

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

- If ground lugs, fuse clips, and access nipples for wiring are to be installed during shop fabrication. (915.07.01.03)

- Delivery requirements for signboard chord clamps. (915.07.01.05.02)

- Rigid duct sleeves. (915.07.02.06)

OPSS 915 contains information that is not used by municipalities in their Contracts. To ensure completeness of the municipal Contract Documents, the designer should invoke Appendix 915-B. The appendix contains information that modifies OPSS 915 so it can be used by a municipality in its Contracts.

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

No information provided here.