

**PART E**  
**SPECIFICATIONS**

## PART E - SPECIFICATIONS

### GENERAL

#### E1. APPLICABLE SPECIFICATIONS, STANDARD DETAILS AND DRAWINGS

E1.1 *The City of Winnipeg Standard Construction Specifications* in its entirety, whether or not specifically listed on Form B: Prices, shall apply to the Work.

E1.1.1 *The City of Winnipeg Standard Construction Specifications* is available in Adobe Acrobat (.pdf) format on the Information Connection page at The City of Winnipeg, Corporate Finance, Materials Management Division internet site at <http://www.winnipeg.ca/matmgt>.

E1.1.2 The version in effect three (3) Business Days before the Submission Deadline shall apply.

E1.1.3 Further to GC:2.4(d), Specifications included in the Bid Opportunity shall govern over *The City of Winnipeg Standard Construction Specifications*.

E1.2 The following Drawings are applicable to the Work:

<u>Drawing No.</u>	<u>Drawing</u>
WF-04-01	COVER SHEET
WF-04-02	SIGN BOX OPTION – SCOPE OF WORK
WF-04-03	SIGN BOX OPTION – SIGN AND POST DIMENSIONS
WF-04-04	SIGN BOX OPTION – POST DETAILS
WF-04-05	SIGN BOX OPTION – SIGN BOX DETAILS – SHEET 1 OF 2
WF-04-06	SIGN BOX OPTION – SIGN BOX DETAILS – SHEET 2 OF 2
WF-04-07	SIGN BOX OPTION – CONCRETE PILE FOUNDATION DETAILS
WF-04-08	SIGN PLATE OPTION – SCOPE OF WORK
WF-04-09	SIGN PLATE OPTION – SIGN AND POST DIMENSIONS
WF-04-10	SIGN PLATE OPTION – SIGN PLATE AND POST DETAILS
WF-04-11	SIGN PLATE OPTION – CONCRETE PILE FOUNDATION DETAILS
ST-116	TOP RING FORM FOR STANDARD DUTY TRAFFIC SIGNAL POLE
ST-117	STANDARD DUTY POLE BASE ANCHOR BOLT TEMPLATE

#### E2. WORK PROGRAM

E2.1 Description

E2.1.1 The Work covered under this item shall include all operations related to the supply and installation of the Winnipeg Traffic Wayfinder Signage System at various locations throughout the City of Winnipeg, in accordance with this Specification and as shown on the Drawings.

E2.1.2 The Work to be done by the Contractor under this Specification shall include the supply of all materials, and the furnishing of all superintendence, overhead, labour, equipment, tools, supplies and all other things necessary for and incidental to the satisfactory performance and completion of all Work as hereinafter specified.

## E2.2 Work Program

E2.2.1 The work program for the Wayfinder Signage System includes two options as shown on the Drawings. The first option consists of using aluminum sign boxes with steel posts. The second option consists of using aluminum sign plates with steel posts.

E2.2.2 Under the sign box option and sign plate option, there are six alternatives for bidding as listed below. The locations for the structures under each alternative are shown on the Drawings. The Bidder is advised that only one (1) alternative will be constructed.

- a) Alternative 1 – 134 structures with 169 sign boxes.
- b) Alternative 2 – 109 structures with 133 sign boxes.
- c) Alternative 3 – 91 structures with 107 sign boxes.
- d) Alternative 4 – 134 structures with 169 sign plates.
- e) Alternative 5 – 109 structures with 133 sign plates.
- f) Alternative 6 – 91 structures with 107 sign plates.

## E2.3 Work Included

E2.3.1 This section gives a general overview of the work required to be carried out by the Contractor. The detailed specifications for structural steel posts, concrete pile foundations, and sign boxes/plates is given in subsequent sections.

E2.3.2 The Contractor shall be responsible for the following work for a complete supply and installation of the Wayfinder Signage System under all alternatives:

- a) Visiting each site location with the Contract Administrator who will mark the location of the structure.
- b) Temporary traffic and pedestrian control.
- c) Clearance from all utility companies.
- d) Construction of cast-in-place concrete pile foundations, complete with anchor bolts.
- e) Supply and installation of breakaway base assemblies.
- f) Restoration of existing property adjacent to piles.
- g) Fabrication of steel posts and brackets.
- h) Hot-dip galvanizing of steel posts and brackets.
- i) Painting of hot-dip galvanized posts and breakaway base shrouds for Alternatives 1, 2, and 3.
- j) Fabrication of aluminum sign boxes (Alternatives 1, 2, and 3) and aluminum sign plates (Alternatives 4, 5, and 6).
- k) Painting of aluminum sign boxes.

- l) Fabrication of aluminum sign panel sheets for the sign boxes.
- m) City logo and lettering of required sign message on the sign panel sheets (Alternatives 1, 2, and 3) and sign plates (Alternatives 4, 5, and 6).
- n) Painting sign panels in back face of sign boxes (Alternatives 1, 2, and 3).
- o) Assembly of sign structure, complete with sign boxes/plates and installation at respective Site.
- p) Clean-up of Site.

#### E2.4 Submission of Sample Traffic Wayfinder Sign

- E2.4.1 The successful bidder shall, within twelve (12) calendar days of the request of the Contract Administrator, provide a sample Traffic Wayfinder Sign in accordance with this specification. The sample shall be submitted to the Contract Administrator through the office of Jean Belair, Superintendent of Traffic Services, 421 Osborne Street, Winnipeg Manitoba, R3L 2A2, Fax 204 - 986-6317, Ph 204 - 986-5841. The sample shall be a full scale Traffic Wayfinder Sign consisting of a sign box, complete with front message panel and a blank back sign panel, complying with the dimensions, colour, and sign panel message requirements in accordance with Alternative 1, for the Traffic Wayfinder Sign specified for installation at Site PE-1 (City Logo and upward pointing arrow on a dark blue background matching Pantone Matching System Colour PMS 2738 and the words "Downtown" in Traffic White lettering and the words "Centre ville" in Traffic Yellow lettering on a light blue background matching Pantone Matching System Colour PMS 3135) as shown on the drawings contained herein. In addition, a separate 900 millimetre by 900 millimetre swatch of the sign sheeting proposed for use in the fabrication of the sign, and a 300 millimetre by 300 millimetre swatch of the tape proposed for use in the white, yellow, and black lettering/stick ons shall be submitted to the office of Jean Belair, within twelve (12) calendar days of the request of the Contract Administrator. The bidder shall provide the Contract Administrator with the name of the supplier of the sign sheeting and lettering/stick ons, as well as the supplier's product name and product number for the sign sheeting and stick ons.

#### E2.5 Measurement and Payment

- E2.5.1 The supply and installation of the complete Wayfinder Signage System will be paid for on a Contract Lump Sum Price basis for only one (1) out of the six (6) alternatives in the "Items of Work," listed herebelow, in accordance with this Specification and accepted by the Contract Administrator.

##### Items of Work:

##### Supply and Installation of Winnipeg Traffic Wayfinder Signage System

- 1. Alternative 1 – 134 Structures with 169 Sign Boxes
- 2. Alternative 2 – 109 Structures with 133 Sign Boxes
- 3. Alternative 3 – 91 Structures with 107 Sign Boxes
- 4. Alternative 4 – 134 Structures with 169 Sign Plates
- 5. Alternative 5 – 109 Structures with 133 Sign Plates
- 6. Alternative 6 – 91 Structures with 107 Sign Plates

### **E3. STRUCTURAL STEEL POSTS**

#### **E3.1 Description**

The Work covered under this item shall include all operations related to the supply, fabrication, delivery, and erection of new structural steel posts for the Traffic Wayfinder Signage System.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of the Work as hereinafter specified.

#### **E3.2 Materials**

##### **E3.2.1 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 structural steel posts shall be new, previously unused material.

##### **E3.2.2 Handling and Storage of Materials**

All materials shall be handled in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the requirements of CSA Standard CAN3 A23.1.8-M77, Storage of Materials, except as otherwise specified herein.

##### **E3.2.3 Structural Steel**

All hollow structural sections (HSS) for the steel posts shall conform to the requirements of CAN/CSA-G40.20M, Grade 350 W, Class H or Class C. Round steel pipe material for sign brackets shall conform to ASTM A53, Gr. 241 MPa, welded and seamless steel pipe. All other structural steel shall be CSA Standard G40.21 M, Grade 300 W.

The Contractor 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 Contract Administrator at least seven (7) days prior to the scheduled commencement of fabrication. Fabrication shall not commence until directed in writing by the Contract Administrator.

##### **E3.2.4 High-Strength Bolts, Nuts and Washers**

High-strength bolts, nuts and washers for connecting the brackets to the posts shall be hot-dip galvanized Accurate Tension Torque Control Bolts, as supplied by Infasco, 700 Ouellette, Marieval, PQ, Canada J3M 1P6 (450) 658-8741, or equal as accepted by the Contract Administrator, and shall conform to the requirements of ASTM Specification A325, Type 1. Nuts shall be hot-dip galvanized and conform to the requirements of ASTM Specification A563, Grade C. Washers shall be hot-dip galvanized and conform to the requirements of ASTM Specification F436, Type 1.

E3.2.5 Other Bolts, Nuts, and Washers

All other bolts, nuts, washers and screws shall be in accordance with ASTM A276 Type 316 stainless steel.

E3.2.6 Hot-Dip Galvanizing

All hot-dip galvanizing shall be in accordance with CSA G164 for a minimum net retention of 600 g/m<sup>2</sup>.

E3.2.7 Galvanizing Touch-up and Field-Applied Galvanizing

Field-applied galvanizing, to touch-up damaged hot-dip galvanizing on-site and to galvanize field welds, shall be done with self-fluxing, low-temperature, zinc-based alloy rods in accordance with ASTM A780-80 for "Repair of Damaged Hot-Dip Galvanized Coatings." Approved products are Galvalloy as manufactured by Metalloy Products Company, P.O. Box No. 3093, Terminal Annex, Los Angeles, California, and Welco Gal-Viz Galvanizing Alloy, as manufactured by Thermocote Welco, Highway 161, York Road, Kings Mountain, North Carolina. Locally, both products are available from Welder Supplies Limited, 25 McPhillips Street, Winnipeg.

E3.2.8 Welding Consumables

Welding consumables for all processes shall be certified by the manufacturer to be complying with the requirements of CSA Standard W59-M1984 and the following Specifications:

a) Manual shielded metal arc welding (SMAW):

All electrodes shall be basic-type electrodes conforming to CSA W48.1-M1991 or W48.3-M1982, classification E480XX, or imperial equivalent.

b) Gas metal arc welding (GMAW):

All electrodes shall conform to CSA W48.4-M1980, classification ER480S-X, or imperial equivalent.

c) Flux cored arc welding (FCAW):

All electrodes shall conform to CSA W48.5-M1982, classification E480XT-X or imperial equivalent. Electrodes shall be controlled by hydrogen (CH) designation.

d) Submerged arc welding (SAW):

All electrodes shall conform to CSA W48.6-M1980, classification F480X-EXXX or imperial equivalent.

e) Shielding gas shall be welding grade carbon-dioxide with a guaranteed dew point of -46°C.

f) All electrodes, wires, and fluxes used shall be of a classification requiring a minimum impact of 27 joules at -18°C.

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

#### E3.2.9 Paint

The paint system for hot-dip galvanized posts shall consist of a high-build epoxy primer and two coats of urethane topcoat. The finish colour shall be Pantone Matching System PMS 2738, dark blue. However, the Contract Administrator will supply a swatch sample to the Contractor to match the colour prior to painting.

#### E3.2.10 Miscellaneous Materials

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

#### E3.3 Equipment

All equipment shall be of a type approved by the Contract Administrator and shall be kept in good working order.

#### E3.4 Construction Methods

##### E3.4.1 General Requirements

- a) Shop drawings, showing fabrication details and dimensions of all the different types of steel posts, consisting of three (3) sets of prints, shall be submitted to the Contract Administrator at least 14 days prior to start of fabrication.
- b) Alternatives 1, 2, and 3 consist of posts with an angled top. Sign boxes, with flanges on steel brackets, are cantilevered and bolted onto the posts. For these alternatives, the posts and the sign boxes shall be painted dark blue to match Pantone Colour System PMS 2738.
- c) Alternatives 4, 5, and 6 consist of posts with a flat top. Sign plates with stiffeners are bolted directly onto steel brackets welded to the vertical shaft of the post, as shown on the Drawings. For these alternatives, the posts and the back of the sign plates are not to be painted.
- d) For the posts applicable to Alternatives 1, 2, and 3, particular care should be given to ensure that the holes on the posts align with the flange holes on the sign box brackets. Poor matching of holes will be cause for rejection.
- e) For Alternatives 1, 2, and 3, the exposed portion of the connecting bolts, namely the head, nut and residual threading, shall be painted dark blue to match Pantone Matching System PMS 2738.
- f) Each post shall be provided with a "raised" structure identification number with a welding electrode in accordance with the details shown on the Drawings. The post identification number shall be placed before hot-dip galvanizing.
- g) Holes in the base plates shall be as shown on the Drawings.

- h) Steel may be cut to size by sawing, shearing, flame cutting, or machining.
- i) Prior to fabrication, the dimensional limitations on the size and shape imposed by the galvanizing facilities shall be determined for hot-dip galvanizing.

#### E3.4.2 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, Luminaries, and Traffic Signals - 2001 - 4<sup>th</sup> Edition, plus all subsequent revisions.

The punching of identification marks on the members will not be allowed, except for the structure identification number.

Any damage to members during fabrication shall be drawn to the attention of the Contract Administrator in order that the Contract Administrator may approve remedial measures.

Dimensions and fabrication details that control the field matching of parts shall receive very careful attention in order to avoid field adjustment.

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. Edges of flame cut edges shall be ground to a radius of 2 mm. Re-entrant cuts shall be filleted to a radius of not less than 19 mm. Special attention shall be given to the cutting of cover plates or flange plates. Welds at cover plates shall be ground smooth prior to hot-dip galvanizing. Sheared edges of plates more than 16 mm in thickness shall be planed to a depth of 6 mm. All holes shall be provided by drilling with twist drills not burning. All holes shall be free of burrs and rough edges. Holes shall be pre-drilled prior to hot-dip galvanizing.

#### E3.4.3 Welding

Welding of steel posts shall be in accordance with CSA W59, "Welded Steel Construction."

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

#### E3.4.4 Surface Preparation and Cleaning

Surface preparation and cleaning of materials prior to hot-dip galvanizing shall be in accordance with CSA G164 and SSPC Specification SP:10, "Near White Metal Blast Cleaning," unless otherwise specified herein. The Contractor shall ensure that all exterior surfaces of the posts and brackets are blast cleaned prior to pickling to achieve the minimum zinc coating mass of 600 g/m<sup>2</sup>. 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 posts shall be done in the shop. After the posts and brackets have been sandblasted and cleaned, the Contract Administrator will carry out a visual inspection of the blast-cleaned items in the shop before they are shipped to the galvanizing plant.



#### E3.4.5 Hot-Dip Galvanizing

The hot-dip galvanizing plant shall be a Regular Member of the American Galvanizers Association, Inc. and certified to CSA G164.

All outside surfaces of the posts and brackets shall be hot-dip galvanized in accordance with the requirements of this Specification.

Adequate venting and drainage holes shall be provided in enclosed sections for hot-dip galvanizing. The galvanizing facility shall be consulted regarding the size and location of these holes. Such holes shall be provided by drilling not burning.

The galvanizing coating on outside surfaces of the posts shall be generally smooth and free of blisters, lumpiness and runs. In particular, the outside surfaces of the bottom 3.0 m of the posts shall have a smooth finish equal to the finish on hot-dipped galvanized handrails.

In addition to the provision of corrosion protection by the galvanized coating, the aesthetic appearance of the posts after hot-dip galvanizing will also be a criteria in the acceptance or rejection of the galvanized coating. The galvanized coating on the entire post shall have a uniform "silver" colour and lustre. Galvanizing with parts of the post 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 post is installed.

Minor defects in the galvanizing coating shall be repaired in accordance with E3.4.9 of this Specification. The Contract Administrator shall be consulted before repairs are made. Use of cold applied spray-on galvanizing will not be permitted and will be cause for rejection.

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.

The Contractor shall verify the thickness of galvanized coatings as directed by the Contract Administrator.

The steel items shall be stored on timber blocking after hot-dip galvanizing.

#### E3.4.6 Painting

All painting shall be carried out in the shop.

For the previously hot-dip galvanized steel items, including posts, base plates, brackets, shrouds, and reaction plates, the paint system for Alternatives 1, 2, and 3 shall be applied as follows:

- a) Surface preparation involving sweep blasting to SSPC-SP7.
- b) One coat of high build epoxy primer with 5 to 6 mils dry film thickness.
- c) Two coats of urethane top coat with each coat 2 mils dry film thickness. Colour to match Pantone Colour Matching System 2738.

For Alternatives 4, 5, and 6, the posts and breakaway bases are not to be painted. .

#### E3.4.7 Installation of Sign Boxes/Plates

The Contractor will be responsible for installation of sign boxes/plates at each Site location.

#### E3.4.8 Delivery and Erection

The Contractor shall notify the Contract Administrator at least two (2) working days in advance of the anticipated delivery to the Site and erection of the posts.

The posts shall be lifted and secured with nylon ropes or other approved methods. Use of steel chains and steel hooks against hot-dip galvanized surfaces and painted surfaces will not be permitted. All posts and brackets shall be wrapped in cardboard during transportation to the Site to protect the coated finish.

The Contractor shall ensure that the anchoring nuts of the anchor bolts are tightened according to the "turn-of-nut" method of the AASHTO Code.

#### E3.4.9 Field-Applied Touch-up Galvanizing

Any areas of damaged galvanizing on the posts for Alternatives 4, 5, and 6 shall receive field-applied touch-up galvanizing.

Surfaces to receive touch-up galvanizing shall be cleaned using a wire brush, a light grinding action, or mild blasting to remove loose scale, rust, paint, grease, dirt, or other contaminants. Preheat the surface to 315°C and wire brush the surface during preheating. Rub the cleaned preheated area with the repair stick to deposit an evenly distributed layer of zinc alloy. Spread the alloy with a wire brush, spatula, or similar tool. Field-applied galvanizing shall be blended into existing galvanizing of surrounding surfaces and shall be buffed and polished if required to match the surrounding surfaces. Care shall be taken to not overheat surfaces beyond 400°C and to not apply direct flame to the alloy rods.

### E3.5 Quality Control

#### E3.5.1 General

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, 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 Contract Administrator 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.

### E3.5.2 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 Contract Administrator prior to fabrication of any steel items.

### E3.5.3 Testing

In addition to the Contractor's own quality control testing of all materials, welding procedures and steel fabrication will be inspected by the Contract Administrator to ascertain compliance with the Specifications and Drawings.

The Contract Administrator will hire and pay for a testing agency certified by the Canadian Welding Bureau to carry out the following shop fabrication inspection and testing before the posts are approved ready for application of coating system:

- (1) Magnetic particle inspection and testing of a random 25% of base plate welds.
- (2) Surface preparation prior to hot-dip galvanizing.
- (3) Inspection of finish and zinc coating thickness of hot-dip galvanized steel items.
- (4) Inspection of surface preparation prior to painting.
- (5) Inspection of paint coating thickness.

The Contract Administrator shall have access to all of the fabricator's normal quality control records for this Contract, specified herein.

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 retested. The cost of the repairs and the cost of the retest shall be paid for by the Contractor.

No repair shall be made until agreed to in writing by the Contract Administrator.

### E3.5.4 Unacceptable Work

Any Work found to be unacceptable shall be corrected in accordance with CSA W59.

No repair shall be made until agreed to by the Contract Administrator.

## E3.6 Measurement and Payment

### E3.6.1 Supply and Installation of Structural Steel Posts

Supply and installation of structural steel posts will not be measured and paid for separately. They will be considered as part of the complete installation of the Traffic Wayfinder Signage System as specified in Section E2.

#### **E4. CONCRETE PILE FOUNDATIONS**

##### **E4.1 Description**

The Work covered under this Item shall include all concreting operations related to construction of cast-in-place concrete pile foundations in accordance with this Specification and as shown on the Drawings.

The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of all Works as hereinafter specified.

##### **E4.2 Materials**

###### **E4.2.1 General**

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

###### **E4.2.2 Handling and Storage of Materials**

All materials shall be handled and stored in a careful and workmanlike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with CSA Standard CAN3-A23.1, "Storage of Materials," except as otherwise specified herein.

###### **E4.2.3 Testing and Approval**

All materials supplied under this Specification shall be subject to inspection and testing by the Contract Administrator or by the Testing Laboratory designated by the Contract Administrator. There shall be no charge to the City for any materials taken by the Contract Administrator for testing purposes.

All materials shall conform to CSA Standard CAN3-A23.1.

All testing of materials shall conform to CSA Standard CAN3-23.2.

###### **E4.2.4 Cement**

Cement shall be Type HS, high sulphate-resistant hydraulic cement, conforming to the requirements of CSA A3001-03.

###### **E4.2.5 Supplementary Cementing Materials**

Use of pozzolans, fly ash, or silica fume will not be permitted for use in structural concrete supplied under this Specification.

E4.2.6 Water

Water used for mixing concrete shall be clean and free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances. It shall be equal to potable water in physical and chemical properties.

E4.2.7 Aggregate

The Contractor shall furnish in writing to the Contract Administrator, the location of the sources where aggregate will be obtained, in order that same may be inspected and tentatively approved by the Contract Administrator. Changes in the source of aggregate supply during the course of the Contract will not be permitted without notification in writing to and the expressed approval of the Contract Administrator.

(a) Fine Aggregate

Fine aggregate shall consist of sand having clean, hard, strong, durable, uncoated grains; free from injurious amounts of dust, soft or flaking particles, shale, alkali, organic matter, loam, or other deleterious substances.

Fine aggregate shall be well-graded throughout and shall conform to the following grading requirements:

Gradation of Fine Aggregates	
Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
10,000	100%
5,000	95% - 100%
2,500	80% - 100%
1,250	50% - 90%
630	25% - 65%
315	10% - 35%
160	2% - 10%
80	0% - 3%

(b) Coarse Aggregate (40 mm Nominal)

Coarse aggregate shall conform to the requirements of CAN3-A23.1, Section 5, Aggregates. Coarse aggregate shall be clean and free from alkali, organic, or other deleterious matter, shall have an absorption not exceeding 3 percent, and shall conform to the following gradation requirements:

Gradation of 40 mm Coarse Aggregate	
Canadian Metric Sieve Size	Percent of Total Dry Weight Passing Each Sieve
56,000	100%
40,000	95% - 100%
20,000	30% - 70%
10,000	10% - 0%
5,000	0% - 5%

#### E4.2.8 Admixtures

No admixtures other than air-entraining agent shall be used without the written authorization of the Contract Administrator, unless otherwise specified in these Specifications. It shall be the Contractor's responsibility to ensure that any admixture is compatible with all other constituent materials.

#### E4.2.9 Reinforcing Steel

Reinforcing steel shall be deemed to include all reinforcing bars, tie-bars, and dowels.

All reinforcing steel shall conform to the requirements of CSA Standard G30.12, Grade 400 MPa, Billet-Steel Bars for Concrete Reinforcement. All reinforcing steel shall be new deformed billet steel bars.

#### E4.2.10 Anchor Bolts, Nuts, and Washers

Anchor bolts, nuts, and washers shall be in accordance with CSA Standard G40.21 Grade 300W, and shall be hot-dip galvanized full length in accordance with CSA G164 for a minimum net retention of 600 g/m<sup>2</sup>, for the entire length of the anchor bolts. The top 300 mm shall be threaded. The anchor bolts shall be 25 mm (1 inch) nominal diameter with 8 UNC threads. Anchor bolt supply and installation will be incidental to construction of concrete pile foundation and no separate payment will be made.

#### E4.2.11 Nut Covers

The bolts shall be capped with a 1 inch plastic Nut Cover, manufactured by Nova Pole International, Attention: Sandra Atkins, Distributor, 203, 26229 Township Road, Spruce Grove, Alberta. In the case of Alternatives 1, 2, and 3, the nut covers shall be dark blue in colour matching Pantone Colour System PMS 2738. In the case of Alternatives 4, 5, and 6, the nut covers shall be grey in colour matching Pantone Colour System PMS 429C.

#### E4.2.12 Top Ring Form

Top ring form to be supplied by the Contractor shall be in accordance with City of Winnipeg Standard Drawing ST-116. It will be incidental to construction of new concrete pile foundations and no separate payment will be made.

#### E4.2.13 Anchor Bolt Template

Anchor bolt template to be supplied by the Contractor shall be in accordance with the City of Winnipeg Standard Drawing ST-117. It will be incidental to construction of new concrete pile foundations and no separate payment will be made.

#### E4.2.14 Breakaway Base Assembly

Breakaway base assembly shall be as shown on the Drawings and shall include a C-5 Coupler as manufactured by Safety Base Ltd., 1036 Waverley Street, Winnipeg, Manitoba, R3P 0T3, Attention: Brent Poole.

#### E4.2.15 Miscellaneous Materials

Miscellaneous materials shall be of the type specified on the Drawings or approved by the Contract Administrator.

#### E4.3 Concrete Mix Design

Proportioning of fine aggregate, coarse aggregate, cement, water, and air entraining agent shall be such as yield concrete having the required strength and workability as follows:

- i) Minimum Compressive Strength at 28 days = 35 MPa
- ii) Maximum Water/Cement Ratio = 0.45
- iii) Minimum Cement Content = 340 kg/m<sup>3</sup>
- iv) Slump = 80 mm  $\pm$  30 mm
- v) Aggregate: 20 mm nominal
- vi) Air Content: 5.0 to 8.0 percent
- vii) Cement - Type HS, high sulphate-resistant.

#### E4.4 Equipment

All equipment shall be of a type approved by the Contract Administrator and shall be kept in good working order.

#### E4.5 Construction Methods

##### E4.5.1 Location and Alignment of Piles

Piles shall be placed in the positions shown on the Drawings and as directed by the Contract Administrator in the field.

The Contractor shall satisfy the Contract Administrator, by way of examination at each Site jointly by the Contractor and Contract Administrator (or designate), that the specific Site chosen for the location of the pile is acceptable from a perspective of road user visibility and from a perspective of proximity to existing structures and utilities. Subject to such examination, the location of each specific Site so agreed upon shall be marked by a means such as the insertion of a miniature flag in the boulevard or median where grassed, or by a means such as spray painting in the boulevard or median if concrete-surfaced.

The centre of the pile shall be no closer than 0.8 m from the inside face of curb of the adjacent roadway for right-hand-side (RHS) mounted signs. For left-hand-side (LHS) mounted signs, the centre of the pile shall be no closer than 1.8 m from the inside face of the curb adjacent to the roadway.

The deviation of the axis of any finished pile shall not differ by more than 1 percent from the vertical.

##### E4.5.2 Buried Utilities

The Contractor shall exercise extreme caution when constructing the pile foundations in the vicinity of existing buried utilities. The Contractor shall be responsible for obtaining the exact location of the buried utilities from the appropriate Utility Authority prior to installing the piles.

The Contractor shall be responsible for all costs that may be incurred for repair/rectification of any damage caused to the existing buried utilities as a result of the Contractor's operations in constructing cast-in-place concrete piles, as determined by the Contract Administrator.

#### E4.5.3 Adjacent Property and Site Restoration

When sidewalk or median slab must be removed in preparation for excavation, the Contractor shall saw-cut the slab surface to a minimum depth of 100 mm at both ends of the designated section, carefully break down the designated concrete slab and remove all loose concrete. Care shall be taken to ensure that the saw-edges are not chipped or broken and that existing tie-bars and dowel rods encountered during this work are not damaged.

The restoration of existing concrete sidewalks/medians and curbs, as well as boulevard median, interlocking paving stone, or sodding will be incidental to the construction of cast-in-place concrete pile foundations, and no separate payment will be made. Granular material for backfilling shall conform to Specification CW 3110, Clause 5.5, "Base Course Material," except crushed limestone shall not be used.

Sidewalk or median concrete paving shall be saw cut at least 300 mm all around from the edge of pile and restored flush with adjacent surface level after the new pile has been installed. When interlocking stone must be removed in preparation for excavation, the Contractor shall, upon construction of the pile, restore the area with interlocking stone having a colour and shape and installation pattern identical to that which was originally in place. Based on the weather conditions, the Contractor shall temporarily restore the Site to the satisfaction of the Contract Administrator until final restoration.

#### E4.5.4 Excavation

Excavations for piles shall be made with equipment designed to remove a core of the diameter shown on the Drawings.

Upon reaching the required depth, the bottom of the hole shall be cleaned and, if called for, belled out to the required dimensions and elevations as shown on the Drawings or as directed by the Contract Administrator in the field.

All excavated material from the piles shall be promptly hauled from the Site to an approved disposal area as located by the Contractor.

Upon completion of the cleaning out of the bottom of the hole to the satisfaction of the Contract Administrator, the reinforcement and anchor bolts shall be set in place and the concrete poured immediately. Under no circumstances shall a hole be left to stand open after boring has been completed.

If any hole is condemned because of caving, it shall be filled with lean-mix concrete and a new hole bored as near as possible to the location shown on the Drawings. Payment will not be made for condemned piles.

#### E4.5.5 Sleeving

For cast-in-piles greater than 1.0 m in diameter, timber or steel sleeving shall be used to temporarily line the hole to prevent bulging or caving of the walls and to protect men at work in the hole.



The sleeving shall be designed by the Contractor and constructed to resist all forces that may tend to distort it.

The sleeving shall be withdrawn as the concrete is placed in the bore. The sleeving shall extend at least 1 m below the top of the freshly deposited concrete at all times.

The clearance between the face of the bore hole and the sleeving shall not exceed 75 mm.

#### E4.5.6 Inspection of Boreholes

Concrete shall not be placed in a borehole until it has been inspected and approved by the Contract Administrator.

The Contractor shall have available suitable light for the inspection of each borehole throughout its entire length.

All improperly set sleeving, bore, bell, or bottom shall be corrected to the satisfaction of the Contract Administrator.

#### E4.5.7 Placing Reinforcing Steel

Reinforcement shall be:

- i) placed in accordance with the details shown on the Drawings,
- ii) rigidly fastened together, and
- iii) lowered into the borehole intact before concrete is placed.

Spacers shall be utilized to properly locate the reinforcing steel cage in the borehole.

#### E4.5.8 Placing Anchor Bolts

The Contractor shall fabricate a top steel ring form and steel anchor bolt template for the piles shown on the Drawings. The top steel ring form shall be used for all pile bases. The anchor bolts shall be aligned with the anchor bolt template. Extreme care shall be used in this operation. Placement of anchor bolts without the top steel ring form and steel template will not be permitted.

The threaded portion of the anchor bolts shall be coated with oil, before the concrete is poured, to minimize the fouling of threads splattered by concrete residue. The portion of anchor bolts projecting from the pile shall be fully threaded.

#### E4.5.9 Forms

The top 600 mm of the piles below the top steel ring form shall be formed with tubular forms (Sonotube).

The forms shall be sufficiently rigid to prevent lateral or vertical distortions from the loading environment to which they shall be subjected. Forms shall be set to the design grades, lines, and dimensions, as shown on the Drawings.

#### E4.5.10 Placing Concrete

Care shall be taken to ensure that anchor bolts are vertically aligned and properly positioned prior to placement of concrete.

Concrete shall not have a free fall of more than 2.0 m and shall be placed so that the aggregates will not separate or segregate. The concrete shall be vibrated throughout the entire length of the pile.

Concrete shall be placed to the elevations as shown on the Drawings. The top surface of the pile shall be finished smooth and even with a hand float.

The shaft and bell shall be free of water prior to placing of concrete. Concrete shall not be placed in or through water unless authorized by the Contract Administrator. In the event that tremie concrete is allowed by the Contract Administrator, the concrete shall be placed as specified herein.

#### E4.5.11 Tremie Concrete

The shaft of the pile shall be pumped clear of water so that the bottom can be cleaned and belled. Pumping shall then be stopped and water shall be allowed to come into the bore until a state of equilibrium is reached. Concrete shall then be placed by means of a tremie pipe. The tremie pipe shall have a suitable gate in the bottom to prevent water from entering the pipe. The bottom of the pipe shall be maintained below the surface of the freshly placed concrete. The pipe shall be capable of being raised or lowered quickly in order to control the flow of concrete.

Tremie concrete shall only be poured up to the top of the bell or as the Contract Administrator directs. Pumps shall then be lowered into the bore and the excess water pumped out. The laitance that forms on top of the tremie shall then be removed and the remainder of the concrete shall be placed in the dry.

#### E4.5.12 Protection of Newly Placed Concrete

Newly laid concrete threatened with damage by rain, snow, fog, or mist shall be protected with a tarpaulin or other approved means.

#### E4.5.13 Curing Concrete

The top of the freshly finished concrete piles shall be covered and kept moist by means of wet polyester blankets immediately following finishing operations and shall be maintained at above 10°C for at least seven (7) consecutive days thereafter.

After the finishing is completed, the surface shall be promptly covered with a minimum of a single layer of clean, damp polyester blanket.

Concrete shall be protected from the harmful effects of sunshine, drying winds, surface dripping or running water, vibration, and mechanical shock. Concrete shall be protected from freezing until at least twenty-four hours after the end of the curing period.

Changes in temperature of the concrete shall be uniform and gradual and shall not exceed 3° in one hour or 20° in twenty-four hours.

#### E4.5.14 Form Removal

Forms shall not be removed for a period of at least 24 hours after the concrete has been placed. Removal of forms shall be done in a manner to avoid damage to, or spalling of, the concrete.

The minimum strength of concrete in place for safe removal of forms shall be 20 MPa.

Field-cured test specimens, representative of the in-place concrete being stripped, will be tested to verify the concrete strength.

#### E4.5.15 Patching of Formed Surfaces

Immediately after forms around top of pile have been removed, but before any repairing or surface finishing is started, the concrete surface shall be inspected by the Contract Administrator. Any repair of surface finishing started before this inspection may be rejected and required to be removed.

All formed concrete surfaces shall have bolts, ties, struts, and all other timber or metal parts not specifically required for construction purposes cut back fifty (50) mm from the surface before patching.

Minor surface defects caused by honeycomb, air pockets greater than 5 mm in diameter, and voids left by strutting, and tie holes shall be repaired by removing the defective concrete to sound concrete, dampening the area to be patched and then applying patching mortar. A slurry grout consisting of water and cement, shall be well-brushed onto the area to be patched. When the slurry grout begins to lose the water sheen, the patching mortar shall be applied. It shall be struck-off slightly higher than the surface and left for one hour before final finishing to permit initial shrinkage of the patching mortar and it shall be touched up until it is satisfactory to the Contract Administrator. The patch shall be cured as specified in this Specification, and the final colour shall match the surrounding concrete.

#### E4.5.16 Cold Weather Concreting

Protection of concrete shall be considered incidental to its placement. The temperature of the concrete shall be maintained at or above 10°C for a minimum of three (3) days or till the concrete has reached a minimum compressive strength of 20 MPa, by whatever means are necessary. Concrete damaged as a result of inadequate protection against weather conditions shall be removed and replaced by the Contractor at his own expense. Also, concrete allowed to freeze prior to the three (3) days will not be accepted for payment.

#### E4.6 Painting

In the case of Alternatives 1, 2, and 3, the break away bases, including reaction plates and shrouds, shall be painted dark blue matching Pantone Colour System PMS 2738. In the case of Alternatives 4, 5, and 6, painting of break away bases is not required.

**E4.7 Quality Control**

All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection and testing by the Contract Administrator, 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 or approval that may have been previously given. The Contract Administrator 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.

**E4.8 Measurement and Payment**

**E4.8.1 Construction of Concrete Pile Foundations**

Construction of concrete pile foundations including supply and installation of anchor bolts and breakaway base assemblies will not be measured and paid for separately. They will be considered as part of the complete installation of the Traffic Wayfinder Signage System as specified in Section E2.

**E5. SIGN BOXES AND SIGN PLATES**

**E5.1 Description**

The Work covered under this item shall include all operations related to the supply, fabrication, delivery, and erection of sign boxes and sign plates for the Traffic Wayfinder Signage System.

The work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour, materials, equipment, tools, supplies, and all things necessary for and incidental to the satisfactory performance and completion of the Work as hereinafter specified.

In addition to the Drawings listed in Section E1, the PDF files listed in Table E1 are included in Appendix A to this section for Work covered under this item. The files contain tables and drawings.

**TABLE E1**

<b>Item No./Folder</b>	<b>PDF Files</b>
1. Inventory List	Inventory List-Sept 3-04
2. Site Maps	Sign Plans_Maps_ALT 1 Sign Plans_Maps_ALT 2 Sign Plans_Maps_ALT 3
3. Installations	Installations_ALT 1 Installations_ALT 2 Installations_ALT 3
4. Sign Art	Sign Art_ALT 1 Sign Art_ALT 2 Sign Art_ALT 3
5. Kit of Parts	Kit of Parts
6. Box Sign Back Logo	Box Sign Back Logo

## E5.2 Materials

### E5.2.1 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 overhead sign support structures shall be new, previously unused material.

### E5.2.2 Handling and Storage of Materials

All materials shall be handled in a careful and workmanshiplike manner, to the satisfaction of the Contract Administrator. Storage of materials shall be in accordance with the requirements of CSA Standard CAN3 A23.1.8-M77, Storage of Materials, except as otherwise specified herein.

### E5.2.3 Sign Box Extrusion (Alternatives 1, 2, and 3)

The sign box, as applicable to Alternatives 1, 2, and 3, shall consist of an aluminum extrusion along the outer edge, and shall be constructed in accordance with the details shown on the Drawings. An approved extrusion section is Alloy 6063, Shape No. 961875 manufactured by Altex Extrusion (450-629-4260) available from Summum Signs Inc. (800-561-4900) or SSS Inc. (450-978-5678).

### E5.2.4 Sign Message Panels

The sign message panel for sign boxes shall consist of Gauge No. 12 sheet aluminum (.0808 in. or 2 mm thick), flat sheet tension levelled, sign grade aluminum alloys 5052-H38 or 6061-T6, conforming to the requirements of ASTM B 209M, "Specifications for Aluminum and Aluminum-Alloy Sheet and Plate." Tensioned levelling is a technique that gives aluminum sheets a superior flatness and resistance to tearing at connections.

### E5.2.5 Sign Plates (Alternatives 4, 5, and 6)

Sign plates shall consist of Gauge No. 10 sheet aluminum (0.125 in. or 3.2 mm thick), flat sheet tension levelled, sign grade aluminum alloys 5052-H38 or 6061-T6, conforming to the requirements of ASTM B 209M, "Specifications for Aluminum and Aluminum-Alloy Sheet and Plate." Tensioned levelling is a technique that gives aluminum sheets a superior flatness and resistance to tearing at connections.

### E5.2.6 Aluminum Plates and Stiffener Bars

Aluminum plates and stiffener bars shall be in accordance with ASTM B209, Alloy 6351-T6 or 6061-T6. Sizes shall be as shown on the Drawings.

### E5.2.7 Aluminum Pipe Sleeves

Aluminum pipe sleeves in the sign boxes shall be in accordance with ASTM B209, Alloy 6351-T6 or 6061-T6. Sizes shall be as shown on the Drawings.

E5.2.8 Bolts and Screws

Bolts, nuts, washers, and machine screws shall be in accordance with ASTM A276 Type 316 stainless steel.

E5.2.9 Bonding Tape

Bonding tape for attaching the stiffener bars to the aluminum sheets shall be 3M very high bond (VHB) tape used in the fabrication of traffic sign panels.

E5.2.10 Paint

The paint system for sign boxes of Alternatives 1, 2, and 3 shall consist of an epoxy primer and two coats of urethane topcoat. The paint finish colour shall be dark blue to match Pantone Matching System PMS 2738.

E5.2.11 Miscellaneous Materials

Miscellaneous materials incidental to this work shall be as approved by the Contract Administrator.

E5.3 Construction Methods

E5.3.1 General Requirements

- a) Shop drawings showing fabrication details and dimensions of all the different types of sign boxes/plates, consisting of three (3) sets of prints, shall be submitted to the Contract Administrator at least 14 days prior to start of fabrication.
- b) The Contractor shall refer to Section E2.4.1 regarding submission of sample sign box.
- c) The shape and dimensions of the signs shall be in accordance with the details shown on the Drawings. The dimensions of the sign panel shall be within  $1.5 \pm$  mm of those specified and the finished sign shall be flat with a maximum allowable deflection of .005 (D) where (D) is the maximum dimension of the sign blank in any direction. The signs shall conform in quality and accuracy of detail to the dimensional and tolerance requirements of the specification. Where no tolerances are specified, the standard of workmanship shall be in accordance with normally accepted good practice. In the case of the box sign options, the sign message panel shall fit securely in the aluminum extrusion as shown in the Drawings, and shall become an integral element of the box structure when the top of the extrusion is secured in place.
- d) All fabrication, including shearing, cutting, and drilling shall be completed before treating the metal and applying the face material. Cut all metal message panels to size and shape as per the dimensions for each sign. The panels shall be free of buckles, warp, dents, cockles, burrs, and defects resulting from fabrication. Edges of all substrate panel material shall be de-burred to provide a smooth finished edge. Each face of the panel shall be finished to be a plain surface and flat.
- e) Welding of aluminum plates and pipe sleeves in the sign boxes shall conform to the requirements of CSA Standards CAN3-S157, "Strength Design in Aluminum," W47.2, "Certification of Companies for Fusion Welding of Aluminum, and W59.2, "Welded Aluminum Construction." Where welding is called for on the Drawings, it

shall be done by qualified welders using the Metal Inert Gas (MIG) process. All areas to be welded should be thoroughly cleaned with a suitable solvent followed by wire brushing if surfaces are heavily oxidized.

- f) The sign box extrusion, including screw heads, shall be painted dark blue to match Pantone Matching System 2738, being the colour of the posts for Alternatives 1, 2, and 3. The paint system shall be applied as follows:
  - i) Vinyl wash the aluminum surface on outside and inside.
  - ii) One coat of epoxy primer on both outside and inside surface with 4 mil dry film thickness.
  - iii) Two coats of urethane topcoat on both outside and inside surfaces, each coat to be 2 mils dry film thickness.
- g) Each sign box shall contain a front sign panel and a back sign panel. The vast majority of the sign boxes contain a message only on the front sign panel. In such cases where there is a message only on the front sign panel, the outside surface of the back sign panel shall be painted dark blue to match Pantone Matching System 2738 using the same paint system application as above.
- h) Alternatives 4, 5, and 6 consist of sign plates attached directly onto steel braces welded to the vertical shaft of the post. For these alternatives, the posts and back of the sign plates are not to be painted.
- i) Aluminum stiffener bars shall be attached to the back side of sign message panels and plates using 3M VHB tape in accordance with the manufacturer's instructions.

#### E5.3.2 Sign Fabrication

- a) The surface of the substrate material shall be appropriately prepared prior to the application of sheeting or painting. Such preparation shall include degreasing and etching to promote adhesion of reflective materials as hereinafter recommended or as may be recommended by the sheeting manufacturer. The metal shall be treated by using conversion coating or anodizing to finish the metal before painting or applying reflective sheeting. The finished sign message panel shall have a uniform, light-coloured appearance, without splotches or stains. If the finishing procedure produces an iridescent colour, the shade should be uniform. The metal shall be thoroughly cleaned before finishing. The cleaning process shall begin by cleaning with an etch-type alkaline cleaner or with a vapour degreaser, using a trichloroethylene or perchloroethylene solvent. The cleaner shall be used according to the manufacturer's specifications. After using an alkaline etching cleaner, the metal shall be treated with an acid solution or desmutting compound. The desmutting compound shall be used according to the manufacturer's specifications. The metal shall be finished with a chromate conversion coating or by anodizing with a chromic acid anodizing solution. The conversion-coating compound shall be used according to the manufacturer's specifications. The metal shall be carefully handled with a device or with clean cotton gloves between all cleaning and finishing operations and before applying the finish material. The metal shall never come in contact with greases, oils, dust, or other contaminants before applying the finish material.
- b) Sheeting and taping for the sign faces shall comply with the Canadian Standards Board "Standard for: Marking Material, Retro-reflective Enclosed Lens, Adhesive Backing" document number 62-GP-11M dated May/1978. Specifically, for Type 1

material (sheeting) and for Type 2 material (tape which includes lettering and other stick ons), the reflective material shall be Class 1, being pressure sensitive adhesive backing, and Level 1, being the highest reflectivity; wide angle, long durability. The Standard specifies Silver White, Yellow, Red, Dark Red, Brown, Orange, Green, Blue, and Gold colours that shall meet the chromaticity limits shown in Table 1 of the Canadian Standards Board standard when tested as described in paragraph 8.2.3 of the Canadian Standards Board standard. The reflective intensity values, expressed in candelas per lux per square metre, of the material shall be not less than the values specified in Table 2 for each reflectivity level and colour. As a minimum, the signs must meet the Colour Specification Limits and Reference Standards specified in Table 1, and the minimum Reflective Intensity Values specified in Table 2 of the Canadian Standards Board document number 62-GP-11M in all respects. Notwithstanding the above statement, the signs must also meet the most stringent of the following two requirements: (1) the sheeting and tape product types Colour Specification Limits and Reference Standards and a minimum Reflective Intensity Values as specified for 3M Scotchlite High Intensity Grade Reflective Sheeting as described in 3M Product Bulletin dated January 2000, and Avery Dennison High Intensity Grade Reflective Sheeting as described in Avery Dennison Product Data Bulletin # T-6500 Issued: 05/01; in all other respects, these proprietary products shall comply with the requirement of the Canadian Standards Board Specification. (2) the required minimum level of reflectance is a contrast ratio of 70% in reflectance readings of lettering against background colour; specifically, a 2.3 to 1 contrast ratio for traffic yellow lettering against the Pantone Matching System PMS 3135 aqua blue background, being the US ADA recommended minimum, with reflectance readings of the aqua blue colour for entrance angle of -4 and observation angle of .2 to be between 85 and 90. At the specified minimum reflectance readings for the yellow to aqua blue, the ratio for white to aqua blue will be 3.4 to 1, and the ratio for yellow and white to dark blue will exceed those specified for aqua blue.

- c) Sign sheeting material for the message plate shall consist of pre-coloured reflective sheeting, Traffic White in colour. The white sheeting shall be screened with compatible transparent ink to match dark blue, Pantone Matching System PMS 2738, and light blue Pantone Matching System PMS 3135 as specified herein. Standard Traffic White, Standard Traffic Yellow, and Standard Traffic Black taping/stick-ons shall be used to produce the message as specified on the drawings for the signs. Swatches will be made available to assist the sign manufacturer to match the intended colours. Sign sheeting material shall be correctly applied in accordance to the sheeting manufacturer's recommendations and industry accepted quality practices. The sheeting shall be applied so that it does not contain air pockets and the sheeting shall not have holes, tears, scrapes, compressed cells or patches. Any joints must be sealed in accordance with the sheeting manufacturer's recommendations. The sign fabricator must ensure the signs are adequately protected from damage during shipping.
- d) Ink used for silk screening must be designed for use on highway signs and recommended by the sheeting manufacturer. Inks shall be warranted to be effective for a period of time commensurate with the warranted life of the retro-reflective sheeting.
- e) Typeface lettering shall be Clearview Highway 2-W cut from sheeting of the type specified, Standard Traffic White, Standard Traffic Yellow, or Standard Traffic Black in colour as specified on the drawings for the signs. The Colour Specification Limits and Reference Standards and a minimum Reflective Intensity Values shall be as specified above.



- f) Bob Firth of Informing Design Inc. may be contacted by e-mail at [bob@informingdesign.com](mailto:bob@informingdesign.com) <<mailto:bob@informingdesign.com>> to obtain PC-compatible font files for the cutting of the Clearview Highway 2-W lettering. Mr. Firth has agreed to make this font, which is patented, exclusively available to the successful bidder for use for outputting signs in this Contract only. For all other purposes, the font could be purchased commercially at [www.terminaldesign.com](http://www.terminaldesign.com).
- g) The City of Winnipeg Logo shall be in accordance with the specifications shown on the Drawings.
- h) The Parking “P” symbol shall be in accordance with the specifications shown on the Drawings.
- i) The “Star” symbol shall be in accordance with the specifications shown on the Drawings.
- j) The “Route Number” shall be in accordance with the specifications shown on the drawings contained herein.

#### E5.4 On-Site Installation

- E5.4.1 Sign boxes as applicable to Alternatives 1, 2, and 3, and sign plates as applicable to Alternatives 4, 5, and 6, shall be installed onto the posts at each Site location in the field in accordance with the requirements and details shown on the Drawings.
- E5.4.2 The sign boxes and sign plates shall be handled with care and wrapped with plastic sheeting during their transportation to the Site.

#### E5.5 Quality Control

- E5.5.1 All workmanship and all materials furnished and supplied under this Specification are subject to close and systematic inspection by the Contract Administrator, 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 Contract Administrator reserves the right to reject any materials or works that are not in accordance with the requirements of this Specification.
- E5.5.2 The Contractor shall be responsible for making a thorough inspection of materials to be supplied under this Specification. All material shall be free of surface imperfections and other defects.
- E5.5.3 The Contractor shall, at his own expense, correct such work or replace such materials found to be defective under this Specification in an approved manner to the satisfaction of the Contract Administrator.
- E5.5.4 The Contract Administrator will reject reflective sheeting if the material fails to meet any one of the designated requirements, if the material meets the requirements but later fails during sign fabrication or in actual field use. Cracks, wrinkles, delamination, colour change, or abnormal loss of reflectivity constitute failure.
- E5.5.5 The Contractor shall transfer to the Contract Administrator a performance warranty for the reflective sheeting used by the manufacturer, ensure that the warranties cover the full replacement cost, including material and labour, include in these warranties a provision that the warranty is subject to a transfer to the Contract Administrator, and submit a warranty from the manufacturer that states that the reflective sheeting – processed, applied

to sign blank materials, and cleaned – meets the outdoor weathering photometric requirements of Canadian General Standards Board Specification 62-GP-11M.

- E5.5.6 The Contractor shall submit to the Contract Administrator the manufacturer's certification with respect to the sign sheeting. The certification shall: state that the named product conforms to the specifications contained herein and that representative samples thereof have been sampled and tested as specified; either be accompanied with a certified copy of the test results, or certify that such test results are on file with the manufacturer and will be furnished to the Contract Administrator upon demand; give the name and address of the manufacturer and the testing agency and the date of the tests, and set forth the means of identification which will permit field determination of the product delivered to the project as being the product covered by the certification. The Contractor shall be responsible for any costs of certification or for any costs of the sampling and testing of products in connection therewith. The Contract Administrator reserves the right to require samples to be submitted in addition to the requirement referred to above, and to test products for compliance with pertinent requirements irrespective of prior certification of the products by the manufacturer.

E5.6 Measurement and Payment

E5.6.1 Sign Boxes and Sign Plates

The supply and installation of sign boxes and sign plates will not be measured and paid for separately. They will be considered as part of the complete installation of the Traffic Wayfinder Signage System as specified in Section E2.