



**SPECIFICATIONS FOR HIGHWAY SIGN STRUCTURAL
SUPPORTS FOR EXISTING SIGN PANELS ON HIGHWAY
FIVE WITHIN WATERTON NATIONAL**

**STRUCTURAL SUPPORTS, SITING, SURVEYS,
ENGINEERING, DRAWINGS, LOCATES AND
INSTALLATION**

WATERTON NATIONAL PARK



Parks
Canada

Parcs
Canada

Canada

TABLE OF CONTENTS

Section ONE - General3

Section Two – Sign Structures.....4

Section Three – Sign Panels, transport and location16

Section Four – Measurement and Payment 18

Section Five - Warranty..... 19

Section Six- Technical Drawings, Attachments20

SECTION ONE - GENERAL

1.0 General

This specification is for the siting, Engineering, locates, Engineered drawings, installation of sign panels as per the Alberta Standard, mobilization, demobilization, boulder removal, travel, clean up, removal and disposal of all signs not required in the area of replacement. And all associated work pertaining to highway signs structures. Special note; wind loading in the Waterton area can reach speeds up to 200 kph. Sign Engineering must address this as part of the Engineering sign off on the As-builts.

All sign panels are crated and located at the Waterton Compound near the townsite in Waterton National Park. The pickup of the sign panels, transportation to the site, un packing of the crate if it exists, installation of panel on Engineered support structure and disposal of crate materials as well as existing sign if it exists and all equipment and permitting necessary to carry out this work.

All geo-technical work associated with the design and installation of highway structures and any costs associated with addressing geo-technical and site specific constraints shall be borne by the contractor and be included in the bid price of the foundation.

The underground utilities located on the drawings are approximate and are to be confirmed by the Contractor in the field.

Prior to design and construction, the Contractor shall confirm underground and overhead utility conflicts with the sign bases and support structure and immediately inform the Consultant of these conflicts. Any costs associated with addressing these underground utility conflicts shall be included in the bid price of the foundation.

In advance of any work commencing the contractor will require a business permit and vehicle permits for all equipment utilized in this contract. A health and safety plan and transportation plan will need to be submitted and approved in advance of work commencing. Work will not be allowed on statutory holidays and Friday afternoon's of a long weekend.

Signs are to be installed on 8X8 Douglas Fir. Steel brackets for each panel joint will be provided by the Park. Sign posts to be a minimum of 1.8 m below the original ground surface. All backfill material to be well graded, the granular fill shall be compacted to 98% in lifts of 0.6m maximum. For signs with two distinct panels a 100 mm space will be provided between panels. So the Red Rock and Akamina signs will require this spacing.

SECTION TWO – SIGN STRUCTURES

2.0 Sign Structures

2.1 Design

2.1.1 Design Standards

The design shall be carried out by the Contractor. The Contractor's design engineer shall be a Professional Engineer registered to practice in the Province of Alberta under the APEGGA Act.

The design shall be in accordance with the requirements of AASHTO "Standard Specifications for Structural Supports for Highway Signs", latest Edition and Interims, unless noted otherwise in these special provisions.

AASHTO equation 3-1, Clause 3.8.1, shall be modified as follows:

$$P_z = 2.7 q K_z C_d$$

where q shall be taken from CAN/CSA S6-00, Table A3.1.7 for a return period of 50 years.

The design ice thickness for ice accretion shall be the value given in CAN/CSA S6-00 Figure A3.1.4.

If required, the design of all cantilevered sign structures, the Fatigue Importance Factors in Table 11-1 shall be based on Fatigue Category I. The deflection for cantilevered sign structures, as specified in Clause 11.8, shall not exceed 200 mm.

Anchor bolts if required, shall be post-tensioned to 0.70 Fpu. Stresses for anchor bolts shall be limited to 0.50 Fpu applied to the root tensile stress area for Group Load Combination I, II & III. Stress range for Group IV shall be in accordance with Section 11. The design shall allow for the failure of one anchor at any one location for each pile foundation. After such failure, the remaining anchors shall still be capable of meeting the above design requirements.

If required, based on the sign face the National Building Code will be consulted for wind loading. Appropriate changes will be made to address wind loading for the Waterton Lakes area. Wind loading can be up to 200 kph.

Sign panels are completed and located in Waterton National Park compound.

- Actual sign panel location shown on attached site plan map drawing.
- All panels are 3.0 square metres in size and larger.

The structures shall have a permanent vertical camber of at least $L/200$.

The top of the concrete foundations shall project from 700 mm to 850 mm above the

adjacent ground surface on the traffic side. The exposed portion of the concrete foundation shall be of circular cross-section.

The minimum vertical clearance below the sign panels shall be as per highway standard. This clearance is to be confirmed in the field and will be approximately 1.8 to 2.2 m in height.

All locations and final heights will be approved by the Parks Canada representative in advance of installation.

2.1.2 Final Drawings

All final drawings, shall be stamped, signed, and sealed by an Engineer certified in the province of Alberta.

Parks Canada will receive three hard copies and three electronic copies of the final drawings. Electronic versions of the drawings are to be in Autocad DWG format.

The Contractor shall incorporate as-built conditions at the completion of construction.

- 1) Final Drawings shall be presented in a legible and logical format and shall be sufficiently detailed. Final Drawings shall include, as a minimum, calculations for the following:
 - (a) Design moment, shear and axial force envelopes for serviceability, ultimate and fatigue limit states.
 - (b) Columns
 - (c) Horizontal arm or truss
 - (d) Column or arm flange bolted connections
 - (e) All welded connections, stiffeners, etc.
 - (f) Anchor bolts
 - (g) Foundation
- 2) Final drawings shall be in Autocad DWG format incorporating the drawing standards as specified by Parks Canada CADD standard. Be of legible and of adequate quality to be reproduced and microfilmed. All drawings shall be standard 8 1/2 X 17 inch sheet sizes.

The final drawings shall include the following:

- (a) Parks Canada Asset Management File numbers, and project title, as provided by the Consultant, shall be shown on all drawings.
- (b) Design criteria meeting the requirements of Section 2.1.1, for each individual sign structure, including:
 - i. AASHTO "Standard Specifications for Structural Supports for Highway Signs, " 4th Edition and 2002 interims
 - ii. Initial sign panel area and/or minimum design sign panel area
 - iii. Design wind pressure
 - iv. Fatigue category and fatigue loadings
 - v. Design ice thickness
 - vi. Other dead loads
 - vii. Design temperature range

- viii. Foundation soils parameters
 - ix. Critical anchor bolt forces
 - x. Wind loading design requirements
- (c) Each individual shop fabricated section or assembly shall be shown separately with complete and clearly identified welded or bolted details.
- (d) Weld procedure identification shall be shown on the shop drawings in the tail of the weld symbols.
- (e) All material splice locations shall be shown on the drawings.
- (f) Complete material list.
- (g) Erection procedure including tensioning procedure for anchor bolts.

2.1.3 Engineer Review

The final drawings shall be reviewed by an Engineer solely to ascertain conformance with codes and specifications. Responsibility of the final design remains solely with the Contractor. The Engineer's acceptance of the final drawings shall not be construed as relieving the Contractor from his responsibility for errors or omissions in the calculations and drawings or for proper completion of the work in accordance with the contract.

After the Engineer review, the Contractor shall revise the drawings and calculations as required to the satisfaction of the Engineer without any additional cost to the Department.

Prior to commencing fabrication, all final drawings shall be clearly signed by the Engineer as verification that the Engineer has completed his review and accepted the Drawings. The Engineer's acceptance of the Drawings will apply to general arrangements and details of design but not to figured dimensions or details of fabrication, and will be subject to the requirements of specifications and to such corrections as may be marked here on.

Engineer must be licensed in the province of Alberta.

2.2 Supply and Fabrication

2.2.1 Standards

Fabrication of sign structures shall adhere to the National Building Code, the Alberta Transportation Standard, "The American Association of State Highway and Transport Officials (AASHTO), Standard Specifications for Highway Bridges" and the American Welding Society (AWS) - Bridge Welding Code, D1.5. The Alberta Highway Standards and the National Building code for wind loading.

Where imperial/metric conversions are necessary, The National Standard of Canada, CAN 3-Z234.1-79 shall be used as the basis of conversion.

All welding, cutting and preparation shall be in accordance with the American Welding Society (AWS) - Bridge Welding Code, D1.5, and D1.1.

2.2.2 Qualification

Certification

The Fabricator shall be fully approved by the Canadian Welding Bureau (CWB) as per CSA Standard W47.1.

The Contractor shall notify Parks Canada of any subcontractors in his employ. The Contractor shall remain responsible for the work of the subcontractors. All terms of the contract, such as CWB approval and right of access shall apply to the subcontractor.

Only welders, welding operators and tackers approved by the Canadian Welding Bureau in the particular category shall be permitted to perform weldments. Their qualifications shall be current and available for examination by the Consultant.

2) Contractor's Quality System

The Contractor shall maintain an acceptable quality management system throughout the contract. The purpose of the quality management system is to ensure that the product meets the quality requirements of the contract and is delivered on time. The Contractor's quality management system shall apply to all stages of the design, procurement, manufacturing, testing and delivery of the product.

2.2.3 Engineering Data

All Welding must be reviewed and approved in writing by an Engineer registered in the province of Alberta. The Engineer's letter is to be submitted to Parks with the Final Drawings.

2.2.4 Materials

- a) All materials shall be new.
- b) The use of aluminium and aluminium alloy are not acceptable, unless specifically stated otherwise by the Consultant.
- c) Structural steel plate material shall conform to CSA G40.21M 300W*. *Silicon content shall be less than 0.04% for the shafts, whereas for flanges and base plates the silicon content shall be either less than 0.04% or between 0.15 to 0.25%.
- d) All bolts, nuts and washers shall conform to ASTM standard A325 or shall meet property class 8.8 of the Industrial Fasteners Institute for metric high strength structural bolts, nuts and washers. Certified mill test reports for the fastener material shall be provided.
- e) Anchor bolts shall be fabricated from DYWIDAG thread bars conforming to the requirements of CSA Standard G279.

- f) All steel materials including all hardware and anchor bolts shall be hot-dip galvanized.

2.2.5 Welding

- 1) **Filler Metals** Low hydrogen filler, fluxes and low hydrogen welding practices shall be used throughout. The low hydrogen covering and flux shall be protected and stored as specified by AWS Standard D1.5. Flux cored welding or use of cored filler wires in the submerged arc process or shielding gas processes are not considered as conforming to low hydrogen practice. These methods will not be permitted.

However metal core welding process utilizing low hydrogen electrodes with AWS designation of H4 will be allowed. The deposited weld metal shall provide strength, durability, and impact toughness and corrosion resistance equivalent to base metal.

- 2) **Cleaning Prior to Welding**

Weld areas must be clean, free of mill scale, dirt, grease, and other contaminants prior to welding.

- 3) **Longitudinal Seams**

all longitudinal seams shall be made by an approved semi or fully automatic submerged arc or metal core welding processes.

- 4) **Weld Penetration** The full penetration welds shall be completed using properly fitted backing bars or back gouged to sound metal. The longitudinal seams shall have a minimum 60% penetration; however if backing bar is used for longitudinal seam, the weld penetration shall be 90%. The following welds shall have 100% penetration:

- (a) Column to base plate.

- (b) Member to flange plate.

- (c) Flange plate to gusset plate.

- (d) Longitudinal seam welds within 150 mm of circumferential welds and 150 mm beyond hand holes (when provided) shall be full penetration groove welds.

Transition between full and partial penetration welds shall be ground smooth.

- (e) Backing bar splices the backing bar for full penetration weld shall be properly fitted and the member prepared to a sharp edged 45 degree chamfer. The groove weld shall be placed in a minimum of two passes by using 100 C of preheat (unless higher preheat is required as per AWS) and maintain a root opening of 5 mm. A rod size no greater than 4.0 mm shall be used for the first pass. A reinforcing fillet weld shall be placed all around the joint.

- 5) **Tack and Temporary Welds**

Tack and temporary welds shall not be allowed unless they are to be incorporated in the final weld. Tack welds, where allowed, shall be of a minimum length of four times the nominal size of the weld, and shall be subject to the same quality requirements as the final welds. Cracked tack welds shall be completely removed prior to welding over.

6) **Run-off Tabs**

Run-off tabs shall be used at the ends of all welds that terminate at the edge of a member. They shall be tack welded only to that portion of the material that will not remain a part of the structure, or where the tack will be welded over and fused into the final joint. After welding, the tabs are to be removed by flame cutting, not by breaking off.

7) **Methods of Weldmelt Repair**

Repair procedures for unsatisfactory weldments shall be submitted for review and acceptance by the Department and Consultant prior to repair work commencing.

8) **Arc Strikes**

Arc strikes will not be permitted. In the event of accidental arc strikes, the Contractor shall submit to the Department and Consultant for review and acceptance a proposed repair procedure. The repair procedure shall include the complete grinding out of the crater produced by the arc strike. These areas will be examined by the Consultant to ensure complete removal of the metal in the affected area.

9) **Plug and Slot Welds**

Plug welds or slot welds shall not be permitted.

10) All welding is to be specified, reviewed, stamped and approved by an Engineer licensed in the province of Alberta.

2.2.6 Fabrication

Fabrication shall be performed in an enclosed area which is adequately heated. Field welding will not be allowed.

- 1) **Pre-job Meeting** Prior to commencement of fabrication, a pre-job meeting will be conducted by the Consultant. This meeting will be conducted after the shop drawings have been accepted. The Contractor shall ensure the plant superintendent, plant manager responsible for the work and any manufacturer's representatives directly involved in the specialized work are in attendance.
- 2) **Cutting of Plate** All plate material for main members and any plate material welded to the main member shall be flame cut using an automatic cutting machine. Shearing is not allowed.
- 3) **Material Splices** Additional splices, other than those shown on the drawings, will require acceptance of the Engineer. The Contractor shall bear the cost of inspection of these splices.
- 4) **Additional Requirements**
 - a. Each column, arm, extension, clamp and bracket shall be fabricated from one piece of sheet steel unless accepted otherwise.
 - b. Intermediate circumferential butt welds will not be allowed however horizontal members greater than 12m span may have a bolted splice.
 - c. Columns, arms, extensions and clamps shall be brake press formed or

roll formed. The brake press knife shall have a radius suitable for the thickness of the material and nature of the bend.

- d. All plate edges shall be free of notches and gouges.
- e. The depth or projection of any imperfections on the inner or outer surfaces shall not exceed 15% of wall thickness. Any depth or projection up to 33% of wall thickness may be repaired by welding. Any excessive projecting weld metal shall be removed.
- f. The diameter of bolt holes in base plates shall be 10 mm larger than the bolt diameter.
- g. Punching of full size holes will not be permitted. The holes shall be circular and perpendicular to the member and shall be deburred to ensure a proper faying surface.
- h. Hand holes with cover plates on top and bottom of columns are to be provided for illuminated sign structures or when required as per special provisions.
- i. Hand hole (when required) shall be stiffened by providing a reinforcing rim with semi-circular ends. The rim shall be welded to the member with a full penetration groove weld supplemented with an all around fillet weld.
- j. Only low stress stamps shall be used for identification marks. The stamps and specific location shall be shown on the shop drawings and accepted by the Consultant.

5) **Dimensional Tolerances**

All fabrication shall meet the tolerances described below:

- a. Straightness The straightness of any item shall not exceed the overall length divided by 300 from the surface at any point. This shall be measured with a straight line joining the surface at both ends. The difference between the straight line and the surface shall then be measured to determine the straightness.
- b. Twisting The twist in the overall length of any column, arm, or extension shall not exceed 7°.
- c. Length The specified length of any item shall be within 0 to 60 mm or 0 to +5% (whichever is less) with the exception of sign bridge spans which shall be within 5 mm of the specified dimensions in unloaded condition. The tolerance for height shall be - 0 to +60 mm.
- d. Across the Flat Dimensions The average of all across the flats dimensions from a given cross section shall be within 1% of the specified dimension. In addition, the ratio of the maximum to minimum across the flats dimensions shall be less than or equal to 1.05.
- e. Tolerance for Flatness of Base Plates and Flange Plates Surfaces of column base plates shall be flat to within 3 mm tolerance in 305 mm, and to within 5 mm tolerance overall. Faying surfaces of flange plates shall be flat to within 2 mm tolerance overall.
- f. Arm Rise Arm rises apply to unloaded structure in the standing position.

- 6) **Pre-Assembly** After welding and fabrication, but prior to galvanizing, the Contractor shall pre assemble all structures complete with welded sign clamps to check the fit and geometry. Pre assembled structures shall be inspected by the Consultant.

- 7) Following inspection by the Engineer, the structures shall be disassembled for

galvanizing.

- 8) **Galvanizing** shall be by the hot dip method, after fabrication, in accordance with the current edition of CSA Standard G164 with additions and exceptions as described in this specification. The Fabricator shall provide a smooth finish on all edges and surfaces, and remove all weld spatters and all welding flux residue from the steel components prior to galvanizing. Lumps, globules or heavy deposits of zinc will not be permitted. All threaded holes or threaded couplings shall be retapped after galvanizing. Repair of galvanizing shall only be done if bare areas are infrequent, small, and suitable for repair. A detailed repair procedure shall be submitted and accepted prior to its use. It should be noted that repairs may require complete removal of the galvanized coating and re-galvanizing. Repair shall be in compliance with ASTM A 780, Method A3 Metalizing. The thickness of the metalizing shall be 180 μ m, and the repair tested for adhesion. The finished appearance shall be similar to the adjacent galvanizing. The Consultant will determine the acceptability of repaired areas.

- 9) **Base Plate Corrosion Protection**

The bottom face of each base plate shall be protected by a medium grey colour barrier coating accepted by the Consultant, to prevent contact between the zinc and the grout. The galvanized surface must be roughened prior to application of barrier coating. The surface preparation of the galvanized surface and the dry film thickness (DFT) of the coating shall be in accordance with the coating manufacturer's recommendations. The Consultant will test the adhesion of fully cured coating as per ASTM D3359 "Standard Test Methods for Measuring Adhesion by Tape Test". The method selected for testing (Method A or B) shall depend on the dry film thickness of the coating. The coating manufacturer's product data sheets shall be provided to the Consultant prior to the application of the coating. The adhesion test result shall meet a minimum of "4B" classification (a maximum allowable flaking of 5%).

2.2.7 Testing and Inspection

- 1) **Access**

The Contractor shall provide full facilities for the inspection of material and workmanship. Free access shall be allowed to the Consultant to all parts of the works. When required by the Consultant, the Contractor shall provide needed manpower for assistance in checking layout and performing inspection duties.

- 2) **Testing by the Contractor**

The Contractor shall provide quality control throughout the course of fabrication. All test records made by the fabricating shop in the course of normal quality control shall be open to the Consultant for inspection. Testing and inspection made necessary by the repair of faulty work shall be paid for by the Contractor.

The Contractor shall arrange to have all full penetration welds inspected either by ultrasonic testing or radiographic inspection methods. Partial penetration seam welds shall be inspected by ultrasonic testing. The frequency of partial penetration weld inspections shall be three random locations per weld and the length of weld for ultrasonic inspection at each location shall be 200 mm. Calibration blocks for each thickness shall be prepared for ultrasonic testing to establish sensitivity levels and acceptance criteria. The NDT shall be done by a

company certified to CAN/CSA W178.1. Ultrasonic and radiographic testing technicians shall be certified to Level II of CGSB. Ultrasonic testing procedure shall be submitted to the Consultant for review and acceptance prior to commencement of fabrication. A copy of test results shall be provided to the Engineer indicating the percentage of penetration. The Contractor shall not proceed to the next stage of fabrication until all the seam welds have passed the Quality Control and the results have been reviewed by the Engineer.

All costs associated with non-destructive inspection of partial and full penetration welds, preparation of calibration blocks, establishing sensitivity levels and acceptance criteria shall be the responsibility of the Contractor.

The Contractor shall be responsible for all travel, boarding and lodging costs for a Department's representative to attend the pre-job meeting and two additional trips during the course of fabrication when the sign structures are being fabricated outside the Province of Alberta.

3) Testing request by Parks Canada

the visual, radiographic, ultrasonic, magnetic particle and any other inspection that may be specified or required will be performed by the Engineer or by his testing agencies at the Contractor's expense.

4) Inspection Station

to insure that each stage of inspection is performed in an orderly manner, during the fabrication, Inspection Stations will be set up at specific points. Certain items of the work will then be checked, and deficiencies shall be corrected, prior to the work being sent to the next stage of fabrication. These check points are to be agreed to by the Engineer and the Fabricator prior to commencement of fabrication. Parks Canada reserves the right to stop detrimental fabrication between check points if deemed necessary.

5) Non-destructive Methods of Examination

The methods of non-destructive examination shall be in accordance with the following standards:

- Radiography - AWS Standard D1.5
- Ultrasonic - AWS Standard D1.5
- Magnetic Particle - ASTM Standard E-709

6) Inspection Schedule

all welds will be visually inspected. Ultrasonic or radiographic inspection will be performed on full penetration welds.

2.2.8 Identification Tag

The Contractor shall supply the necessary equipment and materials to install identification tag on one column of each structure at 2.4 m above base plate. The column shall be drilled and tapped for 2-10mm diameter attachment bolts. The Identification Tag shall be fabricated as per the attached drawing S-1682-03. The Identification Tag number will be provided once contract has been awarded.

2.3 Installation

Any product damaged in shipping or transportation or handling of any products or panels shall be replaced at no extra cost to Parks Canada.

The Contractor shall not install/erect the structural steel until the substructure concrete has been cured a minimum of three days and achieved 80% of the 28 day specified concrete strength requirement. All components shall be handled with care to prevent stress to the components through bending or twisting. Bases are to be installed, levelled and squared. Timber and/or I Beam are to then be installed levelled and squared. Extruded aluminum blades are to be installed one at a time, levelled and squared.

The use of steel chains as slings to lift the sign into place shall not be permitted. Signs are not to be assembled on the ground and hoisted into position. Timber/ I beam is not to be cut in the field or have holes placed in the top of the I Beam to hoist the sign up.

Any damage to the components through overstress, scratching or denting shall be repaired or replaced at the Contractor's expense to the satisfaction of Parks Canada.

Hand hole bolts shall be coated with anti seize lubricant.

- 1) **High Tensile Strength Bolted Connections** Bolted parts shall fit solidly together when assembled. Contact surfaces shall be free of dirt, grease, burrs, pits and other defects that would prevent solid seating of the parts. Connections shall be assembled with a hardened washer under the bolt head or nut, whichever is the element turned in tightening. Surfaces of bolted parts in contact with the bolt head and nut shall be parallel.
- 2) **Bolt Tension** Each bolt shall be tightened so as to provide, when all bolts in the joint are tight, at least the minimum bolt tension shown in the following table for the size of bolt used:

Table 1 BOLT TENSION

Specified Bolt Size (A325M Bolts)	Minimum Bolt Tension		Commonly Supplied Equivalent Imperial Size (A325 Bolts)	Minimum Bolt Tension		
	Kilonewtons			pounds-force	Kilonewtons	pounds-force
M16X2	94	21,180	5/8	85		19,200
M20X2.5	147	33,050	3/4	126		28,400
M22X2.5	181	40,700	7/8	175		39,250
M24X3	212	47,660	1	227		51,500
			1 1/8	251		56,450
M30X3.5	337	75,760	1 1/4	319		71,700
			1 3/8	380		85,450
M36X4	490	110,160	1 1/2	463		104,000

All structural bolts if required shall be tightened by using turn of nut method to provide bolt tension specified in Table 1. There shall first be enough bolts brought to a "snug tight" condition to ensure that the parts of the joint are brought into full contact with each other. Snug tight is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench. Following this initial operation, bolts shall be placed in any remaining holes in the connection and brought to snug tightness. All bolts in the joint shall then be tightened additionally by the applicable amount of nut rotation specified below, with tightening progressing systematically from the most rigid part of the joint to its free edges. During this operation there shall be no rotation of the part not turned by the wrench.

Amount of rotation of nut relative to bolt, regardless of which is turned:

- 1/3 turn where bolt length is 4 bolt diameters or less
- 1/2 turn where bolt length is over 4 bolt diameters and not exceeding 8 bolt diameters
- 2/3 turn where bolt length exceeds 8 bolt diameters

Notes -tolerance 1/6 turn (60°) over, nothing under -length of bolt measured from underside of head

2.4 Foundation

General The Contractor is to undertake geotechnical work at his/her own cost where necessary to ensure proper performance of the sign structure.

Any adjustments to the locations of sign structures will be subject to the acceptance of Parks Canada.

The Contractor shall co-ordinate placement of the street light cable and conduit around the sign support foundation to avoid any conflicts.

Foundations shall be designed to allow for local frost conditions.

1) **Material**

- (a) All timber to be Douglas Fir
- (a) All reinforcing steel shall conform to CSA G30.18-M92 Grade 400.
- (b) All concrete shall be Modified Class C - 35 MPa, with type 50 sulphate resistance cement.

- 2) **Anchor Bolt Installation** Anchor bolts if required shall be supplied and installed in one complete assembly and consist of, but not limited to: anchor bolts complete with plate washers, full length sleeves filled with accepted corrosion inhibiting paste, top temporary templates, bottom anchor plates, bottom anchor nuts, thin clamping nuts and all necessary hardware for post-tensioning and future de-tensioning. No welding of any component is allowed. Anchor bolts shall be true and plumb. Anchor bolts shall be post-tensioned to 70% of the ultimate strength after the grout pads have attained design strength. The top anchor nuts shall have plastic caps, and all voids including annular space in the base plate shall be filled with corrosion inhibiting paste. Sufficient anchor bolt projection shall remain for future work. All Post-tensioning work and materials shall meet the requirements of Chapter 3 Specifications of the PTI Post-tensioning Manual.

- 3) **Grout Pockets and Grout Pads If required;** The Contractor shall fill the grout pockets and construct the grout pads using Sika 212 flowable grout or approved equivalent. Filling of grout pockets and construction of grout pads shall be done by workers competent in this work. The grout pocket shall be 25 mm deep and the total grout thickness shall not be less than 75 mm.

Grout shall be packaged in waterproof containers with the production date and shelf life of the material shown. It shall be mixed, placed, and cured in strict accordance with the manufacturer's recommendations.

The method of forming and pouring the grout shall be submitted to the Consultant for acceptance. Dry pack methods of constructing grout pads will not be accepted.

- 4) **Grouting in Cold Weather** When the daily minimum air temperature, or the temperature of the girders, bearings or substructure concrete, in the immediate area of the grouting, falls below 5°C, the following provisions for cold weather grouting shall be effected:
- (a) Before grouting, adequate preheat shall be provided to raise the temperature of the substructure concrete to at least 10°C.
 - (b) Temperature of the grout during placing shall be between 10°C and 25°C.
 - (c) The grout pads shall be enclosed and kept at 10°C to 25°C for at least five days. The system of heating shall be designed to prevent excessive drying out of the grout.
- 5) **Clean-Up**
All timber / steel shall be left clean and free of oil, grease, mud, dust, road spray or other foreign matter.

SECTION THREE – SIGN PANELS, TRANSPORT AND LOCATION

3.0 Sign Panels

The Contractor shall transport and install existing sign panels as shown on locations identified on the Waterton National Park Sign Plans and in accordance with the requirements specified herein.

3.1 Shop Drawings

The Contractor shall provide to Parks Canada three copies hard copies and three electronic copies of the final drawings showing the number, spacing and locations of the aluminium T-section required for each sign panel(s), assembly and mounting details. These drawings shall also detail the required method of attaching the sign panels to the sign support arms.

Parks Canada's review of the final drawings shall not be construed as relieving the Contractor from his responsibility for errors or omissions in the calculations and drawings or for proper completion of the work in accordance with the Contract. If required, the Contractor shall revise the drawings and calculations as required to the satisfaction of Parks Canada without any additional cost.

Fabrication of sign supports a structure shall not commence prior to the review by the Engineer.

3.2.2 Backing

A 1.0 cm wide x 2.5 cm long slotting shall be located on both edges of the extruded aluminium panels. The slotting shall be centered on the identification groove running longitudinally with the first slot centered 76 mm from the end of the section. The slotting shall be spaced on 152 mm centres for the entire length of the section, to allow for T bolt attachment. All material must be stainless steel.

3.2.3 Extruded Aluminium Preparation

The extruded aluminium panels shall be clean of dust, dirt and/or grease. The method used for cleaning must not damage the anodized finish of the extruded aluminium panels or prevent the adhesion of the sheeting material to the extruded aluminium sections.

The ends of the extruded aluminium sections shall be checked to ensure that they are cut square to ensure flush joints between both panels and sections of a panel. The maximum allowable gap between two adjacent sections or panels shall be 5 mm. All excess material found along the slots and edges of the panels shall be removed.

The joint between two sections of a single panel shall be connected together with a T-stiffener when installed on the sign support structure. Care should be taken in choosing

the vertical joint location to avoid conflicts between the joint T-stiffeners and the T-stiffeners used to attach the sign panels to the sign support structure.

Adjacent sign panels shall not be connected together by a joint T-stiffener or the T-stiffener used to attach the sign panel to the sign support structure.

Each extruded aluminum panel shall be installed on erected I beam. No signs shall be assembled on the ground with the I beam and hoisted into place.

3.3 Construction

Signs shall be loaded on an appropriate size truck, secured, shipped, stored and installed in a manner to prevent damage to the sign panels. Any damaged signs shall be repaired or replaced at no cost to Parks Canada. Signs may be or may not be crated. Signs are located at the Compound of Waterton National Park.

The Contractor will be supplied with C – brackets, and all of the necessary hardware to securely assemble the sign and connect the sign panels to the sign structure as shown on the accepted shop drawings.

Individual extruded aluminium sign panels shall be fastened together using stainless steel 10 mm diameter x 20 mm long bolts, nuts, and with a single lock washer on the nut side of the bolt. The last slot of each joint between sections shall be bolted.

The bolting of the joint between the extruded aluminium sections shall be staggered between the rows of slots, except for the last slots at either end of the section or panel.

Sign panels shall be attached with a supplied C bracket with a lock washer and nut assembly. According to PCA Drawing S13-2 steel bracket detail provided.

If required, all joiner bolts and J-clip nuts must be tightened to a torque to 26.5 Nm within a tolerance of ± 0.5 Nm.

The face of the sign panels shall be cleaned prior to acceptance.

3.3 Special Provisions

All cuts are to be made with a metal saw, there are to be no torch acetylene cuts on any portion of the sign structure or panel attachment.

In order to address wind loading in the Waterton area, consult the National Building Code.

All signs must be installed to withstand wind loads in the Waterton National Park area. The wind loads are up to 200 kph winds.

SECTION FOUR – MEASUREMENT AND PAYMENT

4.0 Measurement and Payment

4.1 Sign Structure

Payment for Supply and Install Sign Structures will be made at the lump sum price bid for each specified structure. Such payment will be considered full compensation for the design of the foundation and sign structure, fabrication, erection and the furnishing of all materials, labour, equipment, tools, and incidentals necessary to complete the Work to the satisfaction of Parks Canada and the Engineer. .

4.2 Sign Panels

Prefabricated sign panels are located at the Compound of Watetron National Park. Contractor will be responsible to ensure appropriate measurement of the panel to the sign support structure. Contractor is responsible for the pick up of signs, loading on an appropriate size truck, securing, shipping, storing and installing in a manner to prevent damage to the sign panels. Any damaged signs shall be repaired or replaced at no cost to Parks Canada. Signs may be or may not be crated. If signs are crated the contractor will be responsible for the disposal of the crate.

Payment will be for sign panels acceptably transported and installed. Such payment will be full compensation for all materials, labour, equipment, tools, removal and disposal of old signs, travel, engineering, stamped Engineered drawings, siting, locates, AMS numbering, boulder removal and disposal work preformed outside of the hours from 8 AM to 4 PM and weekends, poor or bad weather, delays, business licensing, vehicle permits and incidentals necessary to complete the Work to the satisfaction of Parks Canada.

4.3 Sign Removal

There are at least an equal number of signs that will be replaced as a result of this contract. The contractor is responsible for the removal and disposal of sign materials to the Waterton upper compound within the National Park. As well, as clean up of the site once the sign has been removed. All disturbances will be seeded with an approved mix by Parks Canada. Such payment will be considered full compensation for the removal of the sign panels and sign structure, disposal for the removal of the sign panel and sign structure, disposal of materials in a regulated land fill and all materials, labour, equipment, tools, travel and time and incidentals necessary to complete the work to the satisfaction of Parks Canada.

SECTION FIVE - WARRANTY

5.0 Warranty

The Contractor shall warrant that sign structures and installation of panels are free from defect (material and workmanship) for a two year period in accordance with these specifications.

SECTION SIX- TECHNICAL DRAWINGS, ATTACHMENTS

1. Steel Identification Plaque
2. Typical Rural Sign Installation (Height and lateral Location)
3. Typical T-Stiffener Spacing for Extruded Aluminium Panels
4. Typical Site Locate Sketch
5. Typical Site Survey
6. Typical Engineer Drawing set – general notes and construction details.
7. Sign #15 Golf
8. Sign #16 Hay Barn
9. Sign #17 Pass Creek
10. Sign #19 Red Rock
11. Sign #20 Akamina
12. Sign location plan.