

Parcs Canada Havre Saint-Pierre (Quebec)



Ship refueling System

Technical Specification

July 2013

GENIVAR Inc.
1600, boul. René-Lévesque Ouest, 16e étage
Montréal, Québec H3H 1P9
Téléphone : 514-340-0046
Télécopieur : 514-340-1337



Parks Canada Parcs Canada

Canada

www.genivar.com

Parcs Canada


**SHIP REFUELING SYSTEM – HAVRE
SAINT-PIERRE**

TENDER DOCUMENTS

FILE : 121-23520-00

JULY 2013

Verified by :


2013-07-04
Joël Morlière
Project Manager
Petroleum and northern engineering

Verified by :


2013-07-04
Guy Chamard, eng.
Director, Mines



GENIVAR Inc.
1600, boulevard René-Lévesque Ouest,
16^e étage
Montréal (Québec) H3H 1P9
Tél. : (514) 340-0046 - Fax : (514) 340-1337
www.genivar.com

TABLE OF CONTENTS

TITLE	PAGE
1 GENERAL	1
2 PREAMBLE	1
3 DEFINITIONS	1
4 TECHNICAL DOCUMENTATION	2
5 SPECIAL CONDITIONS	3
5.1 SCOPE OF WORK	3
5.2 INTENT OF THE PLANS AND SPECIFICATIONS	3
5.4 CODES STANDARDS	3
5.5 SHOP DRAWING, DESCRIPTION OF PRODUCTS AND SAMPLES	4
5.6 PIERCINGS, SLEEVES, REPAIRS, CLEANING AND ANCHORS	6
5.7 SYMMETRY	6
5.8 TESTING	6
5.9 PAINTING.....	6
5.10 CLEANLINESS	6
5.11 INSPECTION.....	7
5.12 ACCEPTANCE AND GUARANTY.....	7
5.13 UNFINISHED INSTALLATION	8
5.14 IDENTIFICATION OF THE SYSTEMS AND DEVICES.....	8
5.15 START-UP	9
5.16 AS-BUILT PLANS.....	9
5.17 LABOUR.....	9
5.18 DRAWINGS.....	9
5.19 RESPONSIBILITIES	10
5.20 SITE MEETINGS.....	10
5.21 REVIEW OF THE WORK.....	10
5.22 USE OF TESTING	10
5.23 REMOVABLE EQUIPMENT AND ACCESSORIES.....	10
5.24 PROTECTION OF THE ENVIRONNENT	10
5.25 OPERATIONS AND MAINTENANCE MANUAL	11
5.26 TRAINING.....	12
5.27 SECURITY MEASURES.....	12
6 TECHNICAL SPECIFICATION	13
6.1 MECHANICAL	13
6.2 ELECTRICITY AND CONTROLS.....	22
6.3 CONCRETE	26
ANNEXES	
A. <u>DRAWING LIST (1 PAGE)</u>	

1 GENERAL

Project No: E0DCC-12092

Project Name: Ship refueling system

Subject: Mechanical and Electrical lot

Site: Havre St Pierre

Location: UG Marina and warehouse

This document describes the scope of construction works that must be completed in order to complete the project.

2 PREAMBLE

The work includes the replacement of the existing tanks and piping systems for fuel distribution of the Marina and existing waste oil tanks of the UG warehouse in order to upgrade the facilities based on the latest editions of Federal Regulation "Regulations on storage systems for petroleum products and related products" (SOR/2008-197) of the Environmental Code of practice from the Canadian Council of Ministers of the Environment (CCME) as well as applicable to municipal standards.

3 DEFINITIONS

Owner

Engineer

Examiner

Specifications

4 TECHNICAL DOCUMENTATION

The works of the present contract must be carried out in compliance with the current Laws, Codes, Standards and Regulations such as:

- Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (SOR/2008-197) ;
- Code of practice for the protection of the environment of the Canadian Council of Ministers of the Environment (CCME);
- National Fire Protection Code (NFPA);
- Canadian Electrical Code, First part, CSA C22.10-10;
- Safety Code for the construction industry;
- Standards : ASTM, CSA and API;
- And all other standards specified in this document or pertinent to the present works.

5 SPECIAL CONDITIONS

5.1 Scope of work

Supply the labour and equipment necessary to complete all the works according to the prescribed methods or according to the best practices of the trade and in compliance with the standards and regulations listed in the present Specification. In addition, carry out all related works which, although not specified, are necessary for the proper functioning and completion of the works. Unless otherwise indicated, all materials and equipment shall be new and approved by the Engineer.

The contractor must supply the tools and materials necessary for the proper functioning of the equipment and various products used in the installation of the equipment.

5.2 Intent of the plans and specifications

It is the intent of the plans and specifications to include everything that is needed for a comprehensive and functional according to the generally accepted and recognized rules of the trade.

All work, although not specifically described in this specification, or shown on the plans, but obviously required for the connection, proper functioning and start-up of the equipment to be installed and connected must be considered as included in the present contract.

Therefore, the Contractor agrees to accept the Engineer's decision regarding the installation and execution of the works to satisfy the intent of the plans and specifications.

No supplemental charge will be granted for a difference in location less than fifteen (15) feet (5 metres) from the location shown on the plans.

The Contractor must verify the available space onsite before the installation of equipment, ducts and piping.

No dimensions or architectural or structural data shall be taken from the plans.

The plans and specifications are complementary.

In the case of disagreement between the plans and specifications regarding quantities, the quality or nature of the work, the Contractor must use the more expensive or superior quality solution. A credit must be issued to the Owner if the less expensive solution is adopted.

5.3 Site visit

It is recommended that the bidder or a representative of the Contractor visit the location and examine the scope of the works and the state of the site in order to verify all the details mentioned in the tender documents.

5.4 Codes Standards

5.4.1

The Contractor must comply with the latest editions of the Codes and Standards relating to this project (Federal, Provincial, Municipal, CSA, NFPA, and API) as well as the directives of the authorities having jurisdiction over this project. Particular attention must be taken regarding the requirements of the Federal regulation on the Storage of Petroleum Products (SOR/2008-197) which the Contractor must respect scrupulously.

5.4.2 **References**

Reference made to technical societies, associations, industry organizations and other authorities should be using the following abbreviations:

A.S.A.	American Standard Association
N.F.P.A	National Fire Protection Association
A.S.M.E.	American Society of Mechanical Engineers
A.S.T.M.	American Society for Testing and Materials
C.S.A.	Canadian Standard Association
A.P.I.	American Petroleum Institute
M.S.S.	Manufacturer's Standardization Society
C.G.S.B.	Canadian Government Specifications Board
S.N.A.	Standard National Association
C.E.M.A.	Canadian Electrical Manufacturer Association
A.C.I.	Alloy Casting Institute
A.I.S.I.	American Iron & Steel Institute
C.C.A.	Canadian Construction Association
I.E.E.E.	Institute of Electrical and Electronic Engineer
N.B.C.	National Building Code
U.L. (C)	Underwriter's Laboratories Inc. (Canada)

5.5 **Shop drawing, description of products and samples**

5.5.1 **Generalities**

The Contractor must submit to the Engineer for verification, the shop drawings, description of the products in electronic version and the prescribed samples.

It is forbidden to undertake the works for which shop drawings, samples and description of the products have not been undergone the above-mentioned verification.

5.5.2 **Shop Drawings**

The submitted shop drawing must be originals prepared by the Contractor, the sub-trade, the supplier or distributor, illustrating the part of the works concerned, the setting or installation details relating thereto.

Identify the details using sheet numbers of the sketches and drawings of the contract.

5.5.3 **Description of the products**

The above-mentioned documentation will be accepted only if it complies with the following conditions:

- It must not contain information that does not pertain to the project.
- The basic information must be completed by additional information specific to the project.
- It must indicate the dimensions as well as the clearances required.

5.5.4 **Verification of the submitted documents**

The Contractor must verify the shop drawings, the characteristics of the products and the samples before submitting them to the Engineer.

The Contractor must verify the execution criteria, catalog numbers and other connected data.

The Contractor must coordinate the documentation submitted with the requirements of the works and the contract documents. The drawings will not be verified one-by-one. Verifications will only be done once all connected drawings have been submitted.

The Contractor is not relieved of his responsibility for errors and omissions contained in the submitted documentation, even if the Engineer has verified the drawings.

The Contractor is not relieved of his responsibility for deviations from the requirements of the contract documents even if the Engineer has verified the documentation submitted to him, except if the latter expresses in writing his acceptance of certain specific deviations.

At the time of issuing the documents, advise the Engineer in writing of any deviations contained in the submitted documentation.

5.5.5 **Requirements for the submission of documents**

- At the first submission of shop drawings, the Contractor shall send to the Engineer the schedule for the submission of shop drawings.
- Establish the date of submission fifteen (15) days before the date on which the revised documentation is required.
- A transmittal must be submitted listing the documents submitted.
- The email sent must be addressed to the Owner or his representative with a copy to the Engineer, it must contain the following information:
 - Explicit document header : « project number – title - subject»
 - The email must contain a brief description of the documents submitted;
 - All attachments (submitted documents) must be numbered with a revision index and an explicit title;
 - The name and address of the Contractor;
 - Any other useful information.
- Each of the submitted documents must contain :
 - The date of presentation of the original documents and that of the revisions;
 - The title and project number ;
 - The name and address of the Contractor, the sub-contractor, the supplier and the manufacturer;
 - The identification of the product of material and its layout in relation the the neighboring works ;
 - The dimensions clearly identified as such ;
 - The section number of the specification ;
 - The applicable Standards, for example CSA or ONGC, and their number ;

- The seal of the Contractor with the initials or signature certifying that the documentation submitted has been reviewed and complies with all contract documents.

5.6 Piercings, sleeves, repairs, cleaning and anchors

Install all anchors, bolts, metal brackets etc. to support the piping and the mechanical equipment. The approval of the Engineer is required for the type of anchoring used. Except in indicated areas, all anchoring accessories shall be in malleable cast iron.

The Contractor for this division must remove the waste and clean the areas where he has worked, periodically or at the request of the Engineer.

5.7 Symmetry

For the exposed portions of the mechanical installation, namely the piping, ducts and other equipment, must be parallel to the line of the ground or the building. Consult the Engineer or his representative in case of doubt.

5.8 Testing

Supply the necessary equipment, connections and other, as well as the manpower required for the testing. The work must be executed under the surveillance of a competent technician.

The date of the testing will be established with the Engineer.

The contractor must protect the equipment not able to withstand testing pressure.

The results must be recorded in tables of 8½" x 11" (210 mm x 280 mm). These tables must be submitted to the Engineer for verification.

5.9 Painting

If the primer or finishing coat of the equipment is damaged during transport or during the works, it must be retouched to the satisfaction of the Engineer.

Unless otherwise indicated, the piping, metallic supports, hooks and anchors for the mechanical equipment must be perfectly cleaned et covered with three coats of Termarust TR2100 paint, according to the manufacturer's directions.

All piping used must be photographed (if possible after installation) before being painted. The pictures must clearly identify the markings of the required certification (ASTM-A53)

Unless otherwise indicated, painting of the fuel and used oil tanks, and their accessories must be in compliance with the Standard ISO12955 C5M « Coastal zone and marine zone with High salinity ». The tanks must be perfectly cleaned, treated SSPC-SP10 (Profil 2.0 mils) and covered with three coats of Amercoat 68HS Zinc rich Epoxyprimer @ 3.0 mils sec, Amercoat 370 @6.0 mils dry and Amercoat 450H or Amershield @ 2-3.0 mils dry. These works must be done in the workshop by the tank supplier.

5.10 Cleanliness

During the works, the interior and exterior of the pipes, conduits and equipment must be kept clean.

Special precautions must be taken in order to prevent the infiltration of all foreign matter into the piping, conduits and equipment.

The piping whereby the interior has been treated in the factory and delivered to the jobsite sealed must remain sealed until used and stored in a location away from the other pipes.

5.11 Inspection

Inspection consists, for the Engineer, to make a reasonable number of visits to the jobsite in order to see if the Contractor is generally executing the works in the manner prescribed in the contract documents. In no case, does the Engineer intend, by his activities, to guarantee the work of the Contractor.

The contractor is never released from the responsibility he has to find his own errors and correct them. The frequency of site visits may not be invoked to excuse poor or defective work undetected during the Engineer's visit.

The contractor must facilitate the visit of the works by the engineer or his representative when the latter judges it necessary. He must also, accompany him or be replaced by a responsible person. All remarks of the Engineer shall be taken into consideration and the necessary modifications made before the next visit of one of the Engineers, if possible.

- a) The Engineer may inspect the site or in the preparation shops if he sees fit.
- b) Inspection and provisional or final acceptance of the work in no way relieves the Contractor of the obligation to complete the contract, to perform the work according to the rules of the art, in full compliance with SOR/2008-197 and keep them in perfect order until final acceptance, even though he had already been paid for imperfect execution.
- c) Under no circumstances when a job needs to be redone because of the lack of experience of the contractor, the latter shall not imply that the engineer should have provided him with additional details or explanations. Ultimately, the Contractor shall realize that the monitoring work of the Engineer is not a work of construction management.

5.12 Acceptance and guarantee

The Contractor must leave the mechanical installation in perfect operational state. Any defect appearing during the guaranty period defined in the contract must be repaired by the Contractor at his costs following the decision of the engineer within the seventy-two (72) hours following written notice. This guaranty covers labours costs.

- a) Any expense or damages incurred directly or indirectly by the defect, repair or replacement are at the expense of the Contractor.
- b) The contractor guarantees that his work in accordance to the laws and regulations of the place where it is executed. The guarantees mentioned in the specification and resulting responsibilities should not be interpreted as limiting the laws of the place or being in opposition. These laws take precedence over the requirements of the specification, except where the requirements of the latter are stricter than those of the law of the place.
- c) The inspection of the works and materials, the payments made and the use of the equipment by the users does not diminish in any way the responsibilities of the contractor.
- d) When the contractor considers the works complete, he must advise the Engineer how will inspect the works in light of the provisional acceptance. The inspection must be done in the presence of the Contractor and or his authorized

representative. The Engineer must note the defects and report them to the contractor. The corrections must be carried out in the shortest possible time. The works are provisionally accepted when the contractor has fulfilled the following conditions:

1. A certificate of disposal in accordance with the requirements of SOR/2008-197, paragraphs 44 and 45, will be produced and delivered to the client;
 2. The works are completely finished and all the equipment functions normally.
 3. The adjustments have been done
 4. The garbage and waste resulting from the works have been removed;
 5. Damages to the property have been repaired
 6. Plans in accordance with the execution, and maintenance and operation manuals are submitted to the Engineer in three (3) copies and electronic versions, unless otherwise indicated;
 7. The Examiner's certificate of acceptance of has been given;
 8. A copy of the plans, approved by the Examiners has been submitted;
 9. Verification testing in normal operation of equipment and systems mentioned in the specifications are done to the satisfaction of the Engineer and the certificates or required reports, have been delivered.
- e) When the Contractor has met these requirements satisfactorily, the Engineer gives provisional acceptance in accordance with the general conditions
- f) The Contractor's guarantee enters in force on the date of provisional acceptance of the works. This is for a duration of one (1) year, for all the works executed by the Contractor.
- g) Final acceptance of the works must be done one (1) year after provisional acceptance or according the requirements of the General Conditions and a hold-back must be kept by the Owner according to the General Conditions.

5.13 Unfinished Installation

The piping and conduits remaining open at the end of the work day, the open end of the pipes must be sealed so that no foreign matter can enter.

5.14 Identification of the systems and devices

(in the French and English languages)

a) Piping

The piping must bear the certification markings required in conformity with the requirements of paragraph 14.5 of SOR/2008-197.

All piping is identified by means of strips (standard colour identification) labels and arrows, following the direction of the flow. This labeling must indicate the complete name of the contents in French and in English. No abbreviations are accepted. These labels must be of the type: Brady no B-350.

The labels must have a height 2½" (60 mm) for pipes of 75 mm and greater, 1¼" (30 mm) of height for pipes less than 3 inches (75 mm) and 1 inch (25 mm) for very

small piping. These labels must be placed on all piping, including those which are hidden.

The labels must be placed at intervals of 40 feet (12 m) maximum, and at all changes in directions and branches. These labels must be held by means of adhesive tape wrapped around the pipe of the same colour as the label.

b) Uniformity

The Contractor must see that there is conformity for the identification of the piping.

5.15 Start-up

Each piece of equipment or appliance must be verified and tested in order to ensure that it is ready to be put in service and that it operates correctly (correction of unusual sounds, rotational direction, lubrication, adjustment of belts temperature controls and security, change of belts and pulleys, if required).

Before proceeding with the transfer of petroleum products in the system, the Contractor must ensure that the requirements of SOR 2008-197, paragraph 34, have been met and that an identification number has been obtained from Environment Canada, as specified in paragraph 28.2 of SOR/2008-197

5.16 As-Built plans

The Contractor must, on a copy of the plans for this purpose only, indicate all changes made to the plans executed during the execution of the works. These plans must be returned to the Engineer at the end of the works, before the final inspection for the issuance of the certificate of final payment, indicating the completion of the works.

These plans must be submitted up-to-date and must be kept in a clean condition.

5.17 Labour

The labour necessary to the execution of the works described herein must be experienced and top notch. The Engineers reserve the right to suspend works that are poorly executed and require the expulsion of any worker who, in their opinion, is not competent. The execution of the works must be done in a manner compliant with the requirements of the National and Provincial laws and regulations, and the Insurance Bureau of Canada etc.

The Contractor must hold an appropriate Contractor's or Owner-Builder license from the Régie du bâtiment du Québec (RBQ). This license must include sub-category 1.8 (previously 4515), Installation of petroleum equipment.

The Contractor must submit to the client a certificate or letter proving that its installers are Persons Authorized by the Province, in compliance with article 33.1 of SOR/2008-197.

The Contractor must complete the SST Compliance Form from Parcs Canada and comply with the requirements that are specified therein.

5.18 Drawings

The drawings indicate in a general way the location and route of the piping and electrical conduits installed under this contract. When required pipes and electrical conduits are not shown on the plans or they are only shown in diagrammatic form, they must be installed in such a way as to preserve open space and to interfere as little as possible with the use of the location where they pass.

5.19 Responsibilities

The Contractor assumes all responsibility regarding the installation of his works and all damage caused to the Owner or to another Contractor following the poor execution of these works or of installation in the wrong place.

All the works must be executed with extreme care and according the rules of the trade, in accordance with the plans and specifications, the requirements of the authorities of the place and the regulations regarding petroleum products, latest edition. Given that the above mentioned are considered by the Engineers as the minimum standards, they must normally be exceeded.

5.20 Site Meetings

The Contractor must hold periodic site meetings for the duration of the works.

5.21 Review of the work

The Contractor of the present works must study the local conditions that have influence on the present contract.

He must carefully study the drawings and must ensure that the works of the present contract may be executed in a satisfactory manner, as indicated on the plans, and before starting the work, he must examine the work of the other trades and must immediately report any default or obstacle to the execution of the works described in the present chapter or influencing the required guarantee.

No additional compensation shall be granted to him later for the consequences of his negligence to perform this inspection.

5.22 Use of testing

The Owner reserves the right to use any piece of mechanical equipment, device or materials installed under the present undertaking, for a reasonable time, and at any time the Engineer may need to carry out complete tests, before the works are complete and before final acceptance.

These tests must not be interpreted as proof that the owner accepts any portion of the works and, it is understood and agreed that no claim for damages will be presented will be made in respect of accidents or failures of portions of the works used in this way, that the cause is the lack of strength or accuracy of components or faulty materials or workmanship of any kind.

The Contractor shall provide all labor and materials required for such tests.

5.23 Removable Equipment and Accessories

All mechanical equipment, accessories, controls etc must be installed by means of flanges or unions, in other words, a flange or union on each side of the unit in such a way that it can be easily dismantled.

5.24 Protection of the Environment

When cleaning piping, equipment etc., the Contractor must respect the Municipal and Governmental regulations concerning the protection of the environment.

5.25 Operations and Maintenance Manual

The Contractor will prepare the Operation and Maintenance manual in accordance with the present article and the details given in the various technical sections of the specification.

a) Maintenance Manual – Generalities

At the end of the works, submit to the Engineer, three (3) copies of the operational data and the maintenance manual in French and English prepared in the following manner:

- Enter data on loose sheets of 8 ½ x 11 inch connected in a three-ring binder with hard vinyl cover;
- Enter on the cover page entitled « Operational Data Maintenance Guide / Données d'Exploitation Guide de Maintenance » the name and date of the installation as well as the table of contents;
- Divide the contents into appropriate sections; in accordance with the subdivisions of the corresponding Specification. Mark each section with a labeled celluloid coated tab attached to the rigid divider sheet.

The Contractor shall provide a copy of operational data in electronic format.

b) Information to supply:

Include the following information in addition to the data prescribed in the specification

- Instructions regarding maintenance of surfaces and finished materials;
- An example of the inventory of the hardware and paint;
- Description and operating, calibration and maintenance instructions for the equipment and networks, including the complete list of equipment and parts. Give information from the nameplate, such as mark, dimensions, capacity and serial number;
- The name, address and telephone number of sub contractors and suppliers;
- The various guarantees and deposits indicating the name and address of the works, the date of entering into force of the guarantee, the date of the certificate of substantial completion, the duration of the guarantee, the subject of the guarantee and the corrective measure offered by the guarantee as well as the signature and seal of the Contractor.
- The requested certificates and photos, as required by the applicable Standards and regulations or in the present specification.

c) Documents

Ensure the clarity of the lists, notes, drawings, diagrams or publications of the manufacturers. Only originals must be provided, No copies will be accepted.

d) Shop drawings

Add a complete set of shop drawings bound separately and bearing the corrections and changes executed during fabrication and installation.

The Contractor must also supply a copy of the shop drawings in electronic format.

L'Entrepreneur doit également fournir une copie des dessins d'atelier en format électronique.

e) Equipment

Supply a complete list of the replacement equipment in the following manner:

- Indicate all the mechanical, electrical or controls parts of the project;
- Identify the recognized suppliers and the respective manufacturers;
- Provide the frequency of the various interventions for the maintenance of the components and the equipment and products recommended by the manufacturer.

5.26 Training

The Contractor must supply appropriate training, in French, to the Owner or his representative regarding the operation of the new installations.

The written documentation supporting/resuming the contents of the training must be submitted to the client in an editable electronic format.

5.27 Security Measures

The Contractor must supply his Safety Program before commencement of the works.

The Contractor must comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) concerning:

- Handling ;
- Storage ;
- Disposal of dangerous materials ; and
- Labeling.

The Contractor must submit copies of the WHMIS Material Safety Data Sheets (MSDS) to the Owner at the time of delivery of the material. These sheets will be kept permanently on the premises.

6 TECHNICAL SPECIFICATION

6.1 Mechanical

6.1.1 Scope of works - Marina

Supply the labour and equipment necessary to perform the work as described on the plans and/or specifications. This list is general and non-limitative:

- Identification and location of underground electrical wires between the electrical panels, the tanks and the catwalk access to the floating dock in coordination with the electrician;
- Removal and relocation of the Marina Environmental kit;
- Dismantling of the 3 dual tanks in the existing Marina fuel depot in compliance with the applicable regulations specifically in conformity with paragraphs 44 and 45 from DORS/2008-197;
- Dismantling of the fence;
- Dismantling of the unused part of the piping from the interior of the existing depot including supports and accessories until the connection points with the existing piping at the catwalk access to the floating dock, including the excavation of the underground portion of the piping;
- Dismantling of the 2 existing unused manholes, in the petroleum depot and in front of the « Le Coquelin » building;
- Preparation of the ground to receive the new tank, leveling and supply of 0 - 20 mm rock, including compaction of the soil;
- Supply and installation of an exterior horizontal tank with 3-compartment retention basin including accessories;
- Supply and installation of three fuel pumping systems including the accessories for piping, anti-leak safety and others;
- Supply and installation of piping for filling and unloading, pressure relief and venting for the new multi-compartment tank, including all valves, flexible joints, removable fittings and including all accessories and materials
- Supply of the materials and fabrication of all piping supports;
- Installation of control valves including the supply and installation of accessories such as joints, unions and bolts required for the installation of the control valves;
- Supply and installation of double-walled underground piping including tertiary piping, transition boxes, isolation valves and fittings;
- Supply and installation of a concrete slab around the transition box of the petroleum depot;
- Supply and installation of the protection for fuel piping at the output of the manhole near the pier;
- Supply and installation of a fence of type : sentinelle 1,8 m high with double gate including posts and concrete bases around the new tank;
- Supply and installation of a concrete protection for the tank; Jersey type, with a length of 4,000 mm;

- Connection of the new piping to the existing piping including isolation valves, dielectric connections, flexible tubing and supports;
- Cleaning of the existing piping on the footbridge and on the floating pier, anti-rust paint on all the retained existing piping;
- Identification of the type of fuel on the new and existing piping and the fuel tanks.
- Leak tests on the piping and testing of the three fuel distribution systems.

6.1.2 **Scope of works of UG Warehouse**

Supply the labour and equipment necessary to perform the work as described on the plans and/or specifications. This list is general and non-limitative:

- Dismantling of the two used oil tanks in the existing UG Warehouse tank farm including the wood access catwalk;
- Preparation of the ground to receive the 2 new tanks, leveling and supply of 0 - 20 mm stone, including compaction;
- Supply and installation of 2 exterior horizontal double-walled used oil tanks; including accessories;
- Supply and installation of the vent piping for the new used oil tanks to the top of the garage roof, including flexible joints, detachable fittings and including all accessories and supports in the new tank farm;
- Identification of the piping and the 2 tanks.

6.1.3 **Dismantling**

The Contractor must supply the manpower and tools for the dismantling of the equipment as described in articles 6.1.1 and 6.1.2, including accessories and existing supports for fuel distribution.

The Contractor must coordinate with the owner regarding the disposal of the used oil and fuel tanks before proceeding to the dismantlement.

The Contractor must clean the tanks and piping before dismantling them.

The Contractor must dispose of the tanks, pump equipment, piping and accessories according to the regulations in force.

The Contractor must include in the cost of his bid the necessary amounts for the transportation of the removed equipment and garbage, according to the instructions of the owner and the associated fees, if appropriate, all in accordance with the agencies having jurisdiction.

6.1.4 **Excavation Works**

6.1.4.1 Protection of existing structures

The Contractor must, himself, be certain of the presence and the exact placement of the existing works, which are, or which could be affected by the works carried out under this contract, and he is, consequently, bound to obtain all the required information from the competent authorities.

The Contractor must, before the beginning of all excavation work, contact the representatives of the public utility companies in order to obtain information relating to

the location of their services. These representatives will be required to indicate on the site, the exact location of all the services.

The Contractor must take all the necessary precautions to ensure the protection of the existing buildings and he is wholly responsible for any damage to these works properties or structures happen as a result of his works or of his negligence to take the necessary protective measures.

6.1.4.2 Site Preparation

The Contractor must, at his own cost, clear any brush, garbage, waste or other material, from the location of any excavation work or any other locations determined on the plans or specified in the contract.

6.1.4.3 Classification of excavations

The excavation indicated on the plans, defined by the contract or determined by the engineer are classified as follows:

a) Excavation in the ground

Excavation in the ground includes the removal of natural or back-filled soils, frozen or non frozen or other artificial works. Included in this classification, is loose sand, hardpan, layers of silt or thin layers of shale bonded with clay, shale or loose earth, cemented gravel, large rocks removable without blasting, or any materials other than rock.

b) Excavation in rock

When it comes to excavation materials, the term "rock" means any solid rock that can only be removed with the use of explosives or any other method of extraction and accepted by the Engineer; rock also includes any big rock over 1.5 m³ extracted or not with the aid of explosives.

6.1.4.4 Stability of the slopes

The Contractor shall ensure the stability of the walls of any excavation or trench and proceed to support if required in accordance with the requirements of the Safety Code of Quebec for the construction works.

6.1.4.5 Unauthorized Excavation

Any material that is shaken outside the prescribed lines, shall be removed at the expense of the Contractor, unless the Engineer permits it is left in place.

Wherever excavation is performed below or beyond the lines and levels specified or supplied by the Engineer, the Contractor shall, at his own expense backfill unauthorized said with a granular material compacted to 95% Modified Proctor capacity.

6.1.4.6 Disposal of Excavation Materials

The Contractor is not permitted to deposit or stock excavated material on existing roads.

The Contractor shall allow free passage of surface water.

The Contractor must dispose of all excavation material at his own cost.

6.1.4.7 Continuity of traffic on the site

The Contractor must take, at his own cost, all the necessary measures to ensure the continuity of vehicular traffic on the site.

All excavated materials liable to impede the circulation of trucks and other vehicles must be loaded and transported to a location acceptable to the owner on his land.

6.1.4.8 Drainage

The Contractor shall build ditches and provide pumps, drains, pipes and other means to remove water from trenches, excavations and other parts of the Work, and shall, when necessary, remove all surface and groundwater, as they come from natural sources, seepage, leakage or flow pipes, sewers, drains or other man-made structures, he must also keep dry excavations and other portions of the work until the permanent drainage, which must be built, are completed.

The Contractor shall see to properly monitor, divert and remove all surface water that may enter in locations where the work is performed under the contract until provisional acceptance, unless otherwise specified in other contract documents.

All water, mud and debris that may penetrate or accumulate in the constructed works, in virtue of the contract, must be quickly removed in a satisfactory manner, and at the completion of the contract, these works must be left in a satisfactory condition.

All expenses arising from the above requirements regarding drainage must be included in the bid price.

6.1.5 **Backfill, Leveling and finishing works**

6.1.5.1 Granular Materials

The Contractor must supply the 0-20mm crushed gravel and the stone dust.

6.1.5.2 Execution

a) Compaction

The maximum thickness of a layer of fill put in place by the Contractor shall be determined based on the energy expended by the various pieces of equipment. The thickness of each loose layer must not exceed 300 mm.

The Contractor shall compact each layer of backfill in place, until a density greater than or equal to 95% Modified Proctor Capacity is reached, over the entire thickness.

The Contractor must demonstrate that the density of the compacted material is sufficient, over the entire thickness of the layer of fill. The evidence must be made by the compaction tests.

These compaction tests must be performed by a laboratory approved by the Engineer and the Contractor must assume the costs.

In areas inaccessible to roller vibrators, materials must be deposited and compacted in layers not exceeding 150 mm thick.

The "frost heaves" arising from a saturated backfill material will not be tolerated. The Contractor shall excavate the area in question and replace the material rejected by the drier material.

b) **Base of the Tanks**

Unless otherwise indicated on the plans, fill under the tank must be made of 0-20 mm crushed gravel, compacted to 95% Modified Proctor capacity. Clay or silt is not accepted under any circumstances.

In all cases, compaction shall be 95% Modified Proctor capacity.

6.1.5.3 Responsibility of the Contractor

If the filling is not executed properly, if it is not consistent with the requirements of the plans and specifications or if it is not satisfactory for other reasons, the Contractor shall be fully responsible for any damages or any damage to the works or property belonging to the Owner or another party, which may result, as long as the work covered by the contract have not been finally accepted by the Owner.

6.1.5.4 Cleaning and restoration

Once the work is completed, the Contractor shall remove all surplus materials and debris, make the slopes properly and to the satisfaction of the Engineer, repair all defects identified at this stage, return all surfaces of the existing work to the original condition they had before the starting the work and leave the site in a clean condition after stripping.

6.1.5.5 Compaction Testing

Take a sample for size analysis for each fill material that is used.

For each layer of fill placed, at least one compaction test must be performed for each two hundred fifty (250) cubic meters of fill.

The cost of testing and particle size analysis required to determine the quality of the fill material is borne by the Contractor. The cost of compaction tests to check implementation is borne by the Contractor.

6.1.6 **Hydrostatic Testing**

Provide labor and equipment necessary to perform a hydrostatic test on the new single and double wall piping.

6.1.6.1 Inspection

Once the hydrostatic testing is finished, he must advise the Engineer who may inspect the works. The inspection must be done in the presence of the Contractor or his authorized representative. The Engineer must make note of any defects and report them to the contractor.

6.1.6.2 Protection of the Environment

The Contractor must respect the directives of the owner and the regulations in force concerning the protection of the environment.

6.1.7 **Products**

6.1.7.1 General

All equipment must be API approved for petrochemical use, bear the required certification markings and be installed according to the DORS/2008-197 regulation.

6.1.7.2 Fuel Tanks

Exterior horizontal tank with retention basin in accordance with ULC-S653, supports, ULC plate, grounding lug, access ladder and service platform, lifting eyes.

- Three compartments with a minimum capacity of :

Coloured Diesel	:	10 000 litres
Clear Diesel	:	5 000 litres
Unleaded gasoline	:	7 000 litres
- Each compartment equipped with
 - 1 manhole;
 - 1 1-1/2 inch flanged connector for the pin guage c/w 2-inch Camlock Rite adapter and stopper, wooden stick and volumetric charter;
 - 1 1-1/2 inch flanged connector for truck filling c/w anti-spill box, overfill limiter, Camlock truck connector;
 - 1 6-inch flanged connector for level control;
 - 1 emergency vent;
 - 1 2-inch water extraction fitting;
 - 1 regular vent
 - 1 1-1/2 inch connector for the return of the pressure relief valve;
 - 1 6-inch flanged connector for the STP fuel pump c/w anti-spill box with ULC compliance plate.
- Paint according to article 5.9 of the specification.

6.1.7.3 Used oil tanks

Exterior horizontal double walled tank in compliance with ULC-S652, supports, ULC plate, grounding lug, service platform and lifting eyes.

- Capacity : 1 100 litres:
- Each tank equipped with:
 - 1 manhole;
 - 1 oil spill hopper with cover
 - 1 off-take connector;
 - 1 emergency vent;
 - 1 normal vent;
- Paint according to article 5.9 of the specification.

6.1.7.4 Submersible fuel pumps

Submersible centrifuge STP-type turbine Pump for a 2,133 mm (84 inch) tank

Note :

Use pumps with the electrical characteristics equivalent to the existing pumps

Pump, generalities

- Speed : fixed 3450 RPM
- Voltage : 208V/1/60
- Motor : Explosion proof
- Accessories : mechanical leak detector Model MLD from FE PETRO for gasoline and diesel according to the corresponding fuel.

Pump P01 - Gasoline

- Power : ¾ HP
- Make : FE Petro
- Model : STPR-AG-75 VL1, 100% alcohol compatible, c/w integrated R- type check valve

Pump P02 – Clear Diesel

- Power : ¾ HP
- Make : FE Petro
- Model : STPR-75 VL1, c/w integrated R- type check valve

Pump P03 – Colored Diesel

- Power : 1,5 HP
- Make : FE Petro
- Model : STPR-150 VL1, c/w integrated R- type check valve

6.1.7.5 Above-Ground Single-walled Piping

All the piping must be in schedule 40 carbon steel, with the exception of the 50 mm (2") diameter piping and less which must be schedule 80, in compliance with ASTM-A53. The joints must be fileted for diameters of 38 mm (1½ ") or less. For diameters of 50 mm (2") or more, the joints must be welded or flanged.

The connections must be class 3000 forged steel.

Flanges shall be Class 150 forged steel.

The piping and connections must bear the certification markings and be installed in compliance with article 14.5 of DORS/2008-197.

6.1.7.6 Underground Double-walled Piping

All underground piping must be flexible, double walled polyethylene, ULC/ORD C971 approved c/w the connections and accessories necessary for tight seals to the transition box.

The piping and connections must bear the certification markings and be installed in compliance with article 14.5 of DORS/2008-197.

Double walled piping \varnothing 40 mm (1 1/2")

- Manufacturer : OPW
- Model : FlexWorks pipe C30
(Approved ULC C971)

Single-walled tertiary piping \varnothing 80 mm (3 ")

- Manufacturer : OPW
- Model : FlexWorks access pipe AXP40

6.1.7.7 Faucets, Valves and accessories

The Contractor must install all the faucets and valves for the good operation of its system. The faucets and valves must be the same diameter as the pipes they are installed upon. The faucets, and valves are new and API approved.

a) Valves for petrochemical use

Ball valves \varnothing 15 mm (1/2 ")

- Manufacturer : M.A. Stewart
- Model : CSS-F-3-HD-FS

Ball valves \varnothing 40 mm (1 1/2")

- Manufacturer : M.A. Stewart
- Model : CSS-F-3-HD-FS

Pressure relief valve \varnothing 12,5 mm (1/2")

- Manufacturer : Nupro
- Model : SS-8CPA2-3 in stainless steel with adjustable pressure from 30 to 50 PSI (base setting of 5 PSI)

b) Piping Accessories

Flexible connections \varnothing 15 mm (1/2") 600 mm lg,

- Manufacturer : Flexonics
- Model : SA-BSN-008-12, tube and mesh in stainless steel, with threaded ends NPT Class 150.

Flexible connections \varnothing 40 mm (1 1/2") 300mm lg,

- Manufacturer : Flexonics
- Model : SA-BSN-024-12, tube and mesh in stainless steel, with threaded ends NPT Class 150.

6.1.7.8 Transition boxes

Transition box, single walled, in fibreglass or polyethelene with tight bolted lid, ULC approved.

- Manufacturer : OPW
- Model : PTS-4021 avec un couvercle d'inspection

complete with concrete base surrounding the transition box, 100 mm thick, 300 mm width, for the stability of the box.

6.1.8 **Execution**

6.1.8.1 Paths and levels

The Contractor must establish all the routes and all levels and must have them verified by the engineer's representative before undertaking the construction works.

6.1.8.2 Flange Connections

Flanged connections must be securely fastened with bolts.

The bolts must be tightened in order to guarantee the seal of the joints.

The Contractor must avoid having too strong a stress on the joints because of poorly fitting pipes.

Bolts and nuts: bolts must be in A307B steel alloy and nuts must be 6-sided.

The sealing joints must be NBR Garlock Model 3000

6.1.8.3 Piping

- a) The piping situated above ground in the tank farm and between the tanks must be supported every 2 metres. Supports must be placed at least 300 mm from each horizontal elbow (90° and 45°). Unless stated otherwise on the plans.
- b) At least one connection must be installed at each 90° or 45° elbow.
- c) Supports must be placed close to the tank and any other appropriate place to prevent breakage due to dropping of ice or snow.

6.1.8.4 Cleaning of piping

- a) The interior of each end must be cleaned with a wire brush before being connected. The Contractor must take all the necessary precautions so that each joint is, as much as possible, free of all dirt or foreign substance. At the end of each work day, care must be taken to block the open ends of the pipes so that no foreign body can enter.

They must only be unblocked when the work restarts. It is strictly forbidden to use rags or cotton debris for this purpose.

- b) The Contractor must remove any obstruction that may be in the pipes, which must be perfectly free of water, dirt or any foreign matter that enters the pipes or must dismantle them, clean them and remount them at the cost of the Contractor. Any damage caused by piping that has not been cleaned must be repaired at the cost of the Contractor.

Before connecting the pipes to the tanks, pumps and other pieces of equipment care must be taken to isolate each section of the pipe and fill them with compressed air at 860 kPa (125 PSI). The air can be released by quickly opening a valve in order to expel as much dirt as possible. This procedure must be repeated until such time as there is no longer any visible dust driven by the air out of the pipe section being cleaned.

6.1.8.5 Leak testing of the piping

- a) Before proceeding to the transfer of petroleum products in the system, the Contractor must ensure that the requirements of DORS/2008-197, paragraph 34 have been met and that an identification number has been obtained from Environment Canada, as specified in paragraph 28.2 of DORS.
- b) Give a written notice twenty-four (24) hours before the date of the testing;
- c) Carry out the tests in the presence of the Engineer;
- d) Assume all the cost, including those for new tests and those for restoration;
- e) Carry out pressure leak testing according the requirements of the Quebec Construction code Chapter VIII;
- f) Before proceeding to the testing, disconnect all pieces of equipment or other material that are not designed to withstand the test pressures;
- g) Produce conformity certificates following the pressure tests and commissioning.

6.1.8.6 Existing piping and accessories

No existing piping or existing piping accessory may be used for the construction of the new fuel distribution station.

6.2 Electricity and controls

6.2.1 Scope of the works

The Contractor must supply all manpower, materials, equipment, tools and services required for the complete execution of the electricity and control works.

All materials and equipment must be in compliance with the requirements of hazardous locations, where applicable.

The works include, but are not limited to the following elements:

- Identification and location of underground electrical wiring between the electrical panels, tanks and access gateway to the floating dock in coordination with mechanical works;
- Powering off and disconnection of the power supply to the existing panels and tank equipment;
- Supply and installation of the leak control system;
- Supply and installation of the fuel level control system;
- Supply and installation of an inverter;
- Supply and installation of an exterior visual and auditory alarm, situated at the fuel tank filling station

- Supply, installation and connection of all pipes, wires, mounting hardware and equipment (if necessary) for a proper electrical installation of the equipment described in this section, in accordance with Electrical Code and as indicated plans and specifications;
- Supply and installation of the grounding (MALT) ;
- Supply, installation and connection of all cables, conductors and wires shown on the plans and all those necessary for a complete and functional installation of the electrical systems;
- Supply and installation of the identification for the pipes, cables and conductors.

6.2.2 **Execution**

6.2.2.1 Dismantling

Remove the cables between the pumps and solenoids of the three existing tanks and the control panel situated in the interior of the building and caulk the existing openings.

Properly indicate the location where the existing cables are attached in the control panel in order to connect the new pumps and solenoids in the same locations.

6.2.2.2 Grounding

Supply, install and connect the new grounding (MALT) as indicated on the plans.

All electrical, mechanical and metal equipment must be attached to the MALT

6.2.2.3 Environmental management system

Supply, installation and connection of a Veeder-Root TLS-350 environmental management system as indicated on the plans;

Supply, installation and connection of the following equipment, which must be connected to the Veeder-Root TLS-350 console :

1. Three (3) level sensors, installed on each of the tanks indicated on the plans;
 - a) magnetostrictive level sensor with water detection « Veeder-Root », Model 846390-107;
2. visual and auditory alarm « Veeder-Root Overfill Alarm » Model 790091-001 at the exterior of the building, at the fill station of the new reservoirs
 - a) The visual and auditory alarm must be activated in the case of high level (85%) of fuel in the new reservoirs, as measured by the magnetostrictive level sensor. The flashing red light must be maintained for a period of 2 minutes.
 - b) The Contractor must supply and install an acrylic engraved plaque near the visual and auditory alarm that indicates : « ALARME DE HAUT NIVEAU DE CARBURANT / HIGH FUEL LEVEL ALARM » (white writing on red background).
3. One (1) leak detection probe for the tanks, installed in a steel retention basin tanks:
 - a) Interstitial leak detection sensor « Veeder-Root », Model 790380-420;
4. Three (3) leak detection sensor, installed in the housings on the refueling tanks;
 - a) Discriminating leak detection sensor« Veeder-Root », Model 794380-352;

5. Two (2) leak detection sensors, installed in the transition boxes:
 - a) Non-discriminating leak detection sensors « Veeder-Root », Model 794380-208;
6. Two (2) leak detection sensors, installed in the box of the distributors on the dock;
 - a) Non-discriminating leak detection sensors « Veeder-Root », Model 794380-321;
7. Three (3) leak detection sensors, installed on the piping in the fuel pump housings of the tanks:
 - a) Pressurized line leak detector sensors (PLLD) « Veeder-Root », Model 848480-001;
8. Three (3) leak detection sensors, installed in the fuel pump housings of the tanks :
 - a) Discriminating leak detection sensor« Veeder-Root », Model 794380-352;

6.2.2.4 Instrumentation and controls

Supply, installation and connection of a PXXM controller with Veeder-Root integrator;

1. The new controller must be installed in the panel, as indicated on the plans;
2. A communication cable must be installed between the controller and the Veeder-Root TLS 350;environmental management console;
3. Use of communication line between the environmental management console and the modem;

The Contractor must supply all pipes, wires, mounting hardware and equipment (if necessary) for a proper electrical installation of the equipment described in this section, in accordance with Electrical Code and as indicated plans and specifications;

The Contractor must identify the conduits and conductors according to the Owner's standards.

6.2.2.5 Verification, start-up and programming

The Contractor shall make all pre-operational checks and start-up of all equipment and instrumentation. All systems must be complete and in perfect operating condition to the satisfaction of the owner or his representative.

The Contractor shall perform the start-up of the environmental management system, including the programming of the Veeder-Root TLS-350 console.

The high and low level fuel alarms must be the following, as measured by the magnetostrictive level sensors

- High level : 90% of the total capacity;
- Low level : 20% of the total capacity;
- Very low level : 5% of the total capacity

The Contractor must perform the start-up of the Veeder-Root PXXM controller with integrator and ensure that the alarms coming from the Veeder-Root TLS-350.environmental management system console are received and treated by the modem.

6.2.3 **Products**

6.2.3.1 Conduits

The conduits for the entry of electrical services will be rigid type galvanized steel.

6.2.3.2 boxes (where applicable)

All junction or exit boxes will be of an approved model and material, they will be in cast aluminum. They will be large enough to accommodate all the wires according to the plans and in compliance with the code requirements.

All boxes and metallic conduits will be grounded.

Exterior boxes shall be equipped with gaskets.

The electrical equipment boxes installed outdoors (in places that are not in hazardous locations) will be NEMA Type 4X.

Aluminum FS-D or FD type boxes of cast aluminum will be used for the surface output.

All outputs will be located according to the location of piping and metal equipment and in accordance with section 20 of the Québec Electrical Code. In the case of confusion, the Contractor shall consult with the Owner or his agent about it. All outputs will be moved the expense of the Contractor, if he failed to inform them of the exact location.

6.2.3.3 Wires

Unless otherwise indicated, all wires will be in gauge 12, minimum, AWG copper, they will be installed without splices.

Wires will be wrapped RWU-90 XLPE type, 600V.

All no. 8 AWG or larger wires will be twisted, smaller than no. 8 AWG wires can be solid.

In output boxes, leave a minimum length of 150 mm (6") moveable wire.

Unless otherwise indicated, the gauge of the wires coming from the panels will be established according to the capacity of the circuit breaker protecting it.

The connectors used in the panels and junction boxes must be of type: "Marette" ou "Thomas & Betts" series PT1 for joints up to 10 gauge.

All no. 8 AWG copper wires or greater must be determined, joined or derived using compression lugs and T. & B." 54000 series four or six sided "COLOR-KEYED" type compression splices. Lugs and splices must be installed according to the instructions of the Manufacturer.

When it is impractical to use lugs and compression splices, lugs or mechanical threaded screw splices "Loctite" series, with incorporated lock washer, must be used.

Insulation of the lugs or compression splices must be done using "SHRINK-ON" heat shrink, waterproof or regular depending on the case by "T. & B.".

Any power and control wiring within cabinets, panels, junction boxes, etc., must be properly installed and secured in place with the use of nylon ties "TY-RAP" Series TY-523 million or TY-534m by "T. & B." or passed through plastic tubing trays when there are more than twelve (12) wires.

The cables will be identified using identification cable ties, series TY-546M by "T. & B." at each end

6.3 Concrete

6.3.1 **Scope of Work (non-restrictive)**

The Contractor shall provide appropriate formwork and all necessary concrete as specified on the plans and specifications.

The main included works are as follows:

- Concrete slab for transition boxes;
- Concrete slab under tanks

The Contractor must also provide, fold, cut, install and secure all reinforcing steel shown on the plans or clearly required for the concrete work using stoppers, concrete blocks and clamps.

Finally, the Contractor shall also provide all services, materials, equipment, tools and labour necessary to the proper construction of all works shown on the plans or specified hereafter.

6.3.2 **Site Conditions**

Before starting any work, the Contractor shall make certain that the site conditions and the state of the works receiving the materials described in this section are satisfactory. Any and all anomalies or irregularities affecting the quality of the work will be reported in writing to the Engineer.

The beginning of work indicates acceptance by the Contractor of the basic structures and responsibility for their correction, if necessary.

6.3.3 **MATERIALS**

6.3.3.1 Cement

Unless otherwise specified, all cement used in the concrete must meet the requirements of the CAN/CSA A5 Portland Cements standard. The cement must be type 10.

6.3.3.2 Coarse Aggregates

The coarse aggregates shall consist of hard and non-erosive crushed stone and meet the requirements of the latest version of the CAN/CSA A23.1 standards.

6.3.3.3 Fine Aggregates

The fine aggregates may be natural or manufactured sand or a mixture of both. They must be composed of compact or cubic particles and must be free of deleterious materials. They must be clean, free of dirt, humus and other impurities and be washed, if necessary. The fine aggregates must meet the requirements of the latest CAN/CSA A23.1 standards.

6.3.3.4 Mixing Water

The mixing water must be clean, clear, drinkable and free of all oily, alkaline, acid or organic substances, or any other deleterious materials.

6.3.3.5 Concrete Admixture

6.3.3.6

The use of an additive should in no way reduce the concrete's durability, its' resistance to freeze-thaw cycles nor should it reduce any of the physical and chemical properties of the concrete.

The admixture must meet the requirements for the CSA CAN3-A266.2 Chemical Admixtures for Concrete standard.

The manufacturer's recommendations and instructions for these products must be followed.

6.3.3.7 Storage

The cement and the aggregates must be stored in such a way as to prevent deterioration or contamination by foreign materials.

Each size or type of aggregate must be stored separately in such a way as to prevent any segregation or uncontrolled mixing.

All reinforcing steel stored on-site must be placed on wood supports far from the movement of trucks, cranes and all other machinery in such a way as to prevent the steel bars from getting soiled, warped or bent.

6.3.4 **DOSAGE AND CONCRETE MIXTURE**

6.3.4.1 Manufacturing

All concrete used in this work must be produced by the Contractor who must also install his own concrete plant on-site.

Concrete dosing, mixing and transportation methods must meet the requirements of the latest CAN/CSA A23.1 standard.

The Contractor must retain the services of a recognized laboratory to analyze the aggregates and determine the mixture to be used for the preparation of the concrete.

The Contractor must have the mixing formula proposed by the laboratory approved by professionals before beginning the concrete work.

6.3.4.2 Concrete Strength

Concrete must have a compressive strength of 30 MPa at twenty-eight (28) days.

The filler concrete must be a lean concrete and must have a minimal compressive strength of 15 MPa at twenty-eight (28) days.

The water-cement ratio must take into account the compressive strength required at twenty-eight (28) days, the aggregate grain size, the slump and the amount of entrained air. However, the water-cement ratio for each class of concrete must not exceed 0.45.

The average result of all compressive strength tests at twenty-eight (28) days for each concrete quality must be greater than or equal to the required resistance. No more than 10% of the tests must present lower values.

The average result of five (5) consecutive tests must be equal to or greater than the specified resistance.

No individual test result must be lower than 85% of the specified resistance.

The Engineer may request a dosing modification for a concrete mix that does not meet these criteria.

6.3.4.3 Maximum Aggregate Size

Unless otherwise specified on the plans or in the specifications, the maximum aggregate size is 20 mm.

However, the size of coarse aggregates must not exceed one-fifth of the minimum size of the element, nor three-quarters of the space between reinforcing bars or between reinforcing steel and formwork.

6.3.4.4 Additives

a) Entrained Air

The entrained air should be used for all exposed concrete and wherever concrete is exposed to conditions that affect its durability. The percentage of entrained air must be set at 6.5% with a tolerance of $\pm 1.5\%$.

b) Slump

The concrete slump must be at 80 mm, ± 20 mm.

6.3.5 **FORMWORK**

6.3.5.1 Scope of Work

The term "formwork" as it is used in this specification refers not only to the wooden and metal parts used to receive fresh concrete, but also all fasteners and accessories necessary for the construction work.

Formwork scope of work also includes supply and installation of the wood required to construct the eaves, chamfers and all other complementary work presented in the civil, structural, mechanical and electrical plans.

6.3.5.2 Material

Unless otherwise specified on the plans, the formwork panels are made of 20 mm thick plywood.

The Contractor must use new panels for the concrete surfaces that will be apparent.

Joists and beams are to be made of eastern spruce, healthy and free of any warping.

6.3.5.3 Construction

Assembly of all formwork must be made so as to prevent any leakage of the cement slurry and as to resist the concrete's lateral pressure without distorting.

6.3.5.4 Cleaning

Formwork must be thoroughly cleaned before concreting. Compressed air or steam will be used to completely clean formwork of sawdust, snow, ice and other contaminants.

The use of calcium chloride to melt snow and ice is strictly forbidden.

6.3.6 **REINFORCING STEEL**

6.3.6.1 General information

The quality of materials, fabrication, bending, installation and the protection of the reinforcing steel must meet the requirements of the latest CAN/CSA A23.1 standards. The Contractor must therefore refer to this standard. The following sections highlight, but are not limited to, the key points of this standard.

All reinforcing steel must be new, free from slag, rust, paint, grease, etc. It must be notched, made of carbon steel and manufactured in Canada following CSA G30.18 standards.

The metal mesh must meet the requirements of the latest CSA G30.5 standards and must measure 152 x 152 MW 18.7 x MW 18.7 unless specified otherwise on the plans.

6.3.6.2 Identification

The manufacturer's name, the type of steel and the size of each bar must be clearly indicated on each armature incorporated into the concrete. All unidentified steel bars must be rejected.

6.3.6.3 Installation

6.3.6.4 The bars and armature assembly in general must be tied together so as to not give way under the worker's combined weight and to remain unmoving during the pouring of the concrete.

Steel coating must meet the requirements of the latest CAN/CSA A23.1 standards.

Metal mesh must be installed in sheets at 50 mm from the concrete's surface unless otherwise specified on the plans. It must be held into position during the pouring of the concrete. Overlapping of the sheets of metal mesh must be done on 10% of the surface or for a minimum of 150 mm.

Overlapping of each bar size must meet the requirements of the latest CAN/CSA A23.3 standards.

All stoppers and supports must be coated in plastic everywhere the concrete is either apparent or simply painted in order to protect them from rust.

6.3.7 **PLACING OF THE CONCRETE**

6.3.7.1 General information

The concrete processing methods must meet the requirements of the present specifications as well as the meet the requirements of the latest version of the CAN/CSA A23.1 standard.

6.3.7.2 Delivery

Unloading of the concrete must be done within two hours after having added the water to the mixture.

A maximum of 6 L/m³ can be added to the mixture on-site maximum sixty (60) minutes after initial dosing.

6.3.7.3 Installation

The concrete must be deposited in horizontal layers of a maximum thickness of 600 mm and as close to its' final position as possible in order to prevent segregation.

The concrete must not be dropped from a height of more than 1.5 m in free fall. For heights exceeding this, the Contractor must use slides, elephant trunks or any other equipment approved by the Engineer.

All necessary precautions must be taken in order to prevent the segregation of the concrete's constituents. If segregation does occur, the Engineer may demand that the Contractor change his installation methods.

6.3.7.4 Concrete Slabs, sleeve, etc.

Before starting any work, the Contractor must ensure the coordination of the professionals' plans in order to include to the concrete the exact positioning of all liners, conduits and anchors necessary to the different services.

No additional sum will be paid to the Contractor for the piercing of a structural element in case of an error or omission.

6.3.7.5 Curing of Concrete

All concrete must be adequately cured for a period of at least seven (7) days.

All exposed surfaces of the concrete must be covered with tarps or burlap canvas that must always be kept humid and the framework must be watered copiously.

If the Contractor wishes to use a chemical membrane for the curing process, he must demonstrate that this type of membrane won't destroy or damage the bond between the concrete and the finish that shall be applied afterwards. The Contractor must not use a chemical membrane on any concrete surface that is to receive a screed mortar or an additional concrete pour.

The curing process must begin as soon as possible after the concrete has hardened enough, which is usually four (4) hours after the concrete placing.

6.3.7.6 Control of Materials

Quality control for the processed concrete must meet the requirements of the latest CAN/CSA A23.2 standards. All tests will be done by a recognized laboratory designated by the Engineer. The Owner shall assume all testing costs.

The compressive strength of the concrete shall be verified during construction by taking three (3) cylinders for every 75 m3 of casting for a minimum of three (3) cylinders per cast. The Engineer may ask the laboratory to take a fourth cylinder and process it on-site as a control sample. The cylinders must be broken according to the following schedule: the first after seven (7) days and the other two (2) at the twenty-eight (28) day mark.

The cylinders must be numbered and the laboratory log report must include the exact location of the place where the sample was taken.

All concrete rejected by the laboratory representative or the Engineer during the pouring of the concrete shall not be paid even if it was already poured by the Contractor.

6.3.8 **COLD-WEATHER CONCRETING**

6.3.8.1 Concrete Temperature

If the ambient temperature is 5°C or less during concreting, the mixing water and the aggregates must be heated so that the temperature of the concrete at the outlet of the truck is between 15°C and 27°C.

6.3.8.2 Preparation

All traces of ice or snow must be removed from the framework or the armature before concreting using steam if necessary. Salts must not be used to this end. The framework and reinforced steel must be heated for at least one (1) hour prior to concreting.

6.3.8.3 Protection Methods

The following precautions must be taken in order to maintain the concrete's temperature above 10°C for at least three (3) days following the pouring of the concrete or until the degree of hydration is high enough to protect the concrete from any damage caused by freezing.

1. When the ambient temperature is between -5°C and 5°C, the concrete surfaces must be covered with tarps or an equivalent insulation material and a heating material must be kept in working condition in case the temperature were to go below -5°C during the three (3)-day period following the pouring of the concrete.
2. When the ambient temperature is between -12°C and -5°C, heating equipment must be used inside the shelters described above for three (3) days.
3. When the temperature is below -12°C, no concreting is allowed unless the whole structure is sheltered and adequate heating installed.

6.3.8.4 Heating

All heating equipment must be approved by the Engineer and must be built and disposed in such a fashion as to prevent any contact between the combustion gases and the concrete surfaces.

6.3.8.5 Additives

Under no circumstances must calcium chloride or any other chemical product be used to reduce the freezing point of fresh concrete.

6.3.8.6 Standards

Cold-weather concreting must meet the requirements of the latest CAN/CSA A23.1 standards and must be approved beforehand by the Engineer. Failure to do so could result in the Engineer suspending all work.

6.3.9 **PARTS CAST INTO THE CONCRETE**

6.3.9.1 General information

The manufacture and installation of the elements cast into the concrete must meet the requirements of the latest CAN/CSA A23.1 standards. The Contractor must therefore refer to this standard. The following sections highlight, but are not limited to the key points of this standard.

6.3.9.2 Location

The Contractor must refer to every professional's plans to know the nature, composition and exact location of the parts that must be embedded in the concrete.

6.3.9.3 Coating

Coating of the parts completely encased in concrete must meet the requirements of the latest CAN/CSA A23.1 standards.

6.3.9.4 Anchors

All anchors must be incorporated into the concrete work by the Contractor.

END OF SECTION

**APPENDIX A
PLAN LIST**



Mécanique

DWG/Dessin	Rev	Titre/Title	Émis pour/ Issued for
121-23520-00 M-001	0	Plan de démantèlement / Dismantling plan	Pour appel d'offre / For tender
121-23520-00 M-002	0	Diagramme de distribution / Distribution diagram	Pour appel d'offre / For tender
121-23520-00 M-003	0	Plan d'aménagement général / General arrangement plan	Pour appel d'offre / For tender
121-23520-00 M-004	0	Clôture & Boîtes de transition & Détails / Fence & Transition boxes & Details	Pour appel d'offre / For tender
121-23520-00 M-005	0	Démantèlement et nouvel aménagement des réservoirs d'huile usées / Dismantling and new arrangement of used oil tanks	Pour appel d'offre / For tender

Électrique

DWG/Dessin	Rev	Titre/Title	Émis pour/ Issued for
121-23520-00 E-001	0	Diagramme électrique / Electrical diagram	Pour appel d'offre / For tender
121-23520-00 E-002	0	Diagramme électrique / Electrical diagram	Pour appel d'offre / For tender
121-23520-00 E-003	0	Diagramme électrique / Electrical diagram	Pour appel d'offre / For tender
121-23520-00 E-004	0	Mise à la terre & Localisation des équipements / Grounding & equipments localisation	Pour appel d'offre / For tender
121-23520-00 E-005	0	Détail installation mise à la terre / Grounding installation details	Pour appel d'offre / For tender