

FOREWORD

I am pleased to introduce the third edition of the *Specifications for Fuel Storage and Distribution Facilities*. The information in this document will be directly incorporated into a construction package for tendering a fuel facility project. Sufficient detail has been provided to minimize errors during the construction of a fuel facility. The safety, security and reliability of fuel storage facilities and equipment are of paramount importance to northern communities, which are extremely dependent upon their fuels supplies.

The *Specifications for Fuel Storage and Distribution Facilities* is intended to be used in conjunction with its two companion documents – *Design Rationale for Fuel Storage and Distribution Facilities* and the *Standard Detail Drawings for Fuel Storage and Distribution Facilities*.

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SPECIFICATIONS

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Specification Note: Header to be revised on all documents to suit particular project.

PART 1 - GENERAL

1.1 Work Under this Contract

- .1 The Work under this contract consists of construction of the following:

Specification Note: Specifier to provide a brief title for the Work here.

For the Government of the Northwest Territories, hereinafter called the Owner, including all equipment and appurtenances therein, as shown on the Contract Drawings and/or as specified herein, in accordance with the terms of this Contract.

1.2 Work Included

- .1 The Work, unless specifically stated otherwise, shall include the furnishing of all materials, products, plant, labour and transportation necessary to complete the Work. The intent is that the Contractor provides a complete job.
- .2 The Work shall not be deemed complete until all components are placed in operation by the Contractor, and are operating satisfactorily.
- .3 Any minor item of the Work not called for in the Specifications or shown on the Drawings, but is clearly required to meet the intent of the design and normally provided for the proper operation of such a facility, shall be provided as if specifically called for in the Contract Documents.

1.3 Documents Required

- .1 Maintain at the job site at least one copy of each of the following:
- Contract Drawings
 - Specifications
 - Two Sets of Record Drawings and Specifications
 - Addenda
 - Change Orders
 - Reviewed Shop Drawings
 - Modifications to the Contract
 - Field Test Reports
 - Construction Schedule
 - Manufacturer's Installation and Application Instructions
 - Occupational Health and Safety Regulations

1.4 Specifications

- .1 Sentence structure in parts of the Specifications is abbreviated, and phrases such as "shall be," and "the Contractor Shall" are deliberately omitted. Such sentences shall be read as though they are complete.
- .2 The use of the word "provide" means "supply and install"; or "supply labour and materials for the installation of". It does not mean supply only.

- .3 The word "concealed" in connection with piping, conduit, electrical work, controls and wherever used in other sections shall mean, "hidden from sight" as in ceiling spaces or furred out spaces.
- .4 The word "exposed" in connection with piping, conduit, electrical work, controls and whenever used in other sections shall mean "visible to persons within a building, in normal working areas. "

1.5 Standards

- .1 Wherever Standards (i.e., CSA, ASTM and such) are referred to in these Contract Documents the current edition at the date of closing of tenders shall apply.
- .2 Where there is a clear conflict between the Standards and the Contract Documents, the Engineer shall, in the first instance, give an interpretation of the intent of the Contract.
- .3 Where there is an ambiguity between the Standards and any term of these Contract Documents, the Engineer shall, in the first instance, give an interpretation of the intent of the contract.

PART 2 - PARTICULAR SCOPE OF WORK

Specification Note: Specifier to provide a detailed general description of the Work here.

Specification Note: Specifier to provide Particular Design Data here, including climatic data, seismic loading, etc., as needed from Section 01030.

END OF SECTION 01010

1. WORK SEQUENCE

- .1 The Work shall be executed in a timely manner to ensure that construction is completed by the completion dates outlined in these documents. It is **critical** that planning, purchasing and preparation for delivery of all equipment and materials required for first year construction begin as soon as the contract is awarded. This includes preparation and arrangements for an air charter, if deemed necessary, to complete the Work on schedule.
- .2 It is critical that the tank steel or other long delivery items (if required) be ordered immediately and prepared (including rolling and, if possible, sandblasting and priming of the exterior of the shell and roof plates) ready for shipment by barge or in some cases, by truck over the winter ice road system. Space for barge transport usually needs to be booked with the Northern Transportation Company Limited (NTCL), for tug and barge dry cargo shipping service from Hay River or Inuvik, NT, in late May for shipping in July/August. The winter ice roads are usually open for travel and truck delivery from mid-January to mid-March each year, depending on the weather.
- .3 The Contractor must coordinate activities with other Contractors to ensure the timely completion of the project.
- .4 The Contractor shall confirm the dates and make all arrangements for shipping.
- .5 Permafrost thaw and snow melt is usually sufficiently advanced by the end of June-early July, for earthwork to begin. Consequently, the Pre-Construction Meeting is generally scheduled for the first week in July, on site.
- .6 **Compliance with NWT Business Incentive Policy must be followed.** The current Business Incentive Policy is available through the BIP Monitoring Office; Environment and Natural Resources (ENR) at (867) 873-7215.
- .7 The construction season is normally from the beginning of July to the end of September, depending on the weather, although it can extend into October.
- .8 **Note: All existing tankage and resupply piping shall be available for resupply, for each construction year.**
- .9 Depending on the project scope, second year construction shall generally include *Substantial Completion of Construction*, ready for inspection at least two weeks before fuel resupply. Completion of deficiencies can be completed after the inspection provided all tankage and piping is available for fuel resupply.
- .10 Painting is generally planned for the third year allowing for the best weather to ensure a good coating application.
- .11 Communities that are served by seasonal or winter ice roads will have a different work schedule, determined by the construction and operation of the particular seasonal or ice road.

- .12 The Contractor shall consult with the Engineer on acceptable methods of carrying out the Work, the space available for storage of materials, erection of temporary facilities, location of granular borrow areas, and any other information pertinent to the Work. All costs associated with the forgoing shall be borne by the Contractor.

Specification Note: Specifier to provide a description herein of any required work sequence.

Specification Note: Specifier to provide known details of the fuel resupply operation.

END OF SECTION 01014

1 THE CONSTRUCTION SITE

- .1 The Owner will provide the lands upon which the Work is to be constructed.

2. CONTRACTOR'S USE OF THE SITE

- .1 The Contractor shall have exclusive use of the site, provided that the Contractor shall permit access to the Owner, the Engineer and other Contractors on the site for purposes of inspections, reviews, tests and carrying out work related to the Work.
- .2 The Contractor shall provide access to the site for the local petroleum products operator for continued dispensing operations, resupply operations, product sampling, inspection, etc.
- .3 The Contractor shall keep fuel dispensing systems operational throughout the duration of the Work, adhering to all safety requirements including maintaining secondary containment.

Specification Note: Specifier to describe here any limitations in the Contractor's use of the site.

END OF SECTION 01015

PART 1 – GENERAL

1.1 General

- .1 Unless otherwise specified, allowance of \$15,000.00 shall cover the cost of materials and equipment for the installation of an Electrical Service Pole to the site, Signage and applicable tax. The Contractor's handling cost on the site, labour, installation costs overhead and profit shall be included separately in the Contract Sum and not in the allowance.
- .2 Where it is specified that an allowance is to include both supply and installation costs, such allowances shall cover the cost of materials and equipment delivered and unloaded at the site and all applicable tax. The Contractor's handling cost on the site, labour, installation costs and other expenses except overhead and profit which shall be included separately in the Contract Sum.
- .3 Allowances for independent inspection and testing shall cover the cost of such services as provided by the independent testing agency only. The Contractor's cost for labour, overhead and other expenses shall be included separately in the Tender Price and not in the allowance.
- .4 If the cost of work is covered by allowances, when determined is more or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order.
- .5 The Contractor shall cause the work covered by allowances to be performed for such amounts and by such persons as the Engineer may direct.
- .6 Expenditures from allowances shall be authorized in writing by the Engineer. Trade documents and refunds shall be credited to the Owner, only cash discounts (if any) on account paid by the Contractor before the due date being retained by the Contractor.
- .7 Ensure that allowance and other costs required in connection therewith are included only once in the Contract Sum.
- .8 Progress payments for work and material authorized under cash allowance will be made in accordance with the Terms of Payment.

1.2 Material and Installation Allowance for sign by Owner

- .1 Material and installation cash allowance shall include and provide payment for;
 1. Net cost of material.
 2. Applicable duties and taxes.
 3. Delivery to site.
 4. Handling at site including unloading, uncrating, storage and hoisting.
 5. Protection from damage by elements or otherwise.
 6. Labour, installation and finishing.
 7. Other expenses required to complete installation.

END OF SECTION 01020

1. SPECIAL PROJECT PROCEDURES

- .1 The Owner reserves the right to let other contracts on the site of the Work related to the project and to do work with own forces on the project.
- .2 The Owner shall coordinate the work and insurance coverage of other Contractors insofar as it affects the Work of this Contract.
- .3 The Contractor shall coordinate work with that of other contractors and tie into works constructed by others as specified or shown in the contract documents.
- .4 The Contractor shall report to the Engineer any apparent deficiencies in the work of other Contractors which would affect the Work of this contract as soon as they come to their attention, and shall confirm such a report in writing. Failure by the Contractor to so report shall invalidate any claims against the Owner by reason of deficiencies in the work of other Contractors, except as to those of which the Contractor could not reasonably be aware.

2. STORAGE FACILITIES AND USE OF PREMISES

- .1 The Contractor may use such facilities and areas as the Owner may be willing and able to designate for the storage of material and product for the Work, without charge to the Contractor.
- .2 Should the Contractor require additional facilities or areas, the Contractor shall make all the necessary arrangements with the Owners or occupants of such other facilities or areas and shall pay all rentals and all damages caused by such occupancy.
- .3 The Contractor shall confine his apparatus, the storage of material and product and the operations of his workers to limits indicated by law, ordinances, permits or directions of the Engineer and the Community, and shall not unreasonably encumber the premises with his material, product or equipment.
- .4 The Contractor shall enforce all regulations regarding signs, advertisements, fires, smoking and storage of flammable material or product.
- .5 The Contractor shall not load or permit any part of the Work or of the Owner's structures to be loaded in any way that will endanger their safety.

3. USE OF COMPLETED PORTIONS OF THE WORK

- .1 The Owner shall have the right to take possession of and use any completed or partially completed portions of the Work, notwithstanding that the time for completing the Work or such portions of the Work may not have expired. Taking possession of and use shall not be deemed acceptance of the Work.
- .2 If such prior use increases the cost of the Work, the Contractor shall be entitled to such compensation as the Engineer in the first instance may determine.

4. DUMPING OF MATERIALS

- .1 The Contractor shall make arrangements for the disposal of all waste material at the

Community solid waste disposal facility.

5. TRAFFIC RESTRICTIONS

- .1 The Contractor shall make every effort to keep disruptions to traffic flow to a minimum.

6. KNOWLEDGE OF THE SITE

- .1 The Contractor shall make himself aware of the available methods of transportation for equipment and personnel to the site. Contractors are cautioned that transportation may only be by air, ice road or tug/barge service to some communities.
- .2 Climatic data for design purposes is based on *The National Building Code Supplement No. 1, "Climatic Information for Building Design in Canada"*, latest edition and consultation with the Department of Transport and also Environment Canada. The Contractor shall also refer to Section 01010, Part 2, regarding particular climatic design data.
- .3 The Contractor shall have no claim on account of his failure to familiarize himself with site conditions prior to bidding on this contract. He is advised that local availability of construction equipment and labour is limited and other projects may require the equipment during the short construction season. Early arrangement should be made with the Community Office, Government Liaison Officer and/or local contractors for use of any equipment available.
- .4 The Contractor is responsible for his own accommodation and services at the site as per the General Conditions of the Contract.

Specification Note: Specifier to remove blasting item if there is no blasting on the site.

7. BLASTING

- .1 All blasting performed on the site shall be done in accordance with current regulations of the Government of the Northwest Territories and local bylaws and ordinances. The Contractor shall be responsible for making himself aware of these policies, bylaws and ordinances and adhering to same.

8. CONTINUITY OF PETROLEUM PRODUCTS DISPENSING

- .1 The Contractor shall ensure that the fuel dispensing and metering facilities are fully operational throughout the project, during normal dispensing hours. Temporary shutdowns of the fuel dispensing system, during normal hours, of less than two (2) hours duration may be approved by the Engineer, in cooperation with the local PPD contract operator, for critical construction work.
- .2 No dispensing facility is to be operated without the permanent or approved temporary metering equipment in service.
- .3 All shutdowns must be coordinated with the local Petroleum Products contract operator. The operator and the Engineer must be advised at least 48 hours in advance of a proposed shutdown, with complete details of the nature of the shut

down, i.e., piping, equipment and metering devices affected, and the proposed timing and duration of the shutdown. The Contractor must receive the approval of both the operator and the Engineer before proceeding with the shutdown. The Engineer has ultimate authority for approval of the shutdown and shall notify the Regional Petroleum Products Officer prior to any major disruption of product dispensing facilities. Longer shutdowns must be approved through the Regional Petroleum Products Officer.

- .4 Prior to initiation of construction, the Engineer, in cooperation with the Regional Petroleum Products Officer, shall advise the local Petroleum contract operator of the contents of this Clause and shall provide him with the name and location of the Engineer. Approved temporary metering facilities shall be in operation until new facilities are accepted for permanent use. Temporary metering shall be to the approval of the Regional Petroleum Products Officer.

9. COORDINATION WITH ANNUAL FUEL RESUPPLY OPERATION

- .1 In accordance with the approved construction schedule, the Contractor shall ensure that all facilities including pipelines, shore connections, metering and tankage are complete, tested and approved for filling, when product is delivered to the site during each annual fuel resupply operation. All new and existing tankage must be completed for resupply as indicated in Section 01014. The Contractor must check the resupply dates for each year of the contract and coordinate all operations around the annual fuel resupply dates. The Contractor shall plan and allow for all tankage being full on completion of the resupply operation during each year of the contract.
- .2 The Contractor shall be responsible for any delays in fuel delivery resulting from facilities not being available to receive product due to the Contractor's operations and scheduling. The Contractor shall pay any and all charges resulting from such delays, including all extra barging and demurrage costs, alternate product storage costs and/or alternate product delivery costs.
- .3 The Contractor shall contact the applicable carrier for scheduled shipping dates. The Owner will not accept any responsibility for any changes in the actual shipping dates.

END OF SECTION 01030

1. GENERAL

- .1 Although the Specifications set forth the work of various trades under separate Divisions, it is not intended that the work of that trade is limited to, or includes all work set forth in that particular Division. The Contractor shall delegate the extent of the work to be done by the various trades and shall coordinate execution of the work by all trades.
- .2 Although the Specifications are separated into titled Divisions, neither the Engineer nor the Owner will be an arbitrator to establish limits of any agreements between the Contractor and subcontractors.
- .3 The Contractor is advised that no work shall be covered over until such is first approved by the Engineer. In general, work performed by one trade shall be inspected and accepted by the Engineer, before it is covered by the work of another trade, and the Contractor shall inform the Engineer accordingly.

2. COORDINATION

- .1 The Contractor shall examine the Drawings before tendering and beginning the Work and report to the Engineer any discrepancies or interferences.
- .2 Electrical and mechanical system layouts shown on the Drawings may be diagrammatic with locations of outlets, fittings and equipment approximate. Exact routing of conduits, wiring, pipes and tables shall be determined and coordinated by the Contractor to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Obtain the Engineer's approval for locations of outlets, fittings and equipment.

3. CUTTING AND PATCHING

- .1 The Contractor shall do all cutting, fitting, or patching of the Work that may be required to make its several parts come together properly and fit it to receive or be received by work of other contractors shown in, or reasonably implied by, the contract documents.
- .2 Any cost caused by cutting and patching due to ill-timed work shall be borne by the Contractor.
- .3 The Contractor shall not endanger any existing property or portion of the Work by cutting, digging or any other method, and shall be responsible for any damages caused by him.
- .4 Where new work connects with existing work, and where existing work is altered, cut and patch as required.
- .5 Coordinate the Work to minimize the amount of cutting and patching required.

- .6 Do no cutting that may impair the strength of structures. Obtain the Engineer's approval before cutting, boring or sleeving load-bearing members.
- .7 Make cuts clean and smooth and ensure patches equivalent to new work.
- .8 Provide openings, holes and sleeves as required for, process mechanical, building mechanical, electrical and all other components of the Work. Provide openings in pre-cast work and cast-in-place work.
- .9 Drill or field cut smaller openings or holes and cast openings larger than 100mm diameter.

END OF SECTION 01040

1. FIELD ENGINEERING

1.1 General

- .1 The Engineer will provide a baseline, reference points and a benchmark.
- .2 The Contractor shall be responsible for the correctness of the elevations and dimensions from the references as provided by the Engineer.
- .3 The layout of the Work shall be in accordance with the work schedule, which is prepared by the Contractor, submitted to the Engineer for review and updated monthly.
- .4 If the Contractor requests a change in layout procedure or sequence, he shall submit the request to the Engineer, giving a minimum of 48 hours notice of new or revised activities.
- .5 The notice requesting a change shall be extended to 96 hours whenever a long weekend is involved.

1.2 Survey Assistance

- .1 The Contractor shall supply acceptable survey assistants to the Engineer to assist in measuring, surveying, driving stakes and such other work as the Engineer requires to lay out the Work.
- .2 For setting out line and stakes, two assistants shall be provided.
- .3 For survey leveling and preparation of grade sheets, one assistant shall be provided.
- .4 Survey assistants shall not be changed without the approval of the Engineer.
- .5 If the Contractor fails to provide survey assistants that are acceptable to the Engineer, the Engineer will obtain assistants and deduct the cost and expenses thereof from the Progress Payment Certificates.

1.3 Construction Stakes

- .1 Construction stakes including lathes and hubs shall be provided by the Contractor.

END OF SECTION 01050

1. GENERAL

- .1 The laws and regulations of the Northwest Territories shall govern.
- .2 The standards of the Work shall conform to or exceed the minimum standards of the Canadian General Standards Board, the Canadian Standards Association, the National Building Code of Canada and the National Fire Code of Canada.
- .3 The Contractor shall ensure compliance on his part and on the part of all of his subcontractors, with the Workers' Compensation Ordinance and Regulations there under of the Government of the Northwest Territories.
- .4 The attention of the Contractor is drawn to the requirements of the Northwest Territories Mechanics Lien Act and the requirements there under and the Contractor shall comply therewith.
- .5 In carrying out the Work, the Contractor shall comply with all other acts and ordinances and regulations there under of the Government of the Northwest Territories as though they had been specifically named in this specification.

2. BURNING

- .1 Restrictions of federal, territorial and municipal authorities shall be complied with, with permits to be obtained by the Contractor.

3. REGULATIONS, STANDARDS AND CODES

- .1 Codes, standards and regulations are specified in other Sections of the Specifications and the Work, shall be done in accordance with those Codes, standards and regulations where applicable.
- .2 The Contractor shall obtain and pay for all permits, inspections, etc. required by the authorities having jurisdiction, including local construction permits, quarry permits, water use permits, land use permits, etc.
- .3 When all work has been completed, tested and placed in operation in accordance with the requirements of the Drawings and Specifications and all governing Codes and regulations, the Contractor shall request and obtain a Final Certificate of Approval, without reservations, from the inspection department(s) having jurisdiction, when applicable, and the certificate(s) shall be provided to the Engineer.
- .4 The Contractor shall note that no allowance will be given for modification of the installation to meet requirements of governing Codes or regulations, unless such Codes or regulations were modified by legislation after the contract was awarded.

END OF SECTION 01060

1. ABBREVIATIONS - SPECIFICATIONS, METHODS, STANDARDS

.1 General

The following Codes and Standards govern specific portions of the Petroleum Products program and are referenced throughout this document. A comprehensive list of the applicable Codes and Standards, and their contact addresses, are provided in *Section 1.5 and 1.6 of the CCME, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Products*.

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
API	American Petroleum Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CAN	National Standard of Canada
CCA	Canadian Construction Association
CEC	Canadian Electrical Code
CEMA	Canadian Electrical Manufacturers Association
CGA	Canadian Gas Association
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CSA	Canadian Standards Association
CSPI	Corrugated Steel Pipe Institute
CUA	Canadian Underwriters Association
CWB	Canadian Welding Bureau
EEMAC	Electrical and Electronic Manufacturers Association of Canada
IAO	Insurance Advisory Organization
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IPCEA	Insulated Power Cable Engineers Association
ISO	International Organization for Standardization
LEMA	Lighting Equipment Manufacturers Association
NBC	National Building Code of Canada
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFC	National Fire Code of Canada
NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Administration
SAE	Society of Automotive Engineers
SPC	The Society for Protective Coatings
SSPC	Steel Structures Painting Council (replaced by SPC)
ULC	Underwriters Laboratories of Canada
WCB	Worker's Compensation Board

Government Agencies and Abbreviations

INAC	Indian and Northern Affairs, Canada
GNWT	Government of the Northwest Territories
MACA	Municipal and Community Affairs
MVEIRB	Mackenzie Valley Environmental Impact Review Board
MVLWB	Mackenzie Valley Land and Water Board
NTPC	Northwest Territories Power Corporation
PPD	Petroleum Products Division
PW&S	Public Works and Services
ENR	Environment and Natural Resources

.2 Use of Abbreviations

These abbreviations refer to specifications, methods and standards issued by the respective Associations, and the abbreviations are used in these Specifications.

Alphanumeric designations following the abbreviations denote the specification, method, or standard.

2. ABBREVIATIONS - METRIC

.1 General

These Specifications are in metric and metric usage is based upon SI units in accordance with *CSA Standard CAN/CSA-Z234.1-89 Canadian Metric Practice Guide*. In this Specification SI units are abbreviated in accordance with the Metric Units and Abbreviations below.

.2 Linear Measure

Metre	m
Millimetre	mm
Kilometre	km
Micrometre	µm

.3 Area

Square metre	m ²
Square millimetre	mm ²
Hectare	ha

.4 Volume

Cubic metre	m ³
Litre	L

.5 Mass and Density

Kilogram	kg
Gram	g
Tonne	t
Kilogram per metre	kg/m
Gram per metre	g/m

	Kilogram per square metre	kg/m ²
	Gram per square metre	g/m ²
	Kilogram per cubic metre	kg/m ³
.6	<u>Temperature</u>	
	Degree Celsius	°C
.7	<u>Force, Pressure, Stress</u>	
	Newton	N
	KiloNewton	kN
	Pascal	Pa
	KiloPascal	kPa
	MegaPascal	MPa
.8	<u>Velocity, Rate of Flow</u>	
	Metre per second	m/s
	Metre per hour	m/h
	Kilometre per hour	km/h
	Litre per second	L/s
	Cubic metre per second	m ³ /s
.9	<u>Power, Energy, Heat, Work</u>	
	Watt	W
	Kilowatt	kW
	Kilowatt hour	kWh
	Joule	J
.10	<u>Electricity</u>	
	Ampere	A
	Volt	V

END OF SECTION 01070

1. GENERAL

- .1 All systems shall be installed and identified in accordance with recognized identification systems.

2. ELECTRICAL

- .1 Electrical conductors shall be identified by colour code as specified in *Section 16010 - General Electrical Provisions*.
- .2 Buried conduits shall be identified in accordance with local codes and as specified in *Section 16010 - General Electrical Provisions*.
- .3 Nameplates shall be provided for electrical panels and equipment as specified in *Section 16010 - General Electrical Provisions*.

3. MECHANICAL

- .1 Mechanical and process equipment shall be labeled in accordance with *Sections 13227, 13229, 13230 and 15010*.
- .2 Painting systems shall be labeled as specified in *Section 09900*.

4. PIPE ARROWS

- .1 Arrows to indicate direction of flow shall be installed on the pipelines at the approximate locations indicated on the Drawings. Arrows shall be Brady #91-420, or approved equivalent, 50mm long x 40mm high, black on yellow background, single arrow, pointing in the direction of flow. Arrows shall be printed on Brady #B-946 or approved equivalent all weather film material with adhesive backing suitable to -46°C. Size of stickers to suit arrows. The above shall conform to *ANSI A13.1, Colour Coding*.

5. VALVE TAGS

- .1 Valve tags shall be provided at valves as shown on the Drawings.
- .2 Valve tags shall be fastened to valves with #16 brass jack chain and Brass 'S' hooks.
- .3 Valve tags for each product shall be as indicated in the Standard Detail Drawing NT-P26 and as follows:
 - .1 The tags on the Low Sulphur Diesel Light (LSDL) fuel system shall be round, anodized aluminum, aluminum finish, Brady #49904 or approved equivalent, with product name and valve number stamped on each tag.
 - .2 The tags on the Gasoline fuel system shall be octagonal, anodized aluminum, red finish, Brady #49901 or approved equivalent, with product name and valve number stamped on each tag.

- .3 The tags on the Jet A-1 aviation fuel system shall be round, anodized aluminum, yellow finish, Brady #49900 or approved equivalent, with product name and valve number stamped on each tag.

END OF SECTION 01080

1. ALTERNATIVE MATERIALS

- .1 Although bidders are encouraged to submit alternatives whenever such will ensure a quality, performance and serviceability equal to, or greater than that inferred by the Drawings and Specifications. They should prepare their bid using the specified materials and procedures, submitting a separate proposal for any suggested alternative. This proposal shall show clearly the alternative details of materials and procedures. Any change in price shall be subject to the Engineer's approval, prior to acceptance.
- .2 Where product or materials are specified by trade name or manufacturer's name, the arrangement of equipment shown on the Drawings is generally based on the equipment of the named manufacturer. Should the Contractor obtain authorization from the Engineer to supply product or materials of equivalent manufacture, he shall bear the costs of modifications to the Drawings, equipment arrangements and ancillaries to suit said product.

END OF SECTION 01100

Specification Note: This Section must be read with Appendices B and C of the Tender Form and should be modified on a project specific basis to suit the project.

1. GENERAL

- .1 Payments will be made on the basis of the lump sum prices bid and the unit prices bid in the tender, and in accordance with the general conditions.
- .2 The prices bid for various items of work, unless specifically noted otherwise, shall include the supply of all labour, material, plant and equipment necessary to construct the Work in accordance with the Specifications.
- .3 The prices bid for supply of materials and installation of materials shall be full compensation of supplying, hauling, installing, cleaning, testing, and placing in service, together with all other work subsidiary and incidental thereto for which separate payment is not provided elsewhere.
- .4 The method of measurement of the quantities for payment and the basis for payment will be in accordance with the following items of this section. All measurement shall be done by the Engineer, using generally accepted field survey methods. Stationing interval for volume calculations shall not exceed ten (10) metres.
- .5 Where the tender shows separate items for supply and installation, the unit prices or lump sum prices bid for supply shall include supplying, delivering, loading, unloading and all allowances for handling, storage, breakage and waste. Payment will be made only for materials actually installed.
- .6 All materials on site, whether existing structures, vegetation, topsoil, gravel, sand or other excavated, or piled materials are the property of the Owner or the Owner of the land on which the Work is located. Only those materials specifically noted in the Specifications or on Drawings as belonging to the Contractor shall become the Contractor's property.
- .7 Where there are excess excavated materials, unsuitable materials excavated or materials of any kind that are excavated but not used in the Work, such materials are not the property of the Contractor unless authorized in writing by the Engineer or specified to be disposed of by the Contractor.
- .8 Where work is called for in these Specifications and is not specifically designated for payment under a pay item, the Contractor shall deem such work as incidental to the most closely associated pay items and make appropriate allowances in his bid price. The Contractor will not be allowed an additional amount for any items not included in the tender bid, but which are required to make the Work complete.

2. MEASUREMENT AND PAYMENT CLAUSES

2.1 Mobilization and Demobilization

- .1 Mobilization and demobilization shall include the Contractor's costs of mobilization at the beginning of the project, and the costs of demobilization at the end of the project.

- .2 Included in mobilization are such items as:
 - bonding, insurance and permits;
 - moving personnel, materials and equipment to the site, setting up temporary facilities and all preparation for performing the Work;
 - inspection and acceptance by the Engineer of all materials and equipment received, including as necessary, the opening of crates and recrating by the Contractor at his expense;
 - the storing in an adequate and approved warehouse of those materials and equipment which will not be immediately used for construction;
 - supply of literature and data for O&M manuals;
 - return of Government property in compliance with the contract documents.
- .3 Included in demobilization are; removal of all personnel, materials and equipment, once work has been completed, tested and accepted by the Engineer, general cleanup of the site and the Work, supply drawings of record, and training.
- .4 The lump sum price bid for this work shall be relative to the costs involved.
- .5 Upon completion of mobilization as noted above, the Contractor shall be entitled to claim an amount not exceeding 70% of the lump sum amount stated under this item. Prior to billing for completion of mobilization, the Contractor will have complied with the conditions of *Section 01650, Clause 2.5*, in that all required operations and maintenance manual data and manufacturer's literature for material provided will have been provided to the Engineer. The remaining 30% shall be paid to the Contractor only after work for demobilization is completed to the satisfaction of the Engineer notwithstanding the holdback amount, in compliance with the Specifications, and the contract documents and the record drawings are turned over to the Engineer.

2.2 Lump Sum Contracts

- .1 Payments will be made on the basis of the following:
 - lump sum items in the schedule of breakdown prices in the tender;
 - unit prices bid in the schedule of unit prices in the tender for provisional items;
 - changes in the Work for items not covered by unit prices, in accordance with *Articles GC45 to GC49* of the contract.
- .2 The Contractor must supply copies of invoices to substantiate claims if requested. Deletions will be proportioned on lump sum items or determined on the basis of unit prices.
- .3 For each lump sum item in the schedule of breakdown prices, the Engineer will, in cooperation with the Contractor, estimate the percentage of the item completed at the end of the payment period.

- .4 Provisional work items to be paid by unit prices in the schedule of unit prices, the measurement and payment shall be as follows:

.1 Excavation

The unit price shall include excavating of rock, boulders and granular materials. Payment shall also include loading, transporting within the site limits, stockpiling for backfill or fill, or disposal outside site limits. Also included is the cost of providing temporary drainage and control of water. Overhaul will not be paid. Payment will be made for rock excavation only if other than normal excavation methods are required to break the material, and if rock excavation is ordered in writing by the Engineer.

Payment: Unit price bid per cubic metre excavated.

Measurement: Survey cross sections before and after excavation.

.2 Backfill

Backfill material shall include supply of approved borrow material where extra backfill is required. The unit price includes all royalties, borrow pit preparation, excavation, screening, loading, hauling, placing, compacting, trimming, and cleanup. Payment will be made only when extra material is ordered in writing by the Engineer.

Payment: Unit price per cubic metre placed and compacted.

Measurement: Survey cross sections before and after backfill.

.3 Concrete

Include supply and installation of reinforcing, formwork, concrete and all incidental work for which separate payment is not specified elsewhere.

Payment: Unit price bid per cubic metre.

Measurement: Survey measurement of concrete in place.

.4 Labour Rates

Personnel rates include payroll cost of labour and all payroll burdens, room and board if applicable, and overhead and profit. Overhead includes the cost of superintendents, timekeepers and other administrative and supervisory personnel and their vehicles and other costs. The Contractor understands that the Owner may review these rates and require changes for good cause.

Payment: Unit price bid per hour.

.5 Equipment Rates

Equipment rates include operator, fuel, maintenance, overhead and profit. Overhead includes the cost of superintendents, timekeepers and other administrative and supervisory personnel and their vehicles and other costs. The Contractor understands that the Owner may review these rates and require changes for good cause.

Payment: Unit price bid per hour.

END OF SECTION 01150

1. PRECONSTRUCTION MEETING

- .1 A preconstruction meeting will be arranged by the Engineer after the contract is awarded.
- .2 The meeting will be held at the Engineer's office or at an alternate location at or near the site.
- .3 The Contractor shall have in attendance the Superintendent, the Project Manager and representatives of the Subcontractors, if requested by the Engineer.
- .4 The Engineer will have the consultant and/or the resident inspector in attendance, and any other personnel whom the Engineer feels may add to a successful meeting.
- .5 The Owner may have a representative in attendance.
- .6 Minutes will be taken by the Engineer and copies will be distributed to attendees.
- .7 The preconstruction meeting agenda will include:
 - .1 Identification of key project personnel and lines of communication:
 - .1 Role of the Engineer, consultant and resident Inspector.
 - .2 Contract Authority.
 - .2 Schedule of Work:
 - .1 Contractor's schedule and proposed work plan.
 - .2 Review Drawings and Specifications.
 - .3 Temporary facilities.
 - .4 Granular sources.
 - .5 Equipment.
 - .6 Resupply.
 - .7 Shutdowns.
 - .3 Schedule of values:
 - .1 Progress payments.
 - .2 Change orders.
 - .3 Project inspections.
 - .4 Measurement of unit costs.
 - .5 Claims/disputes.

- .4 Site sign.
- .5 Submissions:
 - .1 Worker's Compensation Board (WCB) certificates and Insurance certificates are required.
 - .2 Shop drawings.
 - .3 Mill test certificates.
 - .4 Weld manual.
 - .5 Welder's certificates.
- .6 Authorities Having Jurisdiction:
 - .1 NWT Fire Marshal.
 - .2 Environment and Natural Resources (ENR), Environmental Protection Services.
 - .3 Municipality.
 - .4 GNWT, PW&S, Electrical/Mechanical Safety.
 - .5 Weights and Measures Canada.
 - .6 Water use applications, Mackenzie Valley Land and Water Board.
- .7 GNWT Policy:
 - .1 Northern involvement.
 - .2 Local accommodation.
 - .3 Local labour.
- .8 Application for fuel supply credit purchases.
- .9 Record drawings.
- .10 Maintenance manual information.
- .11 Safety:
 - .1 Disposal of hazardous wastes.
- .12 Painting:
 - .1 Painting inspection.
 - .2 Limitations on painting during unsuitable weather conditions.

- .13 Liner Installation:
 - .1 Limitations on installation during unsuitable weather conditions.
- .14 Identification of testing agencies:
 - .1 Geotechnical consultant.
 - .2 Liner installer.
 - .3 Tank inspections.
 - .3 Radiographic inspections.
 - .4 Strapping.
 - .5 Concrete testing agency.
- .15 Determination of practical and reasonable time for retesting.
- .16 Shop Inspections:
 - .1 Horizontal tanks.
 - .2 Dispenser buildings.
 - .3 Operator shelter buildings.
- .17 Concrete mix design and trial concrete testing.
- .18 Substantial completion inspection.

2. PROGRESS MEETINGS

- .1 Progress meetings will be held on a regular monthly basis, or more frequently if requested by the Engineer.
- .2 Accommodation for progress meetings shall be provided by the Contractor at or near the site.
- .3 The Engineer will give to all parties advance notice of meeting dates, times and locations.
- .4 The Contractor shall have in attendance the Superintendent, the Project Manager and representatives of the subcontractors, as requested by the Engineer.
- .5 The Engineer will have the consultant and/or the resident inspector in attendance.

END OF SECTION 01200

1. GENERAL

- .1 Submissions are required in accordance with the provisions of this section, to ensure that the specified materials and products are furnished and installed in accordance with the design intent as expressed in the contract documents.
- .2 Individual submissions, as required, are in other Sections of the Specifications.
- .3 Until submissions are reviewed, work involving relevant product or material may not proceed.
- .4 Where the phrase "or approved equivalent alternative" occurs in the contract documents, do not assume that material, product or methods will be accepted as equal by the Engineer, unless the item has been specifically accepted for the Work in writing, by the Engineer, with approval by PPD.

2. IDENTIFICATION OF SUBMISSIONS

- .1 Identify each submission and resubmission by showing at least the following information:
 - .1 Name, address and telephone number of the submitter, and a name of an individual for contact.
 - .2 Drawing number and specification number to which the submission applies.
 - .3 Whether it is an original submittal or resubmission.
 - .4 Confirmation of prior review by the Contractor.
 - .5 Date of submission or resubmission.
 - .6 Authorized signature of the Submitter.

3. COORDINATION OF SUBMISSIONS

- .1 Prior to submission for the Engineer's review coordinate all material:
 - .1 Determine and verify field dimensions and conditions and conformance with the specifications, including material, catalogue numbers, type numbers and similar data.
 - .2 Coordinate requirements between trades.
 - .3 Coordinate with requirements under laws, regulations, etc.
 - .4 Secure required approvals of public agencies, inspection agencies and standards agencies and show proof of approvals acquisition.
 - .5 Indicate any deviations from the intent of design as expressed in the contract documents and request specific review of these deviations.

4. TIMING OF SUBMISSIONS

- .1 Make submissions far enough in advance to allow adequate time for coordination, Engineer's review, revisions and resubmissions, and for supply and delivery in time for the scheduled installation in the Work.

- .2 Allow at least ten calendar days for the Engineer's review after receipt of submissions.
- .3 Costs due to delays in submissions shall be borne solely by the Contractor.

END OF SECTION 01300

1. CONSTRUCTION SCHEDULE

- .1 Within fourteen (14) days after awarding of the contract, the Contractor shall submit for approval to the Engineer, a construction schedule in the form of a Gantt bar chart showing all the principal phases of the Work. No Progress Payment Claim shall be certified until an acceptable construction schedule has been received by the Engineer.
- .2 The construction schedule shall be updated monthly by the Contractor.
- .3 If, in the opinion of the Engineer, any construction schedule is inadequate as a control tool, or if it does not show the Work being fully completed by the contract completion date, the Engineer may reject it and the Contractor shall provide a construction schedule that is acceptable to the Engineer.
- .4 In scheduling the Work, the Contractor shall give due attention to the availability and delivery times for all materials and equipment and to the timing of available transportation facilities.
- .5 The date of arrival of bulk petroleum products by barge, or other transportation means (i.e., the date at which tankage and fill piping are to be ready to receive product) is a critical date and shall be of prime consideration in the scheduling of the Work. If the Contractor should fall behind in his schedule due to his fault and is not ready when the barge arrives for resupply during each year of the contract, he shall bear all costs and consequences of the delay. A delayed schedule may result in having to deliver fuel by air cargo at the Contractor's expense until the facilities are complete, tested and accepted by the Engineer.
- .6 It is emphasized that it is the sole responsibility of the Contractor to ascertain, from the approved carrier, the dates for delivery of cargo to the designated wharf, to arrange the details of shipping, to oversee the reception of materials at the site, and to carry out his work so as to meet the primary objective of the project - provision of facilities to receive shipments of bulk product in time for the yearly resupply. Rectification of any failure to meet this schedule, or any part of it, that may be imputed to the Contractor, shall be made at the Contractor's sole expense.

END OF SECTION 01310

PART 1 – GENERAL

1.1 Definitions

- .1 Activity: An element of Work performed during course of project. An activity normally has an expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Actual Finish Date (AF): The point in time that Work actually ended on an activity.
- .3 Actual Start Date (AS): The point in time that Work actually started on an activity.
- .4 Bar Chart (Gantt Chart): A graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars.
- .5 Baseline: Original approved plan (for Project, work package, or activity), plus or minus approved scope changes.
- .6 Completion Milestones: They are firstly Substantial Completion and secondly Final Certificate.
- .7 Constraint: Applicable restriction that will affect performance of Project. Any factor that affects when an activity can be scheduled.
- .8 Control: Process of comparing actual performance with planned performance, analyzing variances, evaluating possible alternatives, and taking appropriate corrective action as needed.
- .9 Critical Activity: Any activity on a critical path. Most commonly determined by using critical path method.
- .10 Critical Path: Series of activities that determines the duration of a Project. In a deterministic model, critical path is usually defined as those activities with float less than or equal to a specified value, often zero. It is the longest path through Project.
- .11 Critical Path Method (CPM): Network analysis technique used to predict Project duration by analyzing which sequence of activities (which path) has least amount of scheduling flexibility (least amount of float).
- .12 Data Date (DD): Date at which, or up to which Project's reporting system has provided actual status and accomplishments.
- .13 Duration (DU): Number of work periods (not including holidays or other non-working periods) required completing an activity or other Project element. Usually expressed as workdays or workweeks.
- .14 Early Finish Date (EF): In critical path method, earliest possible point in time on which uncompleted portions of an activity (or Project) can finish, based on network logic and any schedule constraints. Early finish dates can change as Project progresses and changes are made to Project Plan.

- .15 Early Start Date (ES): In critical path method, earliest possible point in time on which uncompleted portions of an activity (or Project) can start, based on network logic and any schedule constraints. Early start dates can change as Project progresses and changes are made to Project Plan.
- .16 Finish Date: A point in time associated with an activities completion. Usually qualified by one of the following: actual, planned, estimated, scheduled, early, late, baseline, target, or current.
- .17 Float: Amount of time that an activity may be delayed from its early start time without delaying Project finish time. Float is a mathematical calculation, and can change as Project progresses and changes are made to Project Plan. This resource is available to both PWS/PDD and Contractor.
- .18 Lag: A modification of a logical relationship that directs a delay in successor task.
- .19 Late Finish Date (LF): In critical path method, latest possible point in time that an activity may be completed without delaying a specified milestone (usually Project finish date).
- .20 Late Start Date (LS): In critical path method, latest possible point in time that an activity may begin without delaying a specified milestone (usually Project finish date).
- .21 Lead: A modification of a logical relationship that allows an acceleration of successor task.
- .22 Logic Diagram: See Project network diagram.
- .23 Master Plan: A summary-level schedule that identifies major activities and key milestones.
- .24 Milestone: A significant event in Project, usually completion of a major deliverable.
- .25 Monitoring: Capture, analysis, and reporting of Project performance, usually as compared to plan.
- .26 Near-Critical Activity: An activity that has low total float.
- .27 Non-Critical Activities: Activities which when delayed, do not affect specified Contract duration.
- .28 Project Control System: Fully computerized system utilizing commercially available software packages.
- .29 Project Network Diagram: Any schematic display of logical relationships of Project activities. Always drawn from left to right to reflect Project chronology.
- .30 Project Plan: A formal approved document used to guide both Project execution and Project control. Primary uses of Project Plan are to document planning assumptions, and decisions to facilitate communication among stakeholders, and document approved scope, cost and schedule baselines. A Project Plan may be summary or detailed.

- .31 Project Planning: Development and maintenance of Project Plan.
- .32 Project Planning, Monitoring and Control System: Overall system operated by Contractor to enable monitoring of Project Work in relation to established milestones.
- .33 Project Schedule: The planned dates for performing activities and the planned dates for meeting milestones. A dynamic, detailed record of tasks or activities that must be accomplished to satisfy project objectives. Monitoring and control process involves using project schedule in executing and controlling activities, and is used as a basis for decision making throughout project life cycle.
- .34 Qualified Days Duration: Working days based on a 5-day week, discounting statutory holidays.
- .35 Risk: An uncertain event or condition that, if it occurs, has a positive or negative effect on Project's objectives.
- .36 Scheduled Finish Date (SF): Point in time that Work was scheduled to finish on an activity. Scheduled finish date is normally within a range of dates delimited by early start date and late start date.
- .37 Scheduled Start Date (SS): Point in time that Work was scheduled to start on an activity. Scheduled start date is normally within range of dates delimited by early start date and late start date.
- .38 Start Date: Point in time associated with an activity's start, usually qualified by one of the following: actual, planned, estimated, scheduled, early, late, target, baseline, or current.
- .39 Work Breakdown Structure (WBS): A deliverable-oriented grouping of project elements that organizes and defines total Work scope of Project. Each descending level represents an increasingly detailed definition of Project Work.

1.2 System Description

- .1 Project Time Management: Describes processes required to ensure timely completion of Project. These processes ensure that various elements of Project are properly coordinated. It consists of planning, time estimating, scheduling, progress monitoring and control.
- .2 Planning: This is the most basic function of management, that of determining presentation of action and is essential.
 - 1. It involves focusing on an objective consideration of future, and integrating forward thinking with analysis, therefore in planning, implicit assumptions are made about future so that action can be taken today.
 - 2. Planning and scheduling facilitate accomplishment of objectives, and should be considered a continuous interactive process involving planning, review, scheduling, analysis, monitoring and reporting.

- .3 Ensure that planning process is iterative and results in generally top-down processing with more detail being developed as planning progresses, and decisions concerning options and alternatives are made. This implies progressively more reliability of scheduling data. Detail Project schedule is used for analysis and progress monitoring.
- .4 Ensure project schedule efficiencies through monitoring.
 - .1 When activities begin on time and are performed according to estimated durations without interruptions, original Critical Path will remain accurate. Changes and delays will however, create an essential need for continual monitoring of Project activities.
 - .2 Monitor progress of Project in detail to ensure integrity of Critical Path, by comparing actual completions of individual activities, with their scheduled completion and review process of activities, that have started but are not yet completed.
 - .3 Monitoring should be done sufficiently often so that causes of delays are immediately identified and removed if possible.
- .5 Project Monitoring and Reporting: As Project progresses, keep team aware of changes to schedule and possible consequences. In addition to Bar Charts and CPM networks, use narrative reports to provide advice on seriousness of difficulties and measures to overcome them.
 - .1 Narrative reporting begins with statement on general status of Project followed by a summarization of delays, potential problems, corrective measures and Project status criticality.

1.3 CPM Requirements

- .1 Ensure Master Plan and Detail Schedule are practical and remain within specified Contract duration.
- .2 Master Plan and Detail Schedule deemed impractical by Engineer are to be revised and submitted for approval.
- .3 Acceptance of Master Plan and Detail Schedule showing scheduled Contract duration shorter than specified Contract duration does not constitute change to Contract. Duration of Contract may only be changed through bilateral Agreement.
- .4 Consider Master Plan and Detail Schedule deemed practical by Engineer, showing Work completed in less than specified Contract duration to have float.
- .5 First Milestone on Master Plan and Detail Schedule will identify start Milestone with an "ES" constraint date equal to Award of Contract date.
- .6 Calculate dates for completion milestones from Plan and Schedule using specified time periods for Contract.
- .7 Substantial Completion with "LF" constraint to be equal to calculated date.

- .8 Calculations on updates to be such that if early finish of Interim Certificate falls later than specified Contract duration, then float calculation to reflect negative float.
- .9 Delays to non-critical activities, those with float may not be basis for time extension.
- .10 Do not use float suppression techniques such as software constraints, preferential sequencing, extended activity times or imposed dates other than required by Contract.
- .11 Allow and show Master Plan and Detail Schedule adverse weather conditions normally anticipated. Specified Contract duration has been predicated assuming normal amount of adverse weather conditions.
- .12 Provide necessary crews and manpower to meet schedule requirements for performing Work within specified Contract duration. Simultaneous use of multiple crews on multiple fronts on multiple critical paths may be required.
- .13 Arrange participation on and off site of Subcontractors and suppliers, as required by Engineer, for purpose of network planning, scheduling, updating and progress monitoring. Approvals by Engineer of original networks and revisions do not relieve Contractor from duties and responsibilities required by Contract.
- .14 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this Contract.

1.4 Submissions

- .1 Make submissions in accordance with Section 01300 – Submission Procedures.
- .2 Submit to Consultant Project Control System for planning, scheduling, monitoring and reporting of project progress.
- .3 Include costs for execution, preparation, and reproduction of schedule submissions in bid documents.
- .4 Submit letter ensuring that schedule has been prepared in coordination with major Subcontractors.
- .5 Refer to article “Progress Monitoring and Reporting” of this specification section for frequency of Project control system submissions.
- .6 Submit Project planning, monitoring, and control system data as part of initial schedule submission and monthly status reporting in the following form:
 - .1 Diskette or CD containing all schedule and cash flow information, clearly labeled with data date, specific update, and person responsible for update.
 - .2 Master Plan Bar Chart.
 - .3 Construction Detail schedule Bar Chart.

- .4 Listing of project activities including milestones and logical connectors, networks (sub-networks) from Project start to end. Sort activities by activity identification number, and accompany with descriptions. List early and late start and finish dates together with durations, codes and float.
- .5 Critically report listing activities and milestones with negative total float used as first sort for ready identification of critical paths through entire project. List early and late start and finish dates, together with durations, codes and float for critical activities.
- .6 Progress report in early start sequence, listing for each trade, activities due to start, to be underway, or finished within two months from monthly update date. List activity identification number description, and duration. Provide columns for entry of actual start and finish dates, duration remaining and remarks concerning action required.

1.5 Quality Assurance

- .1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including Commissioning.

1.6 Project Milestones

- .1 Recommended project milestones from targets for both Master Plan and Detail Schedule of the CPM construction network system are as outlined in Section 01014.

1.7 Master Plan

- .1 Structure and base CPM construction networks system on WBS coding in order to ensure consistency throughout Project.
- .2 Prepare comprehensive construction Master Plan (CPM logic diagram) and dependent Cash Flow Projection within ten (10) working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Plan will be used as a baseline.
 - .1 Revise baseline as conditions dictate and as required by Engineer.
- .3 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
- .4 Initial and subsequent Master Plans will include:
 - .1 CD containing schedule and cash flow information, clearly labeled with data date, specific update, and person responsible for update.
 - .2 Bar Chart identifying coding, activity durations, early\late and start\finish dates, total float, completion as percentile, current status and budget amounts.
 - .3 Network diagram showing coding, activity sequencing (logic), total float, early\late dates, current status and durations.

- .4 Actual\Projected Monthly Cash Flow: Expressed annually and monthly, and shown in both graphical and numerical form.

1.8 Detail Schedule

- .1 Provide detailed project schedule (CPM) logic diagram) within ten (10) working days of Award of Contract date showing activity sequencing, interdependencies, and duration estimates. Include listed activities as follows:
 - .1 Shop drawings.
 - .2 Samples.
 - .3 Approvals.
 - .4 Procurement.
 - .5 Construction.
 - .6 Installation.
 - .7 Site Works.
 - .8 Testing.
 - .9 Commissioning and acceptance.
- .2 Detail CPM schedule to cover in detail minimum entire contract period beginning from Award of Contract date.
 - .1 Detail Activities completely and comprehensively throughout duration of project.
- .3 Relate Detail Schedule activities to basic activities and milestones developed and approved in Master Plan.
- .4 Clearly show sequence and interdependence of construction activities and indicate:
 - .1 Start and completion of all items of Work, their major components, and interim milestone completion dates.
 - .2 Activities for procurement, delivery, installation and completion of each major piece of equipment, materials and other supplies, including:
 - .1 Time for submissions, re-submissions and review.
 - .2 Time for fabrication and delivery of manufactured products for Work.
 - .3 Interdependence of procurement and construction activities.
 - .3 Include sufficient detail to assure adequate planning and execution of Work. Activities should generally range in duration from three (3) to fifteen (15) works days each.

- .5 Provide level of detail for project activities such that sequence and interdependency of Contact tasks are demonstrated, and allow coordination and control of project activities. Show continuous flow from left to right.
- .6 Ensure that activities with no float are calculated and clearly indicated on logical CPM construction network system as being, whenever possible, continuous series of activities throughout the length of the project to form "Critical Path". Increased numbers of critical activities are seen as an indication of increased risk.
- .7 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Engineer for review any effect created by insertion of new Change Order.

1.9 Review of the Construction Detail Schedule

- .1 Allow five (5) work days for review by Engineer of proposed construction Detail Schedule.
- .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Engineer for review within five (5) work days.
- .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Engineer.
- .4 Submission of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.10 Compliance with Detail Schedule

- .1 Comply with reviewed Detail Schedule.
- .2 Proceed with significant changes and deviations from scheduled sequence of activities which cause delay, only after written receipt of approval by Engineer.
- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
 - .1 Corrective measures may include:
 - .1 An increase of personnel on site for effected activities or work package.
 - .2 An increase in materials and equipment.
 - .3 Overtime work and additional work shifts.
 - .4 Submit to Engineer, justification, project schedule data, and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. Include as part of supporting evidence:
 - .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.

- .2 Prepared schedule indicating how change will be incorporated into the overall logic diagram. Demonstrate perceived impact based on date of occurrence of change, and include status of construction at that time.
- .3 Other supporting evidence requested by Engineer.
- .4 Do not assume approval of Contract extension prior to receipt of written approval from Engineer.
- .5 In event of Contract extension, clearly display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.
- .1 Engineer will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.
- .2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

1.11 Progress Monitoring and Reporting

- .1 On an ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of Subcontractors and suppliers, as and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Engineer at least once monthly to establish progress on each current activity shown on applicable networks.
- .2 Update and reissue project Work Breakdown Schedule and relevant coding structures as project develops and changes.
- .3 Perform Detail Schedule update monthly with status dated (Data Date) on last working day of the month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Submit to Engineer one (1) copy of updated Detail Schedule.
- .6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay.

Include in report:

- .1 Description of progress made.

- .2 Pending Items and Status of: Permits, Shop drawings, Change orders, Possible time extensions.
- .3 Status of Contract completion date and milestones.
- .4 Current and anticipated problem areas, potential delays, and corrective measures.
- .5 Review of progress and status of Critical Path activities.

END OF SECTION 01322

1. REQUIREMENTS FOR SHOP DRAWINGS AND PRODUCT DATA

- .1 The Contractor shall arrange for the preparation of clearly identified shop drawings and submit shop drawings in one of the following forms:
 - .1 One copy of a reproducible transparency plus two prints, or
 - .2 Two prints to be retained by the Engineer plus the number of copies required by the Contractor.

The Contractor shall provide clearly identified product data and submit two prints to be retained by the Engineer plus the number of copies required by the Contractor.

Product data shall include, but not be limited to:

- product assembly drawings;
 - materials list;
 - principal dimensions;
 - parts and components details;
 - recommended spare parts list;
 - letters of compliance with recognized standards where required;
 - operation and maintenance data;
 - operation curves;
 - operation manuals where specified;
 - product name and model number.
- .2 Shop drawings shall be accurately drawn to a scale sufficiently large to show all pertinent features of the item, and its method of connection to the Work and shall have sufficient space for the Contractor's stamp and the Engineer's stamp.
 - .3 Shop drawings shall be in accordance with the International System of Units (S.I.) metric units.
 - .4 Prior to submission to the Engineer, the Contractor shall review all shop drawings. By this review, the Contractor represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and similar data or will do so, and that he has checked and coordinated each shop drawing with the requirements of the Work and of the contract documents. The Contractor's review of each shop drawing shall be indicated by stamp, with the date and signature.
 - .5 The Contractor shall submit shop drawings to the Engineer for review, with reasonable promptness and in orderly sequence, so as to cause no delay in the Work or in the work of other Contractors. If either the Contractor or the Engineer so requests, they shall jointly prepare a schedule fixing the dates for submission and return of shop drawings. At the time of submission, the Contractor shall notify the Engineer in writing of any deviations in the shop drawings from the requirements of the contract documents.

- .6 The Engineer will review and return shop drawings in accordance with a schedule agreed upon, or otherwise with reasonable promptness. The Engineer's review shall be for conformity to the design concept and for general arrangement only, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings, or of responsibility for meeting all requirements of the contract documents. A specific deviation on the shop drawings requested by the Contractor must be approved in writing by the Engineer.
- .7 The Contractor shall make any changes in shop drawings which the Engineer may require, consistent with the contract documents, and resubmit unless otherwise directed by the Engineer. When resubmitting, the Contractor shall notify the Engineer in writing of any revisions made by the Contractor, other than those requested by the Engineer, in his previous review.
- .8 Each reviewed shop drawing will be stamped by the Engineer with the following form of stamp:

REVIEWED	()
REVIEWED AS MODIFIED	()
REVISE AND RESUBMIT	()
NOT REVIEWED	()

This review by the Engineer is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Engineer approves the design of details inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes, or to techniques of construction and installation, and for coordination of the Work of all subtrades.

By:

Date:

2. DESIGN BY THE CONTRACTOR

- .1 When the Contractor is responsible for engineering design of portions of the Work, this shall be clearly and specifically indicated in the Drawings or in the Specifications of the Contract Documents.
- .2 Where the Contractor is required, either by law or regulation, or by the Contract to provide engineering design, he shall use the services of a Professional Engineer registered in the Northwest Territories, and he shall submit shop drawings bearing the seal and signature of that registered Professional Engineer.

END OF SECTION 01340

1 GENERAL

.1 References

.1 Northwest Territories

.1 *Safety Act, R.S.N.W.T. (latest edition)*

.2 *Canadian Council of Ministers of the Environment (CCME).
CCME EPC LST PN 1326 – October 2003, Environmental Code of
Practice for Aboveground and Underground Storage Tank Systems
Containing Petroleum and Allied Petroleum Products.*

.3 Canadian Federal Legislation (latest editions)

.1 *Canadian Environmental Protection Act (CEPA)*

.2 *Canadian Environmental Assessment Act (CEAA)*

.3 *Transportation of Dangerous Goods Act (TDGA)*

.4 *Motor Vehicle Safety Act (MVSA)*

.4 Canadian Standards Association (CSA) (latest edition)

.1 *CSA S350-M, Code of Practice for Safety in Demolition of
Structures.*

.5 Underwriters Laboratories of Canada (ULC) latest editions

.1 *ULC ORD-C107.19, Secondary Containment of Underground
Piping for Flammable and Combustible Liquids.*

.2 *ULC ORD-C58.15, Overfill Protection Devices for Underground
Flammable Liquid Storage Tanks.*

.3 *ULC ORD-C58.19, Spill Containment Devices for Underground
Flammable Liquid Storage Tanks.*

2 SUBMISSIONS

.1 Contractor's site-specific Health and Safety Plan:

Within (14) fourteen days after date of the Notice to Proceed and prior to mobilization to site, submit a site-specific Health and Safety Plan. The Contractor's site-specific Health and Safety Plan must address items as follows:

.1 Safety and health risk or hazard analysis for each site task and operation found in the work plan.

- .2 Personnel training requirements including as follows:
 - .1 Names of personnel and alternates responsible for site safety and health, hazards present on site and use of personal protective equipment.
 - .2 Work practices by which personnel can minimize risks from hazards, safe use of engineering controls and equipment on site, medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards, and elements of site-specific Health and Safety Plan.
- .3 Personal protective equipment (PPE) program addressing:
 - .1 Donning and doffing procedures.
 - .2 PPE selection based upon site hazards.
 - .3 PPE use and limitations of equipment.
 - .4 Work mission duration, PPE maintenance and storage.
 - .5 PPE decontamination and disposal.
 - .6 PPE inspection procedures prior to, during, and after use.
 - .7 Evaluation of effectiveness of PPE program and limitations during temperature extremes, and other appropriate medical considerations.
- .4 Medical surveillance requirements for personnel assigned to work at site:
 - .1 Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment.
 - .2 Site control measures to be employed at site including site map, site work zones, use of 'buddy system', site communications including site security, alerting means for emergencies, standard operating procedures, safe work practices and identification of nearest medical assistance.
 - .3 Decontamination procedures for both personnel and equipment.
- .5 Emergency response requirements addressing:
 - .1 Pre-emergency planning, personnel roles, lines of authority

and communication.

- .2 Emergency recognition and prevention, safe distances and places of refuge, site security and control, evacuation routes and procedures.
 - .3 Decontamination procedures not covered under decontamination section.
 - .4 Emergency medical treatment and first aid.
 - .5 Emergency alerting and response procedures.
 - .6 Critique of response and follow-up, personal protective equipment (PPE) and emergency equipment selection and use.
 - .7 Site topography, layout, prevailing weather conditions, and;
 - .8 Procedures for reporting incidents to local, territorial, or federal agencies.
- .6 Written respiratory protection plan for project activities.
- .7 Procedures dealing with heat and/or cold stress.

The Engineer will review the Contractor's site-specific Health and Safety Plan and provide comments to the Contractor within (14) fourteen days after receipt of the plan. Revise plan as appropriate and resubmit the plan to the Engineer within (7) seven days after receipt of comments from Engineer.

- .2 Respirator Fit Testing:
- .1 Within (14) fourteen days after date of Notice to Proceed and prior to mobilization to site, submit proof of respirator fit testing for site personnel.
- .3 On-site Contingency and Emergency Response Plan:
- .1 Address standard operating procedures to be implemented during emergency situations.
- .4 Off-site Contingency and Emergency Response Plan:
- .1 Prior to commencing Work involving handling of hazardous materials, develop an off-site Contingency and Emergency Response Plan.
 - .2 The Plan must provide immediate response to serious site occurrence such as explosion, fire, or migration of significant quantities of toxic or hazardous material from site.

3 REGULATORY REQUIREMENTS

- .1 Comply with specified standards and regulations to ensure safe operations at site containing hazardous or toxic materials.

4 SITE CONDITIONS

- .1 Work at site will involve Works, as detailed in *Section 01011, Particular Scope of Work*.

5 GENERAL REQUIREMENTS

- .1 Develop a written site-specific Health and Safety Plan prior to commencing any site work and continue to implement, maintain, and enforce plan until final demobilization from site. The Health and Safety Plan must address the Project Specifications.
- .2 Ensure Health and Safety guidelines provide for safe and minimal risk working environment for site personnel and minimize impact of activities involving contact with any hazardous materials or hazardous wastes on the general public and the surrounding environment.
- .3 Relief from, or substitution for, any portion or provision of the minimum Health and Safety guidelines, specified herein or related to the site-specific Health and Safety Plan, must be submitted to the Engineer in writing. The Engineer will respond in writing, either approving or requesting changes.

6 RESPONSIBILITY

- .1 Be responsible for the safety of persons and property on site, and for the protection of persons off site and the environment to the extent that they may be affected by the conduct of the Work.
- .2 Comply with and enforce compliance by employees with the safety requirements of the Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with the site-specific Health and Safety Plan.

7 HAZARD COMMUNICATION REQUIREMENTS

- .1 Comply with Work Site Hazardous Materials Information Regulations, R.R.N.W.T.
- .2 Provide the Engineer with Material Safety Data Sheets (MSDS) and documentation on any "hazardous" chemical that the Contractor or Contractor's Representatives plan to bring onto site.

8 WORK STOPPAGE

- .1 Safety First policy; give precedence to safety and health of public and site personnel, and protection of the plant and environment, over cost and schedule considerations for the Work.

- .2 Assign responsibility and obligation to the Health and Safety Officer where required, to stop or start Work when, at the Health and Safety Officer's discretion, it is necessary or advisable for reasons of health or safety. The Engineer may also stop Work for health or safety reasons.

9 UNFORESEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of Work, stop work and immediately advise the Engineer verbally and in writing.

10 PERSONAL HEALTH, SAFETY AND HYGIENE

- .1 Training:
 - .1 Ensure personnel entering the jobsite are trained in accordance with specified personnel training requirements.
- .2 Levels of Protection:
 - .1 Establish levels of protection for each Work area based on the planned activity and location of the activity, as per WCB regulations.
- .3 Equipment Usage Procedures:
 - .1 Develop protective equipment usage procedures and ensure procedures are strictly followed by site personnel; include the following procedures as minimum:
 - .1 Ensure prescription eyeglasses worn are safety glass and do not permit contact lenses on site within work zones.
 - .2 Ensure footwear is steel-toed safety shoes or boots and is covered by rubber overshoes when entering or working in potentially contaminated work areas.
 - .3 Dispose of, or decontaminate personal protective equipment (PPE) worn on site at end of each workday.
 - .4 Decontaminate reusable PPE before reissuing.
 - .5 Ensure site personnel have passed respirator fit test prior to entering potentially contaminated work areas.
 - .6 Ensure facial hair does not interfere with proper respirator fit.
- .4 Respiratory Protection
 - .1 Provide site personnel with extensive training in usage and limitations of, and qualitative fit testing for, air purifying and

supplied-air respirators in accordance with specified regulations.

- .2 Develop, implement, and maintain respirator program.
- .3 Monitor, evaluate and provide respiratory protection for site personnel.
- .4 Ensure levels of protection, as listed, have been chosen to be consistent with site-specific potential airborne hazards associated with major contaminants identified on site.
- .5 Immediately notify Engineer when level of respiratory protection required increases.
- .6 Ensure appropriate respiratory protection during work activities.
- .7 Assess ability for site personnel to wear respiratory protection.
- .5 Heat Stress/Cold Stress
 - .1 Implement heat stress and/or cold stress monitoring program as applicable and include in site-specific the Health and Safety Plan.
- .6 Personnel Hygiene and Personnel Decontamination Procedures
 - .1 Provide minimum as follows:
 - .1 Suitable containers for storage and disposal of used disposable Personal protective equipment (PPE).
 - .2 Potable water and suitable sanitation facility.
- .7 Emergency Equipment and First-Aid Technician
 - .1 As a minimum, provide (1) one certified first-aid technician on site at all times when work activities are in progress. A copy of the first-aid technician's current certification shall be submitted to the Engineer.
 - .2 Locate and maintain emergency and first-aid equipment in appropriate location on site, including first-aid kit to accommodate number of site personnel; portable emergency eye wash and two 9 kg ABC type dry chemical fire extinguishers.
- .8 Site Communications
 - .1 Post emergency numbers near site telephones.
 - .2 Ensure personnel use of "buddy" system and develop hand signal system appropriate for site activities.

- .3 Provide an employee alarm system to notify employees of site emergency situations or to stop Work activities if necessary.
- .9 Safety Meetings:
 - .1 Schedule and administer a Health and Safety meeting with the Engineer prior to commencement of Work. A sign-up sheet of attendees shall be included in the minutes of the meeting.
 - .2 Conduct and record mandatory daily safety meetings for personnel, and additionally, as required by special or work-related conditions. A sign-up sheet of attendees shall be included in the minutes of the meetings:
 - include refresher training for existing equipment and protocols,
 - review ongoing safety issues and protocols and;
 - examine new site conditions as encountered.
 - .3 Hold additional safety meetings on an as-needed basis.

11 AIR MONITORING

- .1 Air Monitoring Program:
 - .1 Develop and implement an air monitoring program, as required, which meets WCB regulations.
- .2 Air Monitoring Reporting:
 - .1 Report air monitoring results daily to Engineer as appropriate.

12 CONTINGENCY AND EMERGENCY RESPONSE

- .1 Meet specified requirements.
- .2 Arrange and attend coordination meeting to be held with appropriate authorities, including the Community, Fire, Nursing Station and Community Emergency Coordinator
 - .1 The meeting will identify off-site Emergency Response Coordinator through whom all information and coordination will occur in event of an incident.

13 SITE CONTROL

- .1 Meet specified requirements.
- .2 Prior to commencing work involving handling of drums and other containers, submit procedures for safe handling of drums and other containers.

- .3 Implement and enforce drum handling program during activities involving drummed waste characterization including, but not limited to, handling, opening, sampling, staging, and consolidating.
- .4 Confined Space Entry Program:
 - .1 Entry into a storage tank or any confined space shall be only made in strict accordance with the *American Petroleum Institute (API) Publication 2015, Cleaning Petroleum Storage Tanks*.

Specification Note: Specifier to provide copy of API Publication 2015 in an Appendix.

- .2 Confined space entry shall meet all the requirements of:
 - .1 *API Publication 2015, Cleaning Petroleum Storage Tanks.*
 - .2 *Safety Act, General Safety Regulations, R.R.N.W.T.*
 - .3 *WCB Safety Regulations I/9 36 (1).*

END OF SECTION 01351

PART 1 – GENERAL

1.1 General Description

This section refers to the deconstruction of all tanks, earthwork, buildings and above and below ground electrical and mechanical facilities related to the existing fuel facility. Any salvageable materials or equipment are to be dismantled and packaged for shipment as directed by the Engineer.

1.2 Related Sections

- .1 Section 011010 - Summary of Work

1.3 References

- .1 Federal Legislation
 - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999).
 - .2 Canadian Environmental Assessment Act (CEAA) 1995, SOR/99-330 and SOR/99-438.
 - .3 Transportation of Dangerous Goods Act (TDGA) 1992, (T-19.01).
 - .4 Motor Vehicles Safety Act (MVSA) 1995.
 - .5 Fisheries Act (R.S. 1985, c. F-14).

1.4 Definitions

- .1 Deconstruction: The systematic dismantling of a structure to salvage materials for reuse. What cannot be reused is considered subsequently for recycling. The ultimate objective is to recover potentially valuable resources while diverting from landfill what has traditionally been a significant portion of the waste stream.
- .2 Reuse: The use of a building material in its original form and function.
- .3 Recycling: The use of a building material that has been processed in some way for use in a form and function that is different from its original form and function.
- .4 Disassembly: The physical detachment of materials from a structure. Includes prying, pulling, cutting, unscrewing etc.
- .5 Processing: Tasks that are subsequent to disassembly. Includes moving materials, de-nailing, cleaning, separating, stacking, etc.
- .6 Waste Audit: A detailed inventory of the materials in a building. Involves quantifying (by volume or weight) amounts of materials and wastes generated during deconstruction. Indicates quantities of reuse, recycling and landfill.
- .7 Waste Reduction Work Plan: A written report that outlines all actions to be taken to reduce, reuse and recycle materials during the course of deconstruction. Actions based on the findings of the waste audit.

- .8 Alternative Disposal: The reuse and recycling of materials by a designated facility, user or receiving organization which has a valid Certificate of Approval to operate. The alternative to landfill disposal.
- .9 Waste Management Coordinator: Contractor's representative responsible for supervising all waste management activities as well as coordinating all related, required submission and reporting requirements.
- .10 Hazardous Materials: Dangerous substances, dangerous goods, hazardous commodities and hazardous products, such as poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or any other material that can endanger human health or well being or the environment if handled improperly.
- .11 Used Building Material Receipt: Receipt issued at end destination for materials designated for alternative disposal.
- .12 Hauler: A company (possessing appropriate and valid Certificate of Approval) contracted to transport waste and/or reusable/recyclable materials off site to designated facility, user or receiving organization.
- .13 Weigh bill: Receipt received from a recycling facility indicating weight and content of each load/bin of material.

1.5 Submissions

- .1 Waste Management Coordinator is responsible for fulfilling of all reporting requirements.
- .2 Prior to the start of Work on the site submit detailed waste audit indicating descriptions of and anticipated quantities of material to be reused, recycled and landfilled.
- .3 Based on the findings of waste audit, submit waste reduction work plan indicating schedule of selective demolition, material descriptions and quantities to be salvaged, and names and addresses of haulers and receiving facilities.

1.6 Deconstruction Drawings

- .1 The Contractor is to submit to the Engineer for approval, drawings, diagrams and details showing sequence of deconstruction work, materials designated for salvage and support of structures and underpinning.
- .2 Submit drawings stamped and signed by qualified Professional Engineer registered with NAPEGG.

1.7 Quality Assurance

- .1 Qualifications: Provide adequate workforce training through meetings and demonstrations. Have someone on site with deconstruction experience throughout project for consultation and supervision purposes.
- .2 Regulatory Requirements: Ensure Work is performed in compliance with CEPA and

applicable NWT regulations.

- .3 Meetings: Hold project meetings every week. Ensure all site personnel attend. Waste Management Coordinator will provide a written report on status of waste diversion and deconstruction activity at each meeting. Consultant will provide verbal notification of any change to regular meeting schedule established upon contract award to Contractor twenty four (24) hours prior to scheduled meeting.

1.8 Site Conditions

- .1 Existing Conditions
 - .1 Base structures to be deconstructed on their condition on date of contract award. Be responsible for provision of all services required for deconstruction.
- .2 Storage:
 - .1 Store materials salvaged for reuse and recycling in locations as outlined in waste reduction work plan as directed by Engineer.
 - .2 Maximum permitted duration of material storage on site determined in consultation with Engineer after project completion.

1.9 Environmental Protection

- .1 Ensure deconstruction work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air noise pollution.
- .2 Fires and burning of waste or materials is not permitted on site.
- .3 Do not bury waste or materials on site unless approved in writing by the Engineer.
- .4 Do not dispose of waste or volatile materials into watercourses, storm or sanitary sewers. Ensure proper disposal procedures in accordance with all applicable territorial regulations.
- .5 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties in accordance with authorities having jurisdiction.
- .6 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction and as directed by the Engineer.
- .7 Protect trees, plants, and foliage on site and adjacent properties where indicated.
- .8 Prevent extraneous materials from decontaminating air beyond deconstruction area, by providing temporary enclosures during Work.
- .9 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on temporary roads.

- .10 Employ reasonable means necessary to protect salvaged materials from vandalism, theft, adverse weather, or inadvertent damage by heavy machinery.

PART 2 – EXECUTION

2.1 Site Verification of Conditions

- .1 Employ necessary means to assess site conditions to determine quantity and locations of hazardous materials.
- .2 Investigate site to determine dismantling, processing and storage logistics required prior to commencement of Work.
- .3 Develop strategy for deconstruction to facilitate optimum salvage of reusable and recyclable materials.

2.2 Preparation

- .1 Obtain necessary permits and approval from the Fire marshal. Provide copies to Engineer within twenty four (24) hours of written request.

2.3 Removal from Site

- .1 Transport material designated for alternative disposal using approved haulers listed in waste reduction work plan, and in accordance with all applicable regulations. Written authorization from Engineer is required to deviate from haulers listed in waste reduction work plan.
- .2 Dispose of materials not designated for alternate disposal in accordance with all applicable regulations. Disposal facilities must be those approved of and listed in waste reduction work plan. Written authorization from the Engineer is required to deviate from disposal facilities listed in waste reduction work plan.

END OF SECTION 01356

1. RECORDS DURING CONSTRUCTION

- .1 The Contractor shall keep two (2) complete sets of all construction drawings on the site of the Work.
- .2 One set of record drawings shall not be used other than to record changes due to field conditions and must be kept available for the Engineer to review at site at all times. These drawings shall be clearly marked up by the Contractor in **RED** to record all changes incorporated into the project during construction. The Drawings shall be clearly identified as '**record drawings**'. Failure to provide marked-up record drawings can result in hold back of monies under the *Section 01150 for Demobilization*.
- .3 All final positions of tankage and pipe work shall be correctly plotted to scale and all revised dimensions noted. Neat, dimensioned sketches of all site coordinated systems and equipment, such as electrical layout, shall be prepared on separate sketches and appended to the record drawings.
- .4 The Contractor shall keep these record drawings in good condition and not allow the use of this set for administration purposes by site personnel.

END OF SECTION 01390

1. GENERAL

- .1 The Contractor is wholly responsible for the quality of materials and products, that are provided and for the Work.
- .2 The Contractor is responsible for quality control and shall perform such inspections and tests as are necessary to ensure that the Work conforms to the requirements of the Contract Documents.
- .3 During the progress of the Work, a sufficient number of tests shall be performed by the Contractor to determine that material, product and installation meet the specified requirements.
- .4 Minimum requirements regarding quality control are specified in various sections of the Specifications, however, the Contractor shall perform as many inspections and tests as are necessary to ensure that the Work conforms to the requirements of the Contract Documents.
- .5 Testing shall be in accordance with pertinent Codes and regulations, and with selected standards of the American Society for Testing Materials (ASTM) and Canadian Standards Association (CSA).
- .6 Product testing, mill tests and laboratory reports to demonstrate that product and material supplied by the Contractor meet the requirements of the Specifications as are specified under various sections of the Contract Documents.

2. QUALITY CONTROL TESTING BY THE CONTRACTOR

- .1 The Contractor shall retain the services of an independent testing agency under supervision of a registered Professional Engineer, and pay the cost of testing services for quality control including, but not limited to, the following:
 - .1 Sieve analysis of sands and aggregates to be supplied to the Work.
 - .2 Standard Proctor Density curves for backfill materials.
 - .3 Standard Proctor Density curves for approved borrow materials.
 - .4 Compaction control tests for backfill and embankment material.
 - .5 Any product testing that is required and is specified under various sections of the Specifications.
- .2 The Contractor shall promptly process and distribute all required copies of test reports, test information and related instructions to all of his subcontractors and suppliers, to ensure that all necessary retesting and replacement of construction can proceed without delay.
- .3 The Contractor shall promptly provide the Engineer with originals plus copies of all test results.

3. QUALITY ASSURANCE TESTING BY THE OWNER

- .1 The Owner may retain and pay for the services of an independent testing agency for testing for quality assurance, for the Owner's purposes.
- .2 The Owner's testing agency and the Engineer may inspect and test materials, products and the Work for conformance with the requirements of the Contract Documents, however, they do not undertake to check the quality of the Work on behalf of the Contractor nor to provide quality control.
- .3 Inspections and tests by the Owner's testing agency and by the Engineer do not relieve the Contractor of his responsibility to supply materials and products and perform the Work in accordance with the requirements of the Contract Documents.
- .4 The Engineer, at their discretion, may order or perform any additional inspections and tests for purposes of his own, or for purposes of the Owner.
- .5 The Contractor shall coordinate with the Engineer, the scheduling of testing and inspection by the Owner's testing agencies, or by the Engineer, to enable testing to be done as necessary, without delay, and the Contractor shall notify the Engineer sufficiently in advance of operations to allow for such inspection and tests by the Engineer's or the Owner's testing agency.

4. CODE COMPLIANCE TESTING

- .1 Inspections and tests required by Codes or ordinances, or by an Authority Having Jurisdiction (AHJ), shall be the responsibility of and shall be paid for by the Contractor.

5. RETESTING

- .1 When tests on products, materials or completed work carried out by the Contractor or the Contractor's testing agency yield results not meeting the requirements of the Contract Documents, the Contractor, in addition to carrying out remedial work or replacement of the product or materials, shall provide for retesting of the remedied work and the replacement product and materials. Retesting shall be at the Contractor's expense.
- .2 In every case where the Contractor has submitted test results which fail to meet the requirements of the Contract Documents, the Contractor shall submit within a practical and reasonable time, as discussed in the preconstruction meeting, results of a retest showing that the results are in accordance with the requirements of the Contract Documents.
- .3 Radiographic retesting of welds to be in accordance with *Section 15010*.

6. SHOP INSPECTION

- .1 The Contractor shall notify the Engineer at least two weeks prior to commencement of fabrication of tankage and dispenser buildings in order that he may arrange for shop inspection of such if required.

- .2 The Contractor shall provide access for the Engineer during all stages of fabrication.
- .3 Mill test certificates shall be provided in duplicate (prior to shipping any material) for all steel to be used in fabrication. A copy of the welder's qualifications shall be provided to the Engineer prior to commencement of any welding. Qualified welding procedures shall also be provided.
- .4 All tradesmen, welders, etc., who will be working on the site, shall be qualified and registered with the proper authorities of the Northwest Territories and certification shall be provided to the Engineer prior to commencing work.

7. INSPECTION AND TESTING

- .1 As the Work progresses, the Contractor shall arrange to have same inspected, tested and accepted periodically by the Engineer in conformity with the Contract Documents. The Contractor shall advise the Engineer sufficiently in advance to allow him to get to the site and carry out these inspections.
- .2 When the Work is completed and the Contractor has complied with the Contract and all orders and directions made pursuant thereto, he may request the issuance of a Substantial Completion Certificate or Final Certificate of Completion from the Engineer. All requests for the issuance of said certificates shall be made in writing to the Engineer at least fourteen (14) days prior to carrying out any tests that warrant the issuance of said certificates. The Contractor is advised that a maximum of one Substantial Completion and one Final Inspection will be allowed. If the Work is not satisfactorily completed, any additional Substantial Completion or Final Inspections shall be at the Contractor's expense, unless specifically requested by the Engineer.
- .3 Cost of all testing, unless specified otherwise, shall be borne solely by the Contractor.
- .4 All tests for materials and equipment described in these specifications, or elsewhere in the Contract Documents, shall be the Contractor's responsibility. For tests to be valid they shall be made and documented in the presence of the Engineer unless otherwise instructed.
- .5 Testing performed by or on the behalf of the Government of the Northwest Territories shall in no way relieve the Contractor of his responsibility for ensuring that all materials, equipment and workmanship meet the specified standards.

END OF SECTION 01400

1. TEMPORARY UTILITIES

1.1 Water

- .1 Provide and pay all costs for all water required for the performance of the Work, in accordance with governing regulations and ordinances.
- .2 Furnish and install all necessary temporary piping and upon completion of the Work remove all such temporary piping.
- .3 Use of and disposal of water used for hydrotesting etc., is the responsibility of the Contractor.
- .4 The Contractor is responsible for obtaining all required water use licenses from the Northwest Territories Water Board. Up to six months may be required to obtain a water license.

1.2 Electricity And Lighting

- .1 Provide and pay all costs for electricity and artificial lighting required for the performance of the Work, in accordance with governing regulations and ordinances.
- .2 Furnish and install all necessary temporary wiring, distribution boxes, panels, etc., and upon completion of the Work, remove all such temporary materials.

1.3 Telephone

- .1 Provide, maintain and pay all costs for a telephone for the Contractor's use.

1.4 Heating And Ventilating

- .1 Provide and pay all costs for heating and ventilating, coverings and enclosures as necessary to protect and perform the Work.
- .2 Furnish and install all necessary temporary equipment, piping, wiring, ducting, and other materials to perform the Work and upon completion of the Work, remove all such temporary equipment.
- .3 Temporary heating and ventilating shall be in accordance with all governing regulations and ordinances.
- .4 Temporary heating and ventilating shall be provided to:
 - .1 facilitate progress of the Work;
 - .2 protect the Work and products against dampness and cold;
 - .3 prevent moisture condensation on surfaces;
 - .4 provide an atmosphere for curing materials, as required;
 - .5 provide adequate ventilation to meet safety regulations;

- .6 prevent hazardous accumulation of dust, fumes, mists, vapours or gases in areas occupied during construction;
- .7 ventilate storage spaces containing hazardous or volatile materials.

1.5 Sanitary Facilities

- .1 Furnish and install all required temporary toilet buildings with sanitary toilets for use of all workmen; comply with all minimum requirements of the Department of Health and Social Services, or other public agency having jurisdiction; maintain in a sanitary condition at all times.

1.6 Fire Protection

- .1 Provide and pay all costs for adequate fire protection of the Work and adjacent property.
- .2 Furnish and install temporary fire extinguishers, hydrants and other equipment, and upon completion of the Work, remove all such temporary equipment.

1.7 Fuel Supply

- .1 Applications must be made for credit purchases prior to mobilization. Failure to obtain credit will result in the Contractor having to pay cash for all fuel purchases in the community.
- .2 The application shall be made to Petroleum Products Division, Public Works and Services, Box 710, Fort Simpson, Northwest Territories, X0E 0N0.

2. CONSTRUCTION AIDS

2.1 Temporary Plant

- .1 Provide, arrange for, maintain and pay for all temporary items such as, but not limited to, stairs, ladders, scaffolding, ramps, transportation of labour and materials, runways, chutes, hoists, elevators, tools, templates, as required for the completion of the Work.
- .2 The location of such items shall be such as to prevent interference with, marking of, or damage to any portion of the Work.
- .3 All such items shall conform to all applicable National and local ordinances regulating safety, and to the *National Building Code of Canada (NBC)*.

2.2 Temporary Enclosures

- .1 Furnish, install, and maintain for the duration of construction, all required scaffolds, tarpaulins, barricades, temporary dikes, fences, canopies, warning signs, steps, bridges, platforms, and other temporary construction necessary for proper completion of the work in compliance with all pertinent safety and other regulations.

2.3 Falsework And Temporary Construction Supports

- .1 The Contractor shall be responsible for methods used for the falsework and temporary construction supports.
- .2 Employ a qualified, Professional Engineer, registered in the Northwest Territories, for the design of temporary works, and design in accordance with CSA S269.1, (*Latest Edition*) *False work for Construction Purposes*.
- .3 Record design calculations and drawings to show that temporary works are adequate. Provide design loads, material details and dimensions. Sign and seal design calculations and drawings, and revisions thereto.
- .4 The Engineer's approval to proceed with falsework and temporary construction supports shall not relieve the Contractor of his responsibility.

2.4 Winter Construction

- .1 Special construction methods required to perform the Work in severe weather shall be the responsibility of the Contractor.
- .2 Where the Specifications call for Work to be performed within a given temperature range or above a minimum temperature, it shall be the Contractor's responsibility to provide all temporary enclosures and heat necessary to provide the conditions specified.
- .3 Where compaction of backfill is specified, the Contractor shall perform the Work in a manner such that the specified compaction can be achieved.
- .4 Where weather conditions are such that compaction of backfill consisting of excavated materials is not possible, the Contractor shall provide unfrozen granular material for backfill, at the Contractor's expense.

3. EXISTING UTILITIES AND STRUCTURES

- .1 Existing utilities and structures include pipes, culverts, ditches or other items which are a part of an existing sewage, drainage or water system, or which are a part of an electrical, telephone, television, telecommunications or other utility system. Also included are swales, poles, fences or any other structures encountered during construction.
- .2 The Contractor shall be responsible for location, protection, removal or replacement of existing utilities and structures, or for repair of any damage which may occur during construction.
- .3 Existing utilities and structures may be shown on the Drawings or described in the specifications. Such information is shown for design purposes and the existence, location and detail given is information that is obtained during the design period and is not necessarily complete, correct or current.
- .4 The Contractor shall pay all costs and be responsible for establishing locations and state of use of all existing utilities that may affect the Work. The Contractor shall make satisfactory arrangements with the utility companies involved for the location,

protection and inspection of existing utilities.

- .5 Notice in writing shall be given by the Contractor to the utility companies 48 hours before work commences in the vicinity of existing utilities.
- .6 The Contractor shall pay all the costs involved in protection of utilities, inspection of utilities, and all costs due to delays because of existing utilities and structures.
- .7 The Contractor shall provide for the uninterrupted flow of all water courses, sewers and drains encountered during the Work.
- .8 Access shall be maintained to all existing structures such as valves, hydrants, meter chambers and control structures at all times during construction.
- .9 If interruption of service provided by an existing utility is necessary, a planned shutdown shall be approved by the owners of the utilities. Requests for a shutdown shall be made, by the Contractor, in writing, at least 48 hours in advance.
- .10 The Contractor shall notify all customers, or make arrangements with the utility company to notify all customers, 24 hours in advance of a shutdown.
- .11 Unless otherwise specified, the Contractor shall make arrangements for relocation of existing utilities that the Engineer requests to be relocated, and the actual relocation shall be constructed by the owner of the utility. The Contractor will be reimbursed the invoiced cost of the relocation. No extra payment is permitted for delays, or standby time.
- .12 Contact the noted Owners of the utilities for further information:

- Northwest Territories Power Corporation
Phone: 1-867-874-5200

- Northland Utilities (NWT) Ltd. - Wekweeti (Snare Lakes)
Phone: 1-800-264-5313 - Trout Lake

- NorthwesTel (Business Telephone Service)
Phone: 611 or 1-800-661-0745

Specification Note: Specifier is to provide correct telephone numbers herein for project and location of project.

4. TEMPORARY CONTROLS

4.1 Noise Controls

- .1 Perform the Work in conformity with all municipal bylaws with respect to noise, hours of work, night work and holiday work. Night work or holiday work requires the written permission of the Engineer.

4.2 Dust Control

- .1 Perform the Work in a manner that will not produce an objectionable amount of dust. Dust control measures shall be paid for by the Contractor.

4.3 Pollution Control

- .1 Perform the Work in conformance with the applicable sections of the Territorial regulations with respect to air, ground and water pollution control requirements.

4.4 Disposal Of Waste

- .1 Burying of rubbish and waste on site is not permitted.
- .2 Disposal of waste or volatile materials into waterways, storm or sanitary sewers is not permitted.
- .3 Pumping or draining water containing silt in suspension into waterways, sewers or drainage systems is prohibited.
- .4 Disposal of all waste shall be as laid out in the ENR guidelines.
[contact Environmental Protection Services (867) 873-7654]

5. TRAFFIC REGULATION

- .1 The Contractor shall be responsible for the regulation of traffic during construction, and shall perform the Work in a manner that will cause the least disruption of traffic.
- .2 The Contractor shall coordinate the Work with the Engineer, and the Owner to reduce traffic problems.
- .3 The Contractor shall be responsible for providing traffic signs, and other traffic controls, as necessary.
- .4 The Contractor shall supply all barriers, barricades, warning signs, detours, fences, and all other devices to protect the public. All applicable safety standards shall be followed.
- .5 The Contractor shall obtain approval to block traffic temporarily, if it is necessary to do so, to perform the work. Obtain the written approval of applicable municipal departments and the Engineer. At least 48 hours prior to actually blocking traffic notify the following:
 - .1 Public Works departments (GNWT & Community)
 - .2 Utility companies
 - .3 Community fire department
 - .4 Police department (RCMP)
- .6 Adequate construction parking, meeting local regulations, shall be provided by the

Contractor.

- .7 Haul routes shall be maintained by the Contractor. They shall be kept open to traffic and shall be clean at all times.

6. CONTRACTOR'S FIELD OFFICE

- .1 Furnish and install a field office building adequate in size and accommodation for all Contractor's offices, Resident Engineer's office, and supply and tool room throughout the entire construction period.
- .2 Field office to be located adjacent to the main work site.
- .3 Field office is to be complete with telephone, fax machine and data line.

7. TEMPORARY USE OF OWNER'S FACILITIES AND THE WORK

- .1 If the Owner permits the Contractor to make temporary use of the Owner's facilities, the Contractor shall use the facilities with care, providing all maintenance and repair, and shall leave the facilities in good working order when finished.
- .2 Permanent systems shall not be used by the Contractor without the written permission of the Engineer.
- .3 Permanent heating systems shall not be used for temporary heating without the written permission of the Engineer.
- .4 If the Contractor obtains written permission to use existing heating systems or other systems temporarily, before completion, the Contractor shall change lubricants, filters and other accessory items completely before acceptance. Warranties shall be extended by the Contractor to ensure that the Owner receives the full warranty, as specified.
- .5 Temporary or trial usage by the Owner of any mechanical machinery, apparatus, equipment or any other Work or materials supplied under the Contract, before final acceptance by the Engineer, is not to be construed as evidence of acceptance. The Owner shall have the privilege of such temporary and trial usage as soon as the Contractor shall claim that said work is completed.

END OF SECTION 01500

1. QUALITY

- .1 Materials and products supplied and installed shall be new.
- .2 Materials and products supplied shall conform to these specifications and to applicable standards.
- .3 Workmanship shall be the best quality, executed by workmen experienced and skilled in their respective trades.
- .4 Ensure full cooperation among all trades and coordination of the Work with continuous supervision.
- .5 Use products for which replacement parts and service are readily available.
- .6 Use products of one manufacturer for products of the same type or classification.

2. MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise specified, comply with the manufacturer's/supplier's instructions for material or product and installation methods.
- .2 Notify the Engineer in writing of any conflict between these Specifications and the instructions of the manufacturer/supplier.

3. FASTENINGS

- .1 Provide metal fastenings and accessories in the same texture, colour and finish as the base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work, or work that may be located in a corrosive atmosphere.
- .2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage.
- .3 Space fastenings evenly and lay out neatly.

4. DELIVERY AND STORAGE

- .1 The type, manufacturer, expiry date and storage instructions for paint to be used on the project are to be confirmed in writing and accepted by the Engineer, prior to shipping. All sand blasted and shop primed steel shall be subject to inspection prior to shipping.
- .2 The Contractor shall provide adequate storage for all material and equipment delivered to site and shall be solely responsible for the safety and maintenance of such materials and equipment.
- .3 All equipment, whether in transit, storage or after installation, shall be protected from weather, dust, corrosion, freezing, moisture, impact or malicious damage to the satisfaction of the Engineer and in accordance with the manufacturer's instructions as applicable. Any material or equipment deteriorated or damaged due to inadequate protection shall be replaced at the Contractor's expense.

- .4 In general, mechanical and electrical equipment and machinery shall be stored in weatherproof buildings; special care shall be taken to protect electrical equipment and painting materials.
- .5 The Contractor shall ensure that all dangerous substances such as paints, solvents, propane and petroleum fluids are stored in secure locked locations.
- .6 All costs associated with transporting, storing and stockpiling material shall be borne by the Contractor.

5. HAZARDOUS MATERIALS AND MATERIAL SAFETY DATA SHEETS (MSDS)

- .1 Controlled products, such as paints, thinners, solvents, fuels, etc., for incorporation into the Work shall be labeled in accordance with hazardous products legislation. Workplace Hazardous Material Information System (WHMIS) Material Safety Data Sheets (MSDS) shall be provided.
- .2 Suppliers have the responsibility to ensure labels contain the information required by the legislation for the product. The Contractor shall ensure that the labels are protected and safeguarded in a manner satisfactory to the Engineer.
- .3 The Contractor shall provide the Engineer with five (5) copies of Material Safety Data Sheets for all controlled products to be incorporated into the Work or required for operation. It shall be the Contractor's responsibility to provide this information.
- .4 The MSDS shall be part of the operation and maintenance manual data to be provided to the Engineer and shall contain full details on the identification, safe handling and storage of controlled products and hazards associated with misuse.
- .5 The Contractor shall instruct operators on the safe handling and hazards associated with the misuse of controlled products incorporated into the Work or required for operation as part of the commissioning process.
- .6 The Contractor is advised that by legislation he is required to have the MSDS on the site during construction. The MSDS should be clearly outlined and available to all people working or visiting the site.

END OF SECTION 01600

Specification Note: Specifier is to revise the Inspection Requirements on all documents to suit the particular project.

1. GENERAL

- .1 The Contractor shall follow the listed procedures for the documentation, testing and acceptance for the facility.
- .2 The following procedures shall be carried out by the Contractor for testing and acceptance of the facility. At least fourteen (14) days written notice must be given to the Engineer and the Owner prior to conducting a Substantial Completion Inspection.
- .3 All tests must be or have been witnessed by the Engineer or his representative and shall consist of, but not necessarily be limited to, items as further described.

2. DOCUMENTATION

- .1 The Contractor shall submit proof of each welder's arc welding qualifications (a copy of a valid welding certificate) as issued by the Government of the Northwest Territories, in accordance with the *Boiler and Pressure Vessel Welding Regulations, API Std. 1104 and CSA Std. Z662*. Verify the validity of the certificates to the Work being performed. **It is mandatory that each welder working on tanks or pressure piping has a The Northwest Territories Class B Pressure Welding certification before starting work.**
- .2 The Contractor shall submit weld inspection reports, radiographs and other weld test records, such as vacuum tests, to show Code compliance, as required by the applicable Codes and standards.
- .3 The Contractor shall provide a witnessed certificate of each hydrostatic and other pressure testing carried out on the tanks, piping and special assemblies, such as the dispensing facilities. All piping pressure test certificates must be accompanied by a copy of the pressure and temperature recording charts, field data sheets and/or other documents to adequately support the success of the test as required by *Section 7.7 of CSA Standard, Z662 for Oil Transportation Systems*. All final tank hydrostatic tests must include details of the test together with elevation readings of the tank bases before, during and after the test, to verify the adequacy of the tank foundations.
- .4 The Contractor shall submit a certificate of acceptance of the electrical installations as issued by the Electrical Inspector of the Government of the Northwest Territories (GNWT). The Contractor shall also include a record of the Megger test readings of the ground resistance pertaining to the grounding installations.
- .5 The Contractor shall have submitted the original of finalized shop drawings, product and equipment data sheets, samples and five (5) copies of Operating & Maintenance Data and Spare Parts List to the Engineer, **prior to payment for mobilization as specified**, for each construction year.
- .6 The Contractor shall submit to the Engineer the original and five (5) copies of the five (5) year warranty certificate requested for the liner membrane material and

workmanship as per *Section 02592* of these Specifications.

- .7 The Contractor shall issue a one year security certificate, for the Polygas detection alarm system, to the Engineer in the name of the Government of the Northwest Territories.
- .8 The Contractor shall submit to the Engineer a copy of the Weights and Measures Canada Meter Test Certificates for all the dispenser building and island dispenser meters. **The meters shall have the meter gears set for the particular product being metered before being certified and sealed by Weights and Measures, Canada.** The seal shall not be broken.
- .9 The Contractor shall submit marked-up copies of the Record Drawings to the Engineer, as specified.
- .10 The Contractor shall submit to the Engineer a copy of test results for any other test which may have been requested during construction.

3. INSPECTION AND TESTING PROCEDURES

- .1 **Tankage:** The following inspection shall have been completed, witnessed and documented. Each existing tank shall be drained, gas-freed, cleaned (including power brushing and vacuuming the tank floor plates ready for an API 653 internal inspection. The inspection shall be conducted by a Certified API 653 Tank Inspector and any repairs required shall be completed in accordance with *API Standard 653, Tank Inspection, Repair, Alteration, and Reconstruction*.

The final hydrostatic test for any storage tank shall be made only when the tank has been completely built or modified and installed in its final position. Each tank must be completely isolated from any product piping by the installation of slip blinds, plugs and/or caps. Hydrostatic testing of the tanks shall be done as per *Section 15060 of these Specifications*.

After testing, thoroughly drain and flush the tanks with clean water. Clean and wipe dry the interior of each tank prior to final acceptance by the Engineer.

- .2 **Pipelines and Piping in Tankage Area:** The following testing shall have been completed, witnessed and documented. Prior to testing, the piping is to be disconnected sufficiently to ensure that all construction debris and foreign material has been removed from the piping by flushing thoroughly with clean water. Install slip blinds at the tank, disconnect and plug or blind-off at the dispenser or at equipment (flexible connections, etc.) which may be damaged by the hydro test. No testing shall be made against block valves where leakage cannot be visually checked (use slip blinds). Install calibrated pressure and temperature recording equipment to monitor and document the success of the hydrostatic tests. If suitable monitoring equipment is not available, a calibrated pressure gauge can be used, provided suitable periodic pressure and temperature readings are taken throughout the test to adequately document the success of the test. The piping system under test must be totally isolated from the water supply during the test. All piping shall be hydrostatically tested as per *Specification, Section 15010*. All testing and flushing shall be performed in the presence of the Engineer.

The test records are to be signed by the Contractor and the Engineer or his representative after the test. After testing, the piping shall be flushed with clean water until no deposits are retained in the strainer baskets. After flushing, completely drain all water from the system. Reassemble the piping using new gaskets and new pipe thread compound.

- .3 **Dispenser Buildings:** The following inspection shall have been completed, witnessed and documented. Once the upgrading of the dispenser building has been completed, the piping shall be air tested at 770 kPa and all joints shall be tested with a soap bubble solution. Any leaks found shall be repaired at once by the Contractor, and the system shall be retested. After the dispenser building has been installed and final connections made, testing of the dispenser building, piping and equipment shall be done with product at a pressure as delivered by the pumps prior to start-up.

4. SUBSTANTIAL COMPLETION INSPECTION

- .1 The following inspection procedure shall be carried out by the Contractor in the presence of the Engineer and Consultant (and possibly a PPD representative) and shall consist of, but not necessarily be limited to:
- .1 Carry out a visual inspection of the tankage areas and yard facilities as well as of the pipelines and sea hose connection point facilities. Particular attention should be directed to verifying the tightness of all joints and equipment connections.
 - .2 All valves shall be operated full cycle (open and close) and stem threads lubricated with low temperature lubricant as recommended by the valve manufacturer (repeat the operation as necessary and to the satisfaction of the Engineer).
 - .3 The Contractor shall provide a plug at the tank water draw-off valves (if not already installed). Fully open and close valves and ensure that the valves hold tight in the closed position.
 - .4 The gauge hatches shall be verified to hold tight.
 - .5 The pressure/vacuum vents shall be inspected; the inscription on the weights shall be noted for compliance with the pressure and vacuum settings called for on the drawings. Hoods shall be firmly installed. Serial numbers of the pressure/vacuum vents shall be recorded for each tank.
 - .6 The Contractor shall adjust level gauges and repeat test until accurate readings are obtained.
 - .7 All covers on strainers shall be removed for verification of cleanliness and upon satisfaction of the Engineer shall be reinstalled. Procedure to be repeated at the Engineer's discretion upon completion of the trial operation.
 - .8 All tank equipment shall be inspected and verified for proper operation.
 - .9 The Contractor shall check and record pressure readings at suction and discharge of all pumps when pump is running at no flow condition, at full flow condition, and when the gate valve at discharge is partly closed allowing

approximately half flow.

- .1 The flow rates shall be noted at the corresponding positions of the valves. **Check that all pumps and gearboxes are properly lubricated.** The product level in the tanks shall be checked and recorded when recording pressures.
- .2 Meter readings shall be taken at every two (2) minute intervals of run and flows calculated. The Contractor shall also make arrangements for the disposal or return of product to the tanks.
- .3 The Contractor shall have made arrangements to have a tank truck and a minimum of three (3) clean 205 litre drums on site for start-up of the plant facilities. A minimum of 4,500 litres shall be run through each of the Low Sulphur Diesel Light (LSDL) fuel and Jet A-1 aviation fuel systems, and 500 litres through the Gasoline and Low Sulphur Diesel Light (LSDL) fuel vehicle sales systems.
- .10 Confirm that the settings on all pressure relief valves have been verified and the relief directions have been confirmed.
- .11 Check the operation of the dike drain pump and hose assemblies.
- .12 Meters shall have been calibrated by the Contractor to *Weights and Measures-Canada Standards*. At the time of start-up, arrangements will have been made by the Contractor to have the accuracy of the meters verified. The Engineer shall assist the Contractor in carrying out this work.
- .13 Verify and make sure that air eliminators on all systems do not leak product and have been connected to a sample tank.
- .14 Verify the operation of the hose reel (electrically and manually) and that the reels are lubricated per manufacturer's recommendations with low temperature lubricant. Check swivel joint for leakage.
- .15 All light switches shall be operated and all defective or burned out lamps replaced by the Contractor. Switches for lighting of the tanks, the tank areas, the yard areas, inside the dispenser buildings and operator's shelter building shall be labeled properly.
- .16 Thermostat settings in all buildings shall be verified. Verify settings of timers in all buildings. The timers shall be set as indicated on the drawings and specifications or otherwise directed by the Engineer. Verify that all timers are properly identified and labeled.
- .17 Verify that seals at electrical conduits are filled with sealing compound, and that covers are tight.
- .18 Verify breaker sizes at the electrical panel boards and that all circuits are properly identified in typewritten form in the panel board and covered by plastic. Verify line voltages at entrance to main breakers.
- .19 Verify that the starters and contactors are properly identified and labeled.

The size of heater elements in the starters shall be verified and noted.

- .20 Verify voltages and amperages at all pump motors under no flow conditions and at maximum flow condition. Record readings. Refer to *Section 16010 of these Specifications*.
 - .21 Check all electrical and static grounding conductors and connections. Perform a ground continuity and resistance test and provide a Certificate of Acceptance for the electrical installations from the *Electrical / Mechanical Safety Group of Public Works and Services*.
 - .22 Record the name plate data for all equipment, including the meters and record the 'start' meter readings on all meters.
 - .23 Calibrate the operation of the gas detection and monitoring system and the ventilation system, using standard calibration gas. Verification shall be done for all the dispenser buildings. Verify that the monitoring lights located inside and outside of the building operate at time of unsafe condition. Verify that the exhaust fan, louvers and dampers operate properly in dispenser buildings. Verify setting automatic louver and static grilles in the ventilation system.
 - .24 Verify that process and instrumentation diagram and instructions, required under *Section 13227 and 13229* of these Specifications, are properly installed under a plastic cover in the Operators Shelter Building and/or dispenser building.
 - .25 Verify the condition of the fire extinguishers.
 - .26 Check the fencing, the operation of all gates and the adequacy of the locking hardware.
 - .27 Ensure that all padlocking features exist at valves, gauge hatches, water draw-off valves, at all doors to dispenser buildings and the operator's shelter building. The Owner (PPD) will supply the locks, all keyed alike at no cost.
 - .28 Verify that tank gauging sign is installed on the railing beside each gauge hatch.
 - .29 Verify that the portable dike pump is turned over to PPD.
- .2 At least fourteen (14) days written notice to the Engineer is required to coordinate the Substantial Completion Inspection. Phone verification shall also be undertaken by the Contractor to ensure that arrangements can be made to conduct the inspection as requested.

END OF SECTION 01650

1. CLEANUP

- .1 Maintain the working area in a clean and orderly manner as the Work progresses, and upon completion of construction, remove all waste materials, and all temporary facilities from the site.
- .2 Haul surplus or salvage materials that are the property of the Owner to the Owner's storage site.
- .3 Remove surplus or salvaged materials belonging to the Contractor from the site.
- .4 Clean haul routes.
- .5 Vacuum clean interior building areas when ready for painting, and continue vacuuming as needed.
- .6 Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight on exposed interior and exterior finished surfaces, including glass and other polished surfaces.
- .7 Clean lighting reflectors, lenses and other lighting surfaces.
- .8 Broom clean paved surfaces, rake clean other surfaces of ground.
- .9 Remove debris and surplus materials from roof areas and accessible concealed spaces.
- .10 Remove snow and ice from access to the buildings.

2. RECORD DOCUMENTS

- .1 As specified in other Sections of the Specifications, the Contractor shall be required to prepare record drawings, to provide survey notes, to supply test results or other documents. Such information shall be turned over to the Engineer as soon as start-up is complete, and before the Final Certificate of Completion is issued.
- .2 Record documents shall be neat, legible and accurate.

3. OPERATION AND MAINTENANCE MANUALS

- .1 The original and five copies of the Operation and Maintenance (O&M) manuals for the Work will be produced, in part, by the Contractor, for completion by the Engineer (consultant). The Engineer will provide the binders.
- .2 The Contractor's work includes: provision of the originals and five (5) copies of Manufacturer's and Supplier's information and warranties (prior to payment of the final 30% of the Mobilization Item (see *Section 01150, Measurement and Payment, Clause 2.1.5*) for each year of construction). The data is to be identified, separated into individual manual sets, organized into applicable categories of work, parallel to the Specifications Sections, and each Chapter.
- .3 The Contractor shall deliver the final O&M Manual data, shop drawings, Manufacturers and Suppliers information, warranties, record drawings, and other

materials to the Engineer at least fourteen (14) days before the Substantial Completion Inspection.

- .4 The Contractor's O&M Manual submissions are to conform to the current edition of the "Specification for Operations and Maintenance Manuals" Department of Public Works & Services, Government of the Northwest Territories. Copy available from the Engineer, if necessary.
- .5 All work described in this Section is the Contractor's work except where specifically indicated otherwise.
- .6 The completed manual will contain ten chapters. The data is to be separated into individual manual sets, organized into applicable categories of work parallel to the Specifications Sections, and each chapter presented in order and identified. The responsibility for production of each chapter is indicated below:

Chapter 1	Introduction (Engineer/Consultant)
Chapter 2	Index (Engineer/Consultant)
Chapter 3	Background, Design Data (Engineer/Consultant)
Chapter 4	Schematic, Functional Data (Engineer/Consultant)
Chapter 5	Component Details (Engineer/Consultant)
Chapter 6	Operating Procedures (Engineer/Consultant)
Chapter 7	Maintenance Procedures (Engineer/Consultant/Contractor) (including lists of recommended spare parts by Contractor)
Chapter 8	Testing and Certification Documents (part by Contractor)
Chapter 9	Manufacturer Data, Shop Drawings and Service Information (Contractor)
Chapter 10	Appendices (Engineer/Consultant, unless directed otherwise in this Section) Gauging (Strapping) Charts (Contractor)
- .7 The language of the manual will be English.
- .8 Testing and certification documents for Chapter 8 shall be provided within one week of the Substantial Completion Inspection and shall include:
 - .1 Provide data sheets that provide actual operating conditions after the systems have been balanced or adjusted to design conditions. Data required includes final control settings, field check data on all motors, including R.P.M., voltage, phase and actual current under normal loads, alignment certificates from millwrights, electrical load balancing, etc.
 - .2 Include all data sheets recording compaction and/or concrete test results, data tests for leakage, drain operation, ground Megger tests, pump capacity tests, certification of meters, etc.
 - .3 List all items that require periodic inspection by independent inspectors. List the frequency of inspection, the inspection agency to contact, including addresses and current phone numbers.
 - .4 Include an original and five (5) photocopies of each certificate issued by the

independent inspectors who make inspections pursuant to health, safety and other regulations of a similar nature. Indicate where the original of each such certificate is filed and where it is to remain displayed.

- .5 Include originals of manufacturers' warranties in Copy 1 of the manual.
- .6 Include clear, legible photocopies of manufacturers' warranties in Copies 2 through 6.
- .7 Group warranties together to form a section in Chapter 8.
- .9 Manufacturers' information data for Chapter 9 shall be provided at least fourteen (14) days prior to the Substantial Completion Inspection as follows:
 - .1 This chapter of the O&M Manual provides an original collection of all manufacturer's service manuals, parts lists, operating and maintenance instructions, performance curves and other applicable data which may be required in future years.
 - .2 Include information needed for operation, maintenance and repair of every component of the mechanical and electrical systems, and any other system requiring or likely to require operation or routine maintenance.
 - .3 Preface this Section with an index. List in order each item by the manufacturer's name and the pieces of equipment to which it refers. Include supplier's name, address and phone number.
 - .4 Include maintenance instructions for finished surfaces and materials and a copy of hardware and paint schedules.
 - .5 Include all original service manuals, data sheets and other manufacturer's information for each component.
 - .6 Manufacturer's information is to be an original and five (5) copies of the manual. Poor quality photocopies are **not** acceptable.
 - .7 On the first page of each inclusion, identify the piece of equipment to which it refers. Include nameplate information such as model, size, capacity, serial number, etc.
 - .8 Remove pages from manufacturer's information that are irrelevant to the equipment provided for this project.
 - .9 Where tables and curves are given for the full range of sizes, underline in **red** on all copies, the data that refers to the installed equipment. If more than one size or type in the same table was used, add the identification for each in the margin to assist in positive identification. Draw a thick black diagonal line across all data not applicable to equipment provided.
 - .10 If any warning instructions are included which, if ignored, could significantly affect the equipment, mark these with red arrows in all copies, to draw the operator's attention.

- .11 Service manuals must be the operating and maintenance type, which give parts lists, preferably including an exposed or sectioned drawing for guidance in assembling, installation details, lubrication and operations details. Sales types of brochures, which give only a very general description and few details, are **not** acceptable.
- .12 Mount any items that are smaller than 216mm X 280mm on a full page for inclusion in the manual.
- .13 Include all wiring diagrams complete with wire coding.
- .10 Gauging Charts for each tank are to be included in the Appendix and are to be provided in draft form two weeks prior to the Substantial Completion Inspection. See *Section 15060*.
- .11 Deliver any outstanding material prior to requesting Final Inspection, and payment of the final Mobilization amount.

END OF SECTION 01700

1. GENERAL

.1 Related Sections

- .1 Section 01010 - Summary of Work
- .2 Section 02224 - Site Work
- .3 Section 15010 - General Mechanical Provisions
- .4 Section 15060 - Tankage
- .5 Section 16010 - General Electrical Provisions

2. REFERENCES

.1 Codes and Standards (latest edition)

- .1 Northwest Territories Safety Act, R.S.N.W.T.
- .2 *Canadian Council of Ministers of the Environment (CCME).
CCME EPC LST PN 1326 – October 2003, Environmental Code of Practice
for Aboveground and Underground Storage Tank Systems Containing
Petroleum and Allied Petroleum Products.*
- .3 Canadian Federal Legislation
 - .1 *Canadian Environmental Protection Act (CEPA)*
- .4 Canadian Standards Association (CSA).
 - .1 *CSA S350-M, Code of Practice for Safety in Demolition of
Structures.*

3. HEALTH AND SAFETY COORDINATOR

- .1 Assign responsibility and obligation to a qualified worker to act as the Health and Safety Coordinator, where required, to stop or start Work if, at the Health and Safety Coordinator's discretion, it is necessary or advisable for reasons of health or safety. The Engineer may also stop Work for health or safety reasons.
- .2 Health and Safety Coordinator must:
 - .1 Have working knowledge of occupational health and safety regulations.
 - .2 Be responsible for completing Contractor's Health and Safety Training and ensuring that personnel, not successfully completing required training, are not permitted to enter site to perform Work.
 - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .4 Be on site during execution of the Work.

4. SUBMISSIONS

- .1 Contractor shall develop and submit a written site-specific Health and Safety Plan, to the Engineer, prior to commencing any site work and continue to implement, maintain, and enforce plan until final demobilization from site.
 - .1 Submit site-specific Health and Safety Plan, within (14) fourteen days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site-specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .3 Ensure Health and Safety guidelines provide for safe and minimal risk working environment for site personnel and minimize impact of activities involving contact with any hazardous materials or hazardous wastes on the general public and the surrounding environment.
 - .4 Give precedence to safety and health of public and site personnel, and protection of the environment, over cost and schedule considerations for the Work.
 - .2 Relief from or substitution for any portion or provision of the minimum Health and Safety guidelines, specified herein or related to the site-specific Health and Safety Plan, must be submitted to the Engineer in writing. The Engineer will respond in writing, either approving or requesting changes.

The Engineer's review of Contractor's final Health and Safety Plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction health and safety.
- .2 The following reports shall be submitted to the Engineer, when required by legislation, regulation or the safety program:
 - .1 Submit three copies of Contractor's authorized representative's work site health and safety inspection reports.
 - .2 Submit copies of reports or directions issued by Territorial Health and Safety inspectors.
 - .3 Submit copies of incident and accident reports.
- .3 Medical Surveillance:
 - .1 Where prescribed by legislation, regulation or the safety program, submit certification of medical surveillance for site personnel prior to commencement of Work (and submit additional certifications for any new site personnel) to the Engineer.
- .4 On-site Contingency and Emergency Response Plan:

- .1 Address standard operating procedures to be implemented during emergency situations and submit the plan to the Engineer, within (14) fourteen days.

5. FILING OF NOTICE

- .1 File notice of the Project with the Territorial Health and Safety authorities prior to commencement of Work.

6. SAFETY ASSESSMENT

- .1 Perform site-specific safety hazard assessment related to the project.

7. MEETINGS

- .1 Schedule and administer a Health and Safety meeting with the Engineer prior to commencement of Work. A sign-in sheet of attendees shall be included in the minutes of the meeting.
- .2 Conduct and record mandatory daily safety meetings for personnel, and additionally, as required by special or work-related conditions. A sign-in sheet of attendees shall be included in the minutes of each meeting.
 - .1 Include refresher training for existing equipment and protocols,
 - .2 Review ongoing safety issues and protocols and examine new site conditions as encountered.
 - .3 Hold additional safety meetings on an as-needed basis.

8. PROJECT/SITE CONDITIONS

- .1 See *Section 01011, Particular Scope of Work*, for details of Work on site.

9. RESPONSIBILITY

- .1 Be responsible for the health and safety of persons and safety of property on site, and for the protection of persons off site and the environment to the extent that they may be affected by the conduct of the Work.
- .2 Comply with and enforce compliance by employees with the safety requirements of the Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with the site-specific Health and Safety Plan.

10. HAZARD COMMUNICATION REQUIREMENTS

- .1 Comply with Work Site Hazardous Materials Information Regulations, R.R.N.W.T.
- .2 Provide the Engineer with Material Safety Data Sheets (MSDS) and documentation on any "hazardous" chemical that the Contractor or Contractor's Representatives plan to bring onto site.

11. UNFORESEEN HAZARDS

- .1 Should any unforeseen or peculiar safety-related factor, hazard or condition become evident during performance of Work, stop work and immediately advise the Engineer verbally and in writing.

12. PERSONAL HEALTH, SAFETY AND HYGIENE

- .1 Training:
 - .1 Ensure personnel entering the jobsite are trained in accordance with specified personnel training requirements.
 - .2 Levels of Protection:
 - .1 Establish levels of protection for each Work area based on the planned activity and location of the activity, as per WCB regulations.
 - .3 Equipment Usage Procedures:
 - .1 Develop protective equipment usage procedures and ensure procedures are strictly followed by site personnel; include the following procedures as minimum:
 - .1 Ensure prescription eyeglasses worn are safety glass and do not permit contact lenses on site within work zones.
 - .2 Ensure footwear is steel-toed safety shoes or boots and is covered by rubber overshoes when entering or working in potentially contaminated work areas.
 - .3 Dispose of or decontaminate personal protective equipment (PPE) worn on site at end of each workday.
 - .4 Decontaminate reusable PPE before reissuing.
 - .5 Ensure site personnel have passed respirator fit test prior to entering potentially contaminated work areas.
 - .6 Ensure facial hair does not interfere with proper respirator fit.
 - .4 Respiratory Protection
 - .1 Provide site personnel with extensive training in usage and limitations of, and qualitative fit testing for, air purifying and supplied-air respirators in accordance with specified regulations.
 - .2 Develop, implement, and maintain respirator program.
 - .3 Monitor, evaluate and provide respiratory protection for site personnel.

- .4 Ensure levels of protection, as listed, have been chosen to be consistent with site-specific potential airborne hazards associated with major contaminants identified on site.
- .5 Heat Stress/Cold Stress
 - .1 Implement heat stress and/or cold stress monitoring program as applicable and include in the site-specific Health and Safety Plan.
- .6 Personnel Hygiene and Personnel Decontamination Procedures
 - .1 Provide minimum as follows:
 - .1 Suitable containers for storage and disposal of used disposable Personal protective equipment (PPE).
 - .2 Potable water and suitable sanitation facility.
- .7 Emergency Equipment and First-Aid Technician
 - .1 As a minimum, provide (1) one certified first-aid technician on site at all times when Work activities are in progress. A copy of the first aid technician's current certification shall be submitted to the Engineer.
 - .2 Locate and maintain emergency and first-aid equipment in appropriate location on site including first-aid kit to accommodate number of site personnel, portable emergency eye wash and two 9 kg ABC type dry chemical fire extinguishers.
- .8 Site Communications
 - .1 Post emergency numbers near site telephones.
 - .2 Ensure personnel use of "buddy" system and develop hand signal system appropriate for site activities.
 - .3 Provide an employee alarm system to notify employees of site emergency situations or to stop Work activities if necessary.
- .9 Safety Meetings:
 - .1 Conduct mandatory daily safety meetings for personnel, and additionally, as required by special or work-related conditions;
 - .1 Include refresher training for existing equipment and protocols,
 - .2 Review ongoing safety issues and protocols,
 - .3 Examine new site conditions as encountered.
 - .2 Hold additional safety meetings on an as-needed basis.

13. AIR MONITORING

- .1 Air Monitoring Program:
 - .1 Develop and implement an air monitoring program, as required, which meets WCB regulations.
 - .2 Ensure that the area within the diked containment area and dispenser buildings is **safe for hot work** whenever work is being done in these areas, which are normally explosion-proof areas.
- .2 Air Monitoring Reporting:
 - .1 Report air monitoring results daily to the Engineer as appropriate.

14. CONTINGENCY AND EMERGENCY RESPONSE

- .1 Meet specified requirements.
- .2 Arrange and attend coordination meeting to be held with appropriate authorities, including the Community, Fire, Nursing Station and Community Emergency Coordinator
 - .1 The meeting will identify an off-site Emergency Response Coordinator through whom all information and coordination will occur in event of an incident.

15. SITE CONTROL

- .1 Meet specified requirements.
- .2 Prior to commencing work involving handling of drums and other containers, submit procedures for safe handling of drums and other containers to the Engineer.
- .3 Implement and enforce drum handling program during activities involving drummed waste characterization including but not limited to handling, labeling, opening, sampling, staging, and consolidating.
- .4 Confined Space Entry Program:
 - .1 Entry into a storage tank or any confined space shall only be made in strict accordance with the *American Petroleum Institute (API) Publication 2015, Cleaning Petroleum Storage Tanks*.

Specification Note: Specifier to provide copy of API Publication 2015 in an Appendix.

- .2 Confined space entry shall meet all the requirements of:
 - .1 *API Publication 2015, Cleaning Petroleum Storage Tanks*.

.2 *Safety Act, General Safety Regulations, R.R.N.W.T.*

.3 *WCB Safety Regulations I/9 36 (1).*

16. POSTING OF DOCUMENTS

- .1 Ensure that applicable health and safety items, articles, notices and orders are posted in a conspicuous location on site, in accordance with Acts and Regulations of the authority having jurisdiction, and in consultation with the Engineer.

17. CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by the authority having jurisdiction or by the Engineer.
- .2 Provide the Engineer with a written report of action taken to correct non-compliance of health and safety issues identified.
- .3 The Engineer may stop Work if non-compliance of health and safety issues are not corrected.

END OF SECTION 01705

PART 1 – GENERAL

1. GENERAL

- .1 The CONTRACTOR shall submit for the ENGINEER'S consideration and approval all necessary details of the method of moving the tanks **prior** to proceeding.
- .2 All tanks shall be emptied and gas freed prior to moving according to Section 15060, Tankage.
- .3 The ENGINEER'S approval shall not relieve the CONTRACTOR from his responsibility for the WORK or method selected and any damage that occurs to the tankage due to improper equipment or moving methods. Damage shall be repaired by the CONTRACTOR at no extra cost to the OWNER.
- .4 The CONTRACTOR shall take suitable measures to protect the liner of compacted gravel from damage due to the relocation of tanks and equipment used in this procedure. the method of protection shall be reviewed and approved by the ENGINEER.
- .5 The CONTRACTOR must provide experienced tank-moving personnel for the moving of all tanks.
- .6 Temporary locations of tanks proposed by the CONTRACTOR shall be reviewed and approved by the ENGINEER prior to their use, in accordance with Section 01030, Special Project Procedures.

END OF SECTION 02200

DIVISION 2 - SECTION 02223

EXCAVATING, TRENCHING AND BACKFILLING

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PART 1 – GENERAL

1.1 General Conditions

- .1 The contractor shall read and be governed by the General Conditions, General Instructions, Instructions to Bidders, Addenda, Form of Tender and Agreement of the complete Specifications for this project.
- .2 Complete work under this trade shall be governed by the dictates of good practice in all details of materials and methods even if not minutely specified. The work shall be properly coordinated with the requirements of other units of work specified in other sections.

1.2 Standards

- .1 American Society for Testing and Materials: ASTM (where noted)

1.3 Site Conditions

- .1 Visit the site and note all characteristics and irregularities affecting the work of this section.
- .2 To proceed with the work will mean acceptance of the conditions and failure to comply with the above will in no sense form the basis for any claims.

1.4 Utility Lines

- .1 Contact all required utility companies prior to commencing work and become informed of exact location of utilities. Protect utilities during construction and assume liability for damage to utilities.

1.5 Permits

- .1 Obtain and pay for any permits required to complete the work.

1.6 Compaction Densities

- .1 Compaction Densities are percentages of Standard Proctor maximum dry density at optimum moisture content obtainable from ASTM D698.

1.7 Inspection and Testing

- .1 The Contractor will pay costs for inspection and testing as per Division 1, Section 01400.
- .2 Sieve Analysis: The contractor will submit sieve test reports for the proposed fill materials before construction to determine suitability and conformance with the specifications. The Engineer may request additional tests as construction proceeds.

1.8 Protection

- .1 Protect bottoms of excavations from softening. Should softening occur, remove softened soil and replace with Type 1 fill compacted to 98% ASTM D698 maximum

dry density.

- .2 Protect bottoms of excavations from freezing.
- .3 Construct banks in accordance with local bylaws, and local soil conditions. Protect excavations by shoring, bracing or by other methods, as required to prevent cave-ins or loose dirt from falling into excavation or where excavation may endanger adjacent foundations.
- .4 Provide adequate protection around benchmarks, layout markers, survey markers and geodetic monuments.
- .5 Provide protection to ensure no damage to existing facilities and equipment situated on site.
- .6 Do not stockpile excavated material to interfere with site operations or drainage.
- .7 Maintain adequate barriers and construction signs to prevent injury to the public.

PART 2 - PRODUCTS

2.1 Materials

- .1 All materials to be subject to Engineer's approval. Contractor will submit representative samples of proposed fill material for testing.
- .2 Grading of granular materials to show no marketed fluctuations between opposite ends of extreme limits.

Sieve Size (mm)	Percent Passing by Weight
-----------------	---------------------------

Type 1	
---------------	--

63.00	100
40.00	80 – 100
20.00	50 – 85
12.50	50 – 75
5.00	25 – 50
2.00	20 – 45
0.40	10 – 30
0.15	5 – 15
0.08	2 – 8

Type 2	
---------------	--

20.00	100
12.50	60 – 92
5.00	37 – 62
2.00	26 – 44
0.40	12 – 27
0.16	7 – 18
0.08	2 – 6

2.2 Stockpiling

- .1 Stockpile fill materials in areas designated by Engineer. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

PART 3 – EXCAVATION

3.1 Excavating

- .1 Strip all topsoil from areas being excavated.
- .2 Stockpile and remove all topsoil which is unsuitable for regrading.
- .3 Excavate to elevations and dimensions indicated for installation, construction and inspection of work specified.
- .4 Excavate to well defined lines to minimize quantity of fill material required.
- .5 Earth bottoms of excavations to be dry, undisturbed soil, level, free from loose or organic matter.
- .6 Shoring is the responsibility of the Contractor. Excavation must not interfere with normal 45° splay of bearing from bottom of any footing.
- .7 When complete, the Engineer shall inspect excavations to verify soil bearing capacity, depths and dimensions.
- .8 Correct unauthorized excavation or over excavation at no extra cost as follows:
 - .1 General Use: Type 2 Fill compacted to 100% density.

3.2 Backfilling

- .1 Do not commence backfilling until the Engineer has inspected areas of work to be backfilled.
- .2 Areas to be backfilled shall be free from debris, snow, ice water or frozen ground. Backfill material shall not be frozen or contain ice, snow or debris.
- .3 Place and compact fill materials in continuous horizontal layers not exceeding 200mm loose depth or 150mm compacted depth.
- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures use extreme caution during backfill operations. Maximum unbalanced earth elevations against foundations to be 300mm unless noted otherwise. Shore as required. Shoring to be the responsibility of the Contractor.
- .5 Provide bracing inside sumps or other similar structures when backfilling against walls.

- .6 If, during progress of work, tests indicate fills do not meet specified requirements, remove defective fills, replace and retest at no extra cost.

3.3 Surplus Material

- .1 Replace from the site and dispose of surplus or unsuitable material not required for backfill or grading.

3.4 Dewatering

- .1 Keep excavations dry at all stages of construction.
- .2 Control the grading adjacent to the excavation to prevent water running into excavated areas. If trenches are used, ensure that trench excavation does not interfere with or weaken footing bearing surfaces.
- .3 Provide suitable equipment including pumps, piping, temporary drains, trenches and sumps to keep excavations free from water until concrete is placed, cured and structural adequacy is assured.

END OF SECTION 02223

DIVISION 2 - SECTION 02224

SITE WORK

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PART 1 – GENERAL

1.1 Related Work

.1	Summary of the Work	Section 01010
.2	HDPE Liner Membrane	Section 02592
.3	Non-Woven Geotextile	Section 02270
.4	Fencing, Signs and Markers	Section 02831
.5	Tankage	Section 15060

1.2 Reference Standards

- .1 Specifications for aggregates and soils and the compaction of aggregates and soils refer to ASTM Sieve Analyses and ASTM Tests.
- .2 Other materials are specified with reference to CGSB Standards, CSA Standards and ASTM Standards.

1.3 Submissions

- .1 At least two (2) weeks before beginning work, the Contractor shall submit to the Engineer for review, a complete and detailed outline of the procedures and methods that he will employ for this section of the Work.
- .2 The Contractor shall not begin work until the Engineer has reviewed the submission.

1.4 Product Delivery, Storage and Handling

- .1 Deliver materials to the site and store in a manner such that granular materials are kept in separate piles and manufactured materials are stored according to the recommendations of the manufacturer.
- .2 Sand and gravel material required shall be selected from available local sources within approximately 5 kilometre radius of the site. These sources shall be subject to the Engineer's approval, and Land Use Permits must be obtained by the Contractor for the use of these materials.

Specification Note: Specifier to provide details and gravel sources here. Also the minimum clearance between the nearest building and the property line shall be 50m.

- .3 The Contractor is advised that crushing and/or screening and mixing of the material, especially for the fine gravel and sand, may be required to meet the specifications. The Contractor shall at no additional cost to the Owner screen and blend materials from one or more sources to achieve the gradations shown and to permit compaction to the required levels called for in this Section.
- .4 The Owner reserves the right to have sampling of granular material and concrete, as well as compaction tests, carried out by an independent material testing firm to satisfy the specifications are met. Should results indicate that the specifications are not met, all costs related to the sampling, testing and correction of the problem will be charged to the Contractor, unless the Contractor can produce proof of compliance.

- .5 Frozen material and ice will not be accepted as backfill material.

NOTE: No earthwork construction shall be done when the surface of the ground is frozen. Compaction at freezing temperatures is not effective.

1.5 Job Conditions and Regulations

- .1 Perform work in accordance with the Safety Act and General Safety Regulations of the Northwest Territories.
- .2 Perform work in a manner that will cause the least disruption or danger to traffic and pedestrians.
- .3 The Contractor is responsible for posting of warning and traffic signs, with supply and placing of barricades and protective hoarding.

1.6 Quality Assurance

- .1 Refer to Section 01400 Quality Control.
- .2 Submit to the Engineer, a list of sources of materials including sand, gravel and borrow materials.
- .3 Provide samples, test results, sieve analyses and reports for preliminary approval of all materials.

1.7 Minimum Quality Control Test Frequencies

- .1 The following frequencies of testing are the minimum required. The Contractor shall perform as many tests as are necessary to ensure that the Work conforms to the requirements of the contract regardless of the minimum number specified.
- .2 Provide moisture/density curves for each type of material, from each source of material, to be compacted to a specified density.
- .3 Field densities:
- Structures and Embankments (from excavated material) - one for each 400m² of each compacted layers.
 - Pipe Bedding - one for each 100m of pipe installed.
 - Pipe Zone Backfill - one for each 100m of pipe installed.
 - Trench Backfill - one for every 100m of trench of 1,000mm fill depth.
 - Subgrade Preparation - one field density for every 200m² of 150mm compacted layers.
 - Road Sub-base and Base course - one field density for every 100m² of sub-base and one field density for every 100m² of base course.

1.8 Disposal

- .1 All materials on site, whether stockpiled, stored or excavated, are the property of the Owner, and the Owner reserves the right to keep any part or all of the material.
- .2 The Contractor shall dispose of debris, waste, unsuitable material, rock or excess

material in accordance with the Specifications.

- .3 The Contractor is encouraged to reuse materials encountered on site to the extent they comply with the specifications in this Section.
- .4 Disposal sites must be approved by the community and the Engineer.
- .5 The Contractor shall dispose of all materials at sites, located by the Contractor, in cooperation with the community.

PART 2 – PRODUCTS

2.1 Granular Materials

- .1 Fine Gravel shall comply with the following gradation. It shall be native, clean, well graded, organic free gravel.

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
25mm	100
19mm	95 - 100
13mm	65 - 95
No. 4	35 - 60
No. 16	20 - 35
No. 50	10 - 20
No. 200	2 - 8

- .2 Coarse Gravel shall comply with the following gradation, except that no more than 10% of the fill material shall pass through a No. 200 sieve. It shall be native, clean, well graded, organic free gravel.

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
100mm	100
No. 4	35 min.
No. 200	0 - 10

- .3 Sand shall comply with the following gradation. It shall be native, clean, salt free, well graded, organic free, rounded or angular pieces containing no more than 4% particles passing a No. 200 sieve.

<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
10mm	100
No. 4	80 - 100
No. 16	50 - 75
No. 50	15 - 30
No. 100	2 - 8

Sand shall be used as topping material for vertical tank bases, below and above membranes at dike walls, around underground piping and electrical conduits, and where called for elsewhere on the Drawings.

2.2 Common Fill

- .1 Shall be native material found on site or imported and free of stones larger than 100mm in size, frozen matter, rubbish, and organics or vegetation (except natural vegetation over permafrost).

2.3 Rip Rap

- .1 Use Class 1 Nominal Size 300mm hand placed rock rip rap.
- .2 Rip Rap shall be:
 - 100% smaller than 450mm or 136kg
 - 20% larger than 350mm or 68kg
 - 50% larger than 300mm or 36kg
 - 80% larger than 200mm or 11kg

2.4 Culvert

- .1 Corrugated Steel Pipe in accordance with CSA CAN3-G401-01.
- .2 Round, Plain Galvanized, 68mm x 13mm corrugations.
- .3 Diameter and length - as indicated on the Drawings
- .4 Wall Thickness - 16 gauge
- .5 Couplings - Hugger Band type c/w O-Ring Gaskets.
- .6 Culvert for pipe supports shall be corrugated steel, multi-plate, nestable sections, 12 gauge, galvanized.
- .7 Culvert shall be as manufactured by Armco or approved equivalent.

PART 3 – EXECUTION

3.1 Construction Methods - General

- .1 The Contractor is advised that the Drawings and Specifications are not based on a legal survey plan of the existing facilities, or detailed survey information of existing site conditions.
- .2 The location of property limits, fences and benchmarks are shown on the Plot Plans and the Grading and Drainage Plans. The Contractor is responsible to maintain and safeguard these throughout the construction period.
- .3 Should a benchmark have to be relocated for the purpose of construction, it shall be relocated on a permanent structure and properly identified.
- .4 The elevations and dimensions shown on the Project Drawings are for the purpose of construction, measurement and evaluating progress payments. The Contractor shall ensure that final elevations are adhered to.

- .5 The Contractor is responsible for all construction surveys and documentation to verify quantities for payment.
- .6 The Owner reserves the right to carry out independent testing of backfill materials and concrete as indicated in other Sections. This does not relieve the Contractor of his responsibility to provide his own testing to ensure proper installation of the materials.

3.2 Site Preparation

- .1 At all developed areas, along pipelines and at spill basins.
 - .1 Prior to proceeding with any backfill operation, the Contractor shall prepare the sites as indicated below or as specifically directed by other parts of the Contract Documents.
 - .2 Remove all boulders resting on the ground in excess of 300mm in size. Buried boulders in excess of 300mm in size and so protruding from the grade that they interfere with new work, shall be removed and the hole left in the ground shall be backfilled immediately with fine gravel compacted to 95% standard proctor density (SPD). Extent of backfill shall exceed the hole by at least 1,000mm on all sides and extend a minimum of 450mm above adjacent ground elevations. Slope backfill sides at 2:1 maximum.
 - .3 Level off areas as required and prepare for backfilling operation as outlined below in order to reach the finish levels shown on the Drawings.

NOTE: On new sites, the surface vegetation and permafrost shall not be disturbed. A minimum of 1,000mm of clean common fill shall be placed and compacted to provide the sub-base for constructing the new containment area.

- .4 Carry out an accurate survey to act as a reference for payment of material quantities.
- .5 Clear as required at spill basin area and along pipeline route(s) to depth required by the Drawings.
- .6 Proper precautions shall be taken during excavation so as not to expose unduly the permafrost surface. Prolonged exposure of the frozen soil may result in excessive thawing and water accumulation in the excavation. Backfill operation must follow soon after the excavation is undertaken. Limit and minimize the extent of clearing to allow backfill operation to follow soon after, so as to ensure that a 150mm minimum layer of backfill material is present at all times over excavated areas.

3.3 Placing and Compaction of Backfill Material

- .1 Backfill material shall be in accordance with the Specifications outlined in *Clause 2.1*
- .2 Throughout the developed areas, coarse gravel material shall be added, as required, in maximum 200mm lifts (150mm compacted thickness) to 350mm from the finished grades shown on the Drawings, except at the base for vertical tanks

where the coarse gravel shall terminate at a minimum of 600mm from tank base elevations, i.e., at perimeter of tanks. Each lift shall be compacted to 95% SPD.

.3 Granular base for vertical tanks:

- .1 Shall be built to the details and thickness shown on the Standard Drawing No. NT-S02. Fine gravel material shall be placed in lifts no greater than 150mm and each lift shall be compacted to 95% SPD.
- .2 The top surface of the granular base shall be constructed with a compacted fine gravel ringwall 600 mm wide and domed in the centre with sand to a slope of 1:120, as recommended in *API 650, Appendix B, Recommendations for Design and Construction of Foundations for Aboveground Oil Storage Tanks; Figure B-2, Example of Foundation With Crushed Stone Ringwall and Clause B.4.3, Earth Foundations With a Crushed Stone and Gravel Ringwall.*
- .3 Compaction equipment shall consist of a vibratory roller with an operating weight of not less than 1,000 kilograms, or other equipment of similar or better capacity, acceptable to the Engineer. Light hand-operated compactors, such as jumping jacks, and tracked equipment will not be considered adequate for compaction of tank foundations. The Contractor shall control the moisture level in the backfill material so as to achieve the required compaction levels.

.4 Granular dike wall:

- .1 The granular dike walls shall be constructed prior to installing the liner. If the construction of granular dike walls is done when the liner material installed, the liner shall be rolled clear of the working area. Suitable steps shall be taken to protect the liner and top of compacted gravel layer from damage due to equipment running over these areas during dike wall construction. The method of protection shall be reviewed and approved by the Engineer.
- .2 The core of the dike walls shall be built up with common fill, coarse gravel or fine gravel materials. Sand shall not be used as fill material for the dike core. The dike walls shall be constructed to the dimensions and elevations as shown on the Drawings.
- .3 The top of the dike walls shall be not less than 600mm wide. Backfill at dike walls shall be compacted in maximum 200mm lifts to 95% SPD. A trench shall be provided on top of exterior dike walls for anchoring of the liner membrane, as per the details on the Standard Drawing No. NT-S03.

.5 Areas inside of the dike walls:

- .1 A sand bed shall be installed on the fine gravel material to receive the liner membrane. This sand bed shall be placed in a single lift and compacted to 95% SPD. The bedding surface shall be uniform and all depressions greater than 12mm shall be filled and smoothed with additional sand material to assure proper bearing for the liner membrane. The bedding surface shall be sloped towards the sump location as indicated on the project drawings, at a minimum slope of 1:200, and so as to assure proper drainage of surface

water towards the sump.

- .2 Prior to the liner membrane installation, the Engineer shall inspect the bedding to ensure that it is satisfactory, and any defects noted shall be rectified. The Contractor is responsible for providing at least seven (7) days notice to the Engineer to ensure that he is available for the inspection. The liner membrane installation and testing shall be as detailed in Section 02592, and shall be fully accepted by the Engineer before covering.
- .3 Following the liner membrane installation, a 75mm thick sand layer shall be placed on top of the liner membrane, leveled and lightly compacted, in the presence of the Engineer and Liner Technician engaged by the Contractor. All necessary precautions shall be taken during this operation to ensure that no damage is done to the liner membrane. Any damage to the liner membrane shall be repaired at the Contractor's expense, to the satisfaction of the Engineer.
- .4 A geotextile fabric shall be placed over the sand layer, as specified in Section 02270.
- .5 At areas other than the vertical tank base, cover material consisting of fine gravel shall be placed on top of the sand cover and geotextile fabric in a single lift, graded and compacted to 95% SPD with a manually operated roller of minimum 230 kilogram weight. The cover material shall be placed so as to attain the final grades shown on the Drawings, and so as not to damage the liner membrane.
- .6 At areas under vertical tank bases:
 - .1 Cover material consisting of fine gravel shall be placed to within 50 mm of the final grade and compacted to 95% SPD. A fine gravel ringwall shall be constructed, as per Clause 3.3.3, with a 50mm minimum sand bed placed on the fine granular material, under the tank centre (in a single lift), graded and compacted to 95% SPD. The top surface of the sand bed shall be domed to the centre of the tank, at a slope of 1:120, as shown on the Drawings.
- .7 Under horizontal tanks:
 - .1 Provide a granular pad exceeding the horizontal tank layout by a minimum of 1,000mm all around. The fine gravel material shall be added over the thickness required by Clause 3.3.5.5, in order to provide a level pad for the horizontal tanks to the elevations shown on the Drawings. The backfill shall be level and compacted to 95% SPD.
- .8 At areas outside the dikes:
 - .1 At developed areas adjacent to the dike walls, including the vehicular traffic areas, fine gravel material shall be placed on top of the coarse gravel in maximum 200mm (150mm compacted) lifts, to the elevations and details shown on the Drawings, and compacted to 95% SPD. The top surface of the fine gravel material shall be uniform and to the grades shown on the Drawings, i.e., sloped to permit surface water runoff as shown.

- .9 At pipeline rights-of-way:
 - .1 Clear off boulders interfering with the proposed pipeline.
 - .2 Section 01010 describes the work to be done at pipeline rights-of-way.
 - .3 Where pipelines are to be installed on new pipe supports, granular pads shall be provided under each support. The size of the granular pads will vary due to the irregularity of terrain along the pipeline route(s). Where the pipeline right-of-way crosses an existing ditch, culvert sections full of rip-rap material shall be provided under the supports to prevent erosion of the support bases, refer to the details on the Drawings.
- .10 The ground at the pipe supports:
 - .1 Grade the ground level to receive a fine gravel base pad for the pipe supports, i.e., boulders or rock outcrops shall be removed per Clause 3.2.2. The gravel base at the pipe supports shall be constructed to the thickness required by the field conditions, so as to insure a uniform slope for the piping (with no low areas that can trap water) and such that piping elevations, as shown on the Drawings, are maintained.
 - .2 Backfill with coarse gravel material placed and compacted to 90% SPD, in 200mm maximum (150mm compacted) lifts to an elevation 350mm below finished elevations. Fine gravel shall be placed on top of the coarse gravel in maximum 200mm lifts, to the elevations and details shown on the Drawings, and each lift shall be compacted to 90% SPD. The top surface of the fine gravel shall be uniform.
- .11 Spill basin and vehicular traffic areas:
 - .1 Backfill with coarse gravel material placed and compacted to 95% SPD, in 200mm maximum lifts to an elevation 350mm below finished elevations. Fine gravel shall be placed on top of the coarse gravel in maximum 200mm lifts, to the elevations and details shown on the Drawings, and each lift shall be compacted to 95% SPD. The top surface of the fine gravel shall be uniform and to the grades shown on the Drawings.
- .12 Backfill under concrete slabs, sidewalks, pipe supports and anchoring blocks:
 - .1 Backfill with fine gravel, a minimum of 150mm thick, compacted to 95% SPD.
- .13 Backfill under dispenser buildings and Operators Shelter Building:
 - .1 Backfill with fine gravel material, minimum 150mm in thickness, graded and compacted to 95% SPD, unless noted otherwise on the project drawings.
 - .2 A shallow diked containment area shall be constructed under dispenser buildings complete with an impervious liner and geotextile cover, as shown on the project drawings.

.14 Base for Contaminated Soil Remediation:

- .1 A base for a contaminated soil remediation facility shall be constructed in accordance with the Specifications outlined in Clauses 3.1, 3.2, 3.3.1 and 3.3.2, unless otherwise indicated on the project drawings.

.15 Granular Dike Wall for Contaminated Soil Remediation:

- .1 A granular dike wall for a contaminated soil remediation facility shall be constructed in accordance with the Specifications outlined in Clause 3.3.4, unless otherwise indicated on the project drawings.

.16 Area Inside of Dike Wall for Contaminated Soil Remediation:

- .1 The area inside of a dike wall for a contaminated soil remediation facility shall be constructed in accordance with the Specifications outlined in Clause 3.3.5, unless otherwise indicated on the project drawings.
- .2 The liner and geotextile fabric installation, and testing, shall be as outlined in Sections 02227 and 02592 respectively.

3.4 Drainage of Excavations

- .1 The Contractor shall take all the necessary measures to keep the excavations free of water at all times and to protect the excavations from damage that may be caused by rain, surface water run-off, ground thawing or otherwise. Create low points as required for pumping water out of the excavations or create temporary ditches to direct water away from the excavations.
- .2 The Contractor shall, at his cost, be responsible for any additional excavation and backfill that may be required due to lack of proper drainage of the excavations, and which would have as an effect, the softening of the ground, and consequently, reduction in its load bearing capacity.

3.5 Dike Drain Sump

- .1 The dike areas shall be provided with a drain sump(s) fabricated from a 205 litre steel drum or 610mm diameter galvanized culvert section, cut and with perforations, as shown on Standard Detail Drawings No. NT-S03 and NT-P01. The drain sump(s) shall be located at the low points in the diked area, as shown on the project drawings, with the top of the drain sump(s) level with the finished ground elevation at those points.

3.6 Ditches

- .1 Ditches and drainage swales shall to be provided where necessary and as shown on the project drawings.

3.7 Removal of Contaminated Soil

- .1 If not already done, environmental assessments of a contaminated site shall be conducted and appropriate remedial action shall be carried out in accordance with the *Environmental Guideline for Contaminated Site Remediation*, issued by the EPS,

and as administered by the *GNWT, Environmental Protection Service Division (EPS)* of the *Department of Environment and Natural Resources (ENR)*, (867) 873-7654.

- .2 All fuel contaminated soil shall be excavated and hauled to a remedial site and appropriate remedial action shall be initiated, as directed by the Engineer.
- .3 The Contractor shall, as part of the Works and this Tender, mobilize equipment, manpower, materials, and professional and testing services to the contaminated site for the purposes of excavating contaminated in-place granular or other fill as necessary, testing of the fill and replacing the fill with approved clean compacted granular materials, as specified in above in this Section.

1. The tests shall consist of:
 - Conduct sampling to confirm the extent of any contamination while excavating, by carrying out chemical analyses for benzene, toluene, ethylbenzene, and xylenes (BTEX); petroleum hydrocarbon (PHC) factors F-1 to F-4; and metals in accordance with the Canadian Council of Ministers of the Environment (CCME) guidelines (2001).
 - As specified by *Department of Environment and Natural Resources (ENR)*, the site is to be evaluated according to the Tier 1 (Industrial) evaluation procedure based on the CCME "Canada Wide Standards" (CWS) for Petroleum Hydrocarbons in Soil (CCME 2001).
2. The Contractor's work shall normally include the excavation up to and including the boundaries and depths or estimated quantity of contaminated soil, as specified in the Drawings and Specifications.
3. If not specified in the Drawings and Specifications, the Contractor shall negotiate with the Engineer and establish, before any work is done:
 - the cost of preparing the remediation area, as required by ENR, EPS;
 - a unit price for excavating and hauling the contaminated soil to a suitable remediation area and spreading it on the prepared remediation site;
 - the cost of testing and;
 - the unit cost of replacing the contaminated soil with fine gravel, compacted as detailed in Clause 3.3, above.

These costs shall be confirmed in writing before any work begins on the clean up.

4. The quantities of contaminated soil shall be established either by truckloads or excavated quantities determined by before and after surveys, as agreed upon by the Contractor and the Engineer.
5. The extent of the soil contamination shall be recorded on the Drawings and a report shall be prepared by the Contractor showing the quantities remediated and the concentration of the remaining contamination at the

boundaries.

6. The clean up operation shall be witnessed by an ENR, EPS representative, who may also take responsibility for the testing.
7. The Owner reserves the right to bring in their hydrocarbon remediation specialists.

3.8 Cleanup

- .1 The Contractor shall cleanup and dispose of all excess material, boulders and other debris as the Work progresses. All fuel contaminated soil shall be excavated and hauled to a remedial site, as directed by the Engineer, and replaced with clean compacted fill.
- .2 Before the Work is considered complete, the Contractor shall remove all construction equipment, appliances, barricades, surplus materials, etc., and do such other work as may be necessary to leave the site or any other premises occupied by him in a neat, workmanlike condition, as required by the Engineer.

END OF SECTION 02224

DIVISION 2 - SECTION 02270

GEOTEXTILE

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PART 1 – GENERAL

1.1 Related Work

- | | | |
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| .1 | Summary of the Work | Section 01010 |
| .2 | Site Work | Section 02224 |
| .3 | HDPE Liner Membrane | Section 02592 |

1.2 Reference Standards

- .1 Specifications for aggregates and soils and the compaction of aggregates and soils refer to ASTM Sieve Analyses and ASTM Tests.
- .2 Other materials are specified with reference to CGSB Standards, CSA Standards and ASTM Standards.

1.3 Submissions

- .1 At least two (2) weeks before beginning work, the Contractor shall submit to the Engineer for review, a complete and detailed outline of the procedures and methods that he will employ for this Section of the Work.
- .2 The Contractor shall not begin work until the Engineer has reviewed and approved the submittal.
- .3 Submit Product Data for review prior to ordering of materials.

PART 2 – PRODUCTS

2.1 Geotextile

- .1 Non-woven, needle-punched polypropylene, continuous fibre fabric. The basic function of the geotextile fabric is to provide mechanical protection of the impermeable membrane dike liner from perforation or abrasion, during installation or accidental puncturing with a shovel during operation. Needle punched non-woven geotextiles are made from polypropylene fibres that are tangled together by a needle-punching process
- .2 The geotextile shall be Layfield Plastics LP8 or equivalent.
- .3 Seams shall be lapped in accordance with manufacturer's instructions. A nominal lap of 600mm shall be used in the absence of manufacturer's recommendations.
- .4 Thread for sewn seams shall be equal to, or better, in chemical and biological resistance, than the geotextile.

- .5 Physical properties:
 - .1 Grab tensile strength: 800 Newtons minimum (ASTM D4632).
 - .2 Elongation at break: 50% minimum (ASTM D4632).
 - .3 Puncture: 467 Newtons minimum (ASTM D4833).
 - .4 Mullen Burst: 2 413kPa minimum (ASTM D3786).
 - .5 Nominal weight: 247g/m².
 - .6 Thickness - 2.19mm minimum.

PART 3 – EXECUTION

3.1 Construction Methods

- .1 The Contractor shall place the geotextile once the sand liner cover material has been placed, graded and lightly compacted.
- .2 Place geotextile material by unrolling onto graded surface.
- .3 Place geotextile material smooth and free of tension, stress, folds, wrinkles and creases.
- .4 Place geotextile material on sloping surfaces in one continuous length from toe of slope to a minimum of 2,000mm over the crest.
- .5 Overlap each successive length of geotextile 600mm or to manufacturer's instructions.
- .6 Protect the installed geotextile material from displacement and damage until, during and after placement of additional granular layers.
- .7 Replace damaged and deteriorated geotextile.
- .8 Do not permit passage of any vehicle directly on geotextile at any time.

END OF SECTION 02270

DIVISION 2 - SECTION 02592

HDPE LINER MEMBRANE

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies the requirements for the impervious membrane liner for diked containment areas in fuel storage facilities.
- .2 The Work includes the manufacture, supply and installation of the liner, liner anchor, connections, field welds and supply and inspection of earthworks.

1.2 Related Work

- | | | |
|----|-----------------|---------------|
| .1 | Summary of Work | Section 01010 |
| .2 | Site Work | Section 02224 |
| .3 | Geotextile | Section 02270 |

1.3 Submissions

- .1 Submit Product Data for review prior to ordering material.
- .2 The Contractor shall, at the time of Product Data submittal, submit certification from the manufacturer of the liner, stating that the liner and proposed field joining will meet the physical property requirements for the intended application.
- .3 The material mill test specifications and a quality control certificate shall be submitted to the Engineer, for approval, prior to shipment of material.
- .4 The Contractor shall furnish complete written instructions for the repair of liner material in accordance with the recommendations of the manufacturer.
- .5 The Contractor shall furnish layouts as required for the liner installation.

1.4 Warranty and Guarantee

- .1 The Contractor shall provide a five (5) year written and signed warranty, stating that the liner materials and Workmanship specifically provided and performed for this project, shall be free from any significant defects. Said warranty shall apply to normal use and service by the Owner and specifically excludes mechanical abuse or puncture by machinery, equipment or people, exposure of the liner to harmful chemicals or catastrophe due to earthquake, flood, or other occurrences beyond his control. Such written warranty shall provide for the total and complete repair or replacement of the defect or defective area of lining materials upon written notification and demonstration by the Owner, of the specific non-conformance of the lining material or installation with respect to the project Specifications.

Such defects or non-conformance shall be repaired or replaced within a reasonable period of time at no cost to the Owner, provided that portion of the area in question has been made available to the installer, and that such areas have been cleared of all liquids, sludges, dirt, sand or gravel.

PART 2 – PRODUCTS

2.1 General

- .1 The materials supplied under this Section shall be new, first quality products designed and manufactured specifically for long term storage of petroleum products under exposed conditions. They must have been satisfactorily demonstrated, by prior use and testing, to be suitable and durable for such purposes and must have the approval of the Engineer prior to being accepted. Copies of prior use and test data shall be provided to the Engineer for the approval.

2.2 Impervious Liner Membrane

- .1 The impervious liner membrane material shall be unsupported High Density Polyethylene (HDPE) material manufactured of new, first quality products, designed and manufactured specifically for the purpose of unleaded gasoline, low sulphur diesel light fuel (LSDL) and Jet A-1 aviation fuel containment, as applicable.
- .2 The liner material shall be so produced as to be free of holes, blisters, un-dispersed raw materials or any sign of contamination by foreign matter. Any such defect shall be repaired using the extrudate welding technique in accordance with the manufacturer's recommendations.
- .3 The lining material shall be manufactured to the maximum seamless width. Labels on the roll shall identify the thickness, length, width and manufacturer's mark number.

2.3 Prefabricated Fitments and Sealing of Joints

- .1 Where piping must go through the membrane material, prefabricated fitments factory fabricated of liner membrane material or as detailed on *Standard Detail Drawing No. NT-S04*, and as specified herein, shall be continuously seamed to provide an unbroken fitment and leak proof joint. No grounding cable, ground rod, electrical conduit or teck cable shall pass through the liner, without a sealing fitment being provided, as for the piping. The base panel shall be sized to provide no less than 300mm overlap with the liner. There shall be allowance for movement of pipe, i.e., contraction, expansion, settlement, etc., in the fitment, as shown on the Drawings.
- .2 Where pipes must go through the liner, the sealing shall be done, as per the manufacturer's recommended practice, provided that the details of installation are submitted by the Contractor, to the Engineer for approval, prior to manufacture or installation. No installation shall proceed prior to obtaining approval.
- .3 The physical properties of the finished joints shall equal or exceed the liner membrane specification.

2.4 Anchors

- .1 Anchor material shall be smooth stone, concrete, metal, or other economically available non-organic material, i.e., free of any sharp edges, of sufficient weight, i.e., not less than 15kg/m, to permanently hold down the liner in the dike anchoring trench.

2.5 Manufactured Roll Goods

- .1 Samples of the production run shall be taken and tested according to ASTM D638 for tensile strength at yield and break.

2.6 Membrane Specifications

- .1 The liner material shall be high density polyethylene (HDPE) liner membrane material, 1.5mm (60mil) thick. The liner material supplied shall equal or exceed the specifications of the *American Society for Testing Materials (ASTM)*, provided in Table 1:

Table 1: HDPE Minimum Material Properties (per Layfield Plastic, January 2000)

PROPERTY	TEST METHOD	SPECIFICATION
Minimum Thickness	ASTM D5994	1.5mm (60mil) \pm 10%
Density	ASTM D792	0.940g/cm ³
Melt Index (Maximum)	ASTM D1238, condition E 190°C, 2.16kg	0.15 – 0.60 g/10 minutes
Minimum Tensile Properties	ASTM D638 Type IV Die	50mm/minute
Strength @ Yield		23.1 kN/m (132 pounds/inch)
Stress @ Break		39.9 kN/m (228 pounds/inch)
Elongation @ Break		700 % \pm 10%
Elongation @ Yield		13 %
Modulus of Elasticity	ASTM D882	318 MPa (46 000 psi)
Tear Resistance (Minimum)	ASTM D1004	200 N (45 lb)
Low Temp Brittleness	ASTM D746 Procedure B	-60 °C (-76 °F)
Notch Constant Load ESCR (minutes, hours)	ASTM D5397	200 hrs.
Puncture Resistance	FTMS 101C Method 2065	347 N (78 lb)
Coefficient of Linear Thermal Expansion	ASTM D696	< 2.0 x 10 ⁻⁴ cm/cm °C nominal

2.7 Minimum Welded Seam Test Values

- .1 The extrusion and hot wedge welded seams shall meet the minimum field seam strength test values, provided in Table 2:

Table 2: HDPE Minimum Field Seam Strengths (per Layfield Plastic, January 2000)

PROPERTY	TEST METHOD	SPECIFICATION
Peel Strength (Extrusion) Test Temperature, 23 °C	ASTM D4437 NSF 54	FTB 14 N/mm (78 pounds/inch)
Peel Strength (Hot Wedge - Fusion) Test Temperature, 23 °C	ASTM D4437 NSF 54	FTB 17 N/mm (98 pounds/inch)
Bonded Seam Shear Strength Test Temperature, 23 °C	ASTM D4437 NSF 54	21 N/mm (120 pounds/inch)

2.8 Welding Material

- .1 If welding material is required for field joining, it shall be of a type recommended and supplied by the manufacturer and shall be delivered in the original sealed containers, each with an indelible label bearing the brand name, manufacturer's mark number and complete directions as to proper storage.

PART 3 – EXECUTION

3.1 General

- .1 Inspection of the sand bedding surface on which the membrane is to be installed, seaming and supervision of the liner membrane shall be done only by a qualified Liner Technician and witnessed by the Engineer. The Contractor shall submit to the Engineer for approval the curriculum vitae of all liner technicians he intends to hire for the project, outlining their qualifications and past experience on similar projects.
- .2 The installation shall not be carried out under unsuitable weather conditions. Periods of high winds or precipitation shall be considered unsatisfactory. Liner placement shall not be done if moisture prevents proper subgrade preparation, panel placement, or panel seaming. Limitations on installation should be defined in the preconstruction meeting.
- .3 Considerations of site geometry:
- .1 In general, seams shall be oriented parallel to the line of the maximum slope. In corners and odd shaped geometric locations, the total length of field seams shall be minimized. Seams shall not be located at low points in the subgrade unless geometry requires seaming at such locations, and is approved by the Engineer.

3.2 Inspection of Sand Bedding

- .1 The Contractor shall not proceed with liner membrane installation without prior authorization from the Engineer that the sand bedding surface is acceptable and

sufficiently advanced to allow the installation of the membrane to proceed uninterrupted.

- .2 The Liner Technician shall, during preparation of the sand bed surface, continuously inspect the entire surface, including the anchor trench, to ensure that the liner membrane installation will meet the details on the Drawings and Specifications and the manufacturer's recommendations.
- .3 Final inspection of the sand bed surface prior to the membrane installation shall be made jointly with the Contractor and the Engineer.

3.3 Sand Bed Deployment

- .1 The surfaces to be lined shall be smooth and free of all rocks, stones, sticks, roots, sharp objects, or debris of any kind, and shall consist of a compacted sand layer as shown on Standard Drawing No. NT-S03 and graded as detailed on the Project Drawings. The surface should provide a firm, unyielding foundation for the membrane with no sudden, sharp or abrupt changes or breaks in grade. No standing water or excessive moisture shall be allowed, during the liner installation.

3.4 Placing of Membrane

- .1 No liner material shall be unrolled and deployed if the material temperatures are lower than 0°C unless otherwise approved by the manufacturer and the Engineer. The specified minimum temperature for material deployment may be adjusted by the Engineer, based on recommendations by the manufacturer. Temperature limitations should be defined in the preconstruction meeting. Only the panels which will be anchored and seamed together in one day shall be typically deployed.
- .2 Panels shall be rolled out and stretched flat on the sand bed surface, making sure all folds are smoothed out, but making liberal allowance for expansion and contraction of the material due to temperature changes. Panels shall be lapped one with the other as per manufacturer's specifications. Minimum edge lap required for welding shall be 150mm. Joining shall immediately follow in an orderly and progressive sequence, taking all reasonable precautions not to damage panels. Each panel shall be inspected for damage as it is laid out.
- .3 Damaged panels shall be repaired or replaced immediately by the Contractor as directed by the liner technician at no additional cost to the Owner. Damaged panels or portions of the damaged panels that have been rejected, shall be marked and their removal from the Work area recorded.
- .4 Liner shall not be allowed to 'bridge over' (be pulled taut over) voids or low areas in the subgrade. Liner in these areas shall be cut and patched to provide adequate material to allow the liner to rest on the subgrade surface.
- .5 Wrinkling of the liner shall be permitted only to the extent required to allow for ultimate shrinkage. Folds shall not be permitted. Wrinkles that 'fold over' should be removed by walking them towards open edges, or they should be cut out and repaired.
- .6 As layout and joining progresses, panels shall be temporarily weighted down by the Contractor. Sand bags or equivalent shall be used as necessary to temporarily hold

the liner material in position under normal conditions. Sand bag fabric shall be close-knit in order to prevent fine material from working through the bags.

- .7 Temporary weights shall not be removed until permanent perimeter anchors are in place and shall only be removed to the extent that earth covering progresses.
- .8 Sleeves shall be installed where pipes go through the membrane and sealed against the pipes, as recommended by the manufacturer, or as detailed on *Standard Detail Drawing No. NT-S04*. The manufacturer's recommended method of sealing around pipes may be utilized as per Clause 2.3.

3.5 Joining of Membrane

- .1 Joining procedures shall be as recommended by the manufacturer of the liner material and shall be concurrent with panel layout to minimize exposure to the weather and curing of the spliced area.
- .2 No liner material shall be seamed when ambient temperatures are less than 0°C unless the following conditions are complied with:
 - .1 Seaming of the liner at ambient temperatures below 0°C is allowed if the liner technician can demonstrate to the Engineer, using prequalification test seams, that field seams complying with these Specifications can be fabricated at sub-freezing temperatures.
 - .2 In addition, the liner technician shall submit to the Engineer for review, detailed procedures for seaming at low temperatures, including preheating of the liner.
- .3 No liner material shall be seamed when the sheet temperature is above 71°C as measured by an infrared thermometer, or surface thermocouple, unless otherwise approved by the Engineer. This approval will be based on recommendations by the manufacturer and on a field demonstration, using prequalification test seams, that demonstrates that seams complying with these Specifications can be fabricated.
- .4 All surfaces to be spliced shall be thoroughly cleaned to remove all dust and dirt, prepared according to the procedures laid down by the material manufacturer, and inspected for indications of curing. Cured areas shall be scuffed to expose uncured material and cleaned prior to splicing.
- .5 Seaming shall be performed using either the extrusion or double wedge automatic fusion welding equipment and techniques, as recommended by the manufacturer of the liner membrane. Extrusion welding shall be used where double wedge fusion welding is not possible such as at pipe penetrations, patches, repairs and short (less than a roll width) runs of seams.
- .6 The physical properties of the finished field joints shall equal or exceed the liner membrane specification. All joints shall be tested leak-proof.

3.6 Welding Equipment

- .1 Where welding equipment is used for field joining, it shall be capable of continuously

monitoring and controlling the temperatures of the extrudate and/or the zone of contact where the machine is actually fusing the lining material so as to ensure changes in environmental conditions will not affect the integrity of the weld.

3.7 Anchoring of the Membrane

- .1 The liner technician shall inspect the anchor trench provided for him by the Contractor and shall confirm its suitability. The membrane shall be fitted into the trench, leaving no less than 600 mm for overlap of the anchor. Backfill shall immediately follow placing and overlapping of anchor material.

3.8 Workmanship

- .1 No fish mouths shall be allowed within the seam area. Where fish mouths occur, the material shall be cut, overlapped, and an overlap-extrusion weld shall be applied. All welds on completion of the Work shall be tightly bonded.
- .2 Any membrane area showing injury due to excessive scuffing, puncture or distress from any cause shall be replaced or repaired with an additional piece of membrane. Such defects shall be patched at the cut terminus with an oval or round patch of the same geomembrane material extending a minimum of 150mm beyond the cut in all directions.

3.9 Field Quality Control

- .1 Prequalification Test Seams:
 - .1 Engineer shall be notified when prequalification testing will be performed.
 - .2 Test seams shall be performed by the liner technician and observed by the Engineer to verify that seaming conditions are adequate. Test seams shall be conducted by the liner technician at the beginning of each seaming period. Test seaming shall be performed under the same conditions and with the same equipment as production seaming. The test seam shall be approximately 3,050mm long for double wedge fusion welding and 900mm long for extrusion welding with the seam centered lengthwise.
 - .3 Three (3) -25mm wide specimens shall be die-cut by the liner technician. One from each opposite end, and one from the centre of the test seam. These specimens shall be tested by the liner technician using a field tensiometer in peel and shall not fail in the weld. The three weld seam specimens shall be tested. Any failures through the weld shall be considered a failing test, regardless of the force at failure.
 - .4 The minimum acceptable seam strength values to be obtained for all specimens tested are those indicated in Clause 2.7 of this Section.
 - .5 If a test seam fails, an additional test seam shall be immediately conducted. If the additional test seam fails, the seaming apparatus shall be rejected and not used for production seaming until the deficiencies are corrected and a successful full test seam is produced.
 - .6 A sample from each test seam shall be labeled. The label shall indicate the

date, ambient temperature, number of the seaming unit, liner technician and pass or fail description. The sample shall then be given to the Engineer for archiving.

.2 Non-destructive Field Seam Testing:

- .1 All field seams shall be non-destructively tested by the liner technician over their full length before they are covered. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of tester and outcome of all non-destructive testing shall be observed, recorded, and submitted to the Engineer prior to covering the liner.
- .2 Testing should be done as the seaming Work progresses, not at the completion of all field seaming unless agreed to in advance. All defects found during testing shall be numbered and marked immediately after detection. All defects found should be repaired, retested and remarked to indicate completion of the repair and acceptability.
- .3 Depending on the type of weld, non-destructive testing shall be performed using vacuum box or air pressure testing.
- .4 Non-destructive tests shall be performed by experienced technicians thoroughly familiar with the specified test methods. The liner technician shall field demonstrate all test methods to verify to the Engineer that the test procedures are valid.
- .5 Extrusion seams shall be vacuum box tested by the Contractor according to the following methods:
 - .1 Equipment for testing extrusion seams shall be comprised of, but not limited to: a vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft rubber gasket attached to the base, port hole or valve assembly and a vacuum gauge, a steel vacuum tank and pump assembly equipped with a pressure controller and pipe connections, a rubber pressure/vacuum hose with fittings and connections, a plastic bucket, a wide paint brush or mop, and a soapy solution. The vacuum box should be similar to the Series A 100 Straight Seam Tester, as supplied by the American Parts Service Company.
 - .2 The vacuum pump shall be charged and the tank pressure adjusted to 35kPa absolute.
 - .3 The Engineer shall observe that a leak tight seal is created. The Contractor shall create the leak tight seal by wetting a strip of geomembrane approximately 300mm by 1,200mm (several lengths of box) with a soapy solution, placing the box over the wetted area then compressing. The vacuum box shall be compressed to maintain 35kPa gauge pressure over the test area for a period of approximately 5 seconds and examine the geomembrane through the viewing window for the presence of soap bubbles. If no bubbles appear after 5 seconds, the area shall be considered leak tight. The box shall be moved over to the next adjoining area with an

- appropriate overlap and the process repeated. The extrusion seams should be vacuum box tested under the observation of the Engineer.
- .4 All areas where soap bubbles appear shall be marked and repaired and then retested under the observation of the Engineer.
 - .5 At locations where seams cannot be non-destructively tested (including pipe penetrations), as determined by the Engineer, and the seam cannot be tested prior to final installation, the seaming operations shall be observed by the Engineer for uniformity and completeness.
 - .6 The Engineer shall observe all testing operations for uniformity and completeness.
 - .7 All seams that are vacuum tested shall be marked with the date tested, the name of the liner technician performing the test and the results of the test.
- .6 Double wedge fusion welded seams with an enclosed channel shall be air pressure tested by the liner technician according to the following procedure:
- .1 Equipment for testing double wedge fusion welded seams shall be comprised of, but not limited to: an air pump equipped with a pressure gauge capable of generating and sustaining a pressure of 200kPa gauge, mounted on a cushion to protect the liner, and a manometer equipped with a sharp hollow needle or other approved pressure feed device.
 - .2 The Engineer shall observe that a leak tight seal is created by the Liner Technician. The testing activities shall be performed by the Liner Technician. Both ends of the seam to be tested shall be sealed and a needle or other approved pressure feed device shall be inserted into the tunnel created by the double wedge fusion weld. The air pump shall be adjusted to a pressure of 200kPa, the valve closed and the pressure sustained for five minutes. If pressure drop does not exceed 28kPa, the seam shall be considered leak tight. The needle or other approved feed device shall be removed and the feed hole sealed. Pressure test(s) shall be conducted in accordance with the procedures outlined in *"Pressurized Air Channel Test for Dual Seamed Geomembranes"*, Geosynthetic Research Institute Test Method GM6.
 - .3 If loss of pressure exceeds 28kPa during the testing period or the pressure does not stabilize, the faulty area shall be located, repaired, and retested by the liner technician.
 - .4 Results of the pressure testing shall be recorded on the line at the seam tested and on a pressure testing record. All tests shall be observed by the Engineer.

.3 Destructive Field Seam Testing:

- .1 A minimum of one destructive test sample per 150 metres of seam length or another predetermined length shall be cut by the Liner Technician from a location specified by the Engineer. The liner technician shall not be informed in advance of the sample location. In order to obtain test results prior to completion of the liner installation, samples shall be cut by the Liner Technician as directed by the Engineer as the seaming progresses.
- .2 Sampling times, types of testing and locations shall be determined by the Engineer. The Engineer shall witness the collection of all field samples and mark all samples with their location, and roll and seam number. Also record in written form the sample number, date, time, location and seam number. A copy of the information must be attached to each sample portion. The Liner Technician shall repair all holes in the geomembrane resulting from obtaining the seam samples. All patches should be vacuum tested. If a permanent patch cannot be installed over the test location the same day of sample collection, a temporary patch shall be tacked over the opening until a permanent patch can be affixed.
- .3 The sample shall be 300mm wide by 900mm long with the seam centered lengthwise. The sample shall be cut into three equal sections and distributed as follows: one section given to the Engineer as an archive sample, one section given to the Engineer for laboratory testing as specified below and one section retained by the liner technician for field testing as specified below.
- .4 For field testing, the liner technician shall die cut ten (10) - 25mm wide replicate specimens from his sample. The Engineer shall observe the die cutting and testing of the specimens. The liner technician shall test five specimens for seam strength and five for peel strength. Only one weld of a dual hot wedge seam needs to be tested in peel. To be acceptable, 4 out of 5 test specimens must pass.
- .5 Laboratory testing by the *GQA Laboratory* would consist of *Bonded Seam Strength and Seam Peel Adhesion*, in conformance with *ASTM D6392*. Only one weld of a dual hot wedge weld seam would be tested in peel. The minimum acceptable values to be obtained for all specimens tested are those indicated in Clause 2.7 of this Section. The Owner may request that further testing be conducted by the *GQA Laboratory*.
- .6 Reports of the results of examinations and testing shall be prepared and submitted to the Engineer.
- .7 For field seams, if a laboratory test fails, that would be considered an indicator of the possible inadequacy of the entire seamed length corresponding to the test sample. More destructive test portions would then be taken by the Liner Technician at locations indicated by the Engineer, typically 3,000mm on either side of the failure. The same laboratory tests required of test seams would be performed. Passing tests shall be an indicator of adequate seams. Failing tests shall be an indicator of inadequate seams and all seams represented by the destructive test location shall be repaired with an extrusion welded cap-strip. The cap-strip would be non-

destructively tested and repaired, as required, until adequacy of the seams is achieved.

3.10 Liner Acceptance

- .1 The geomembrane liner will be accepted by the Engineer when:
 - .1 The entire installation is finished or an agreed upon subsection of the installation is finished.
 - .2 All documentation of installation is completed.
 - .3 Verification of the adequacy of all field seams and repairs, and associated testing is complete.

3.11 Cover of Membrane

- .1 The Liner Technician shall inspect the bedding and protective cover materials prior to placement and shall confirm their suitability. The Liner Technician shall remain on the site throughout the placing of protective material and shall immediately bring to the Engineer's attention any procedures that he considers to be detrimental to the membrane.

END OF SECTION 02592

DIVISION 2 - SECTION 02831

FENCING, SIGNS AND MARKERS

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies requirements for chain link fencing, signs and markers.

1.2 Location

- .1 The location of the fence terminal posts and gates is shown on the Project Drawings.

1.3 Quality Assurance

- .1 Fence erection shall be carried out by experienced fence construction personnel.
- .2 Supply materials to the latest edition of CAN/CGSB - 138.1 and CAN/CGSB-138.2.

1.4 Submissions

- .1 Provide shop drawings prior to ordering materials.
- .2 Shop drawings to indicate fence dimensions, assembly details, anchorage details and fence components.

PART 2 – PRODUCTS

2.1 Fabric

- .1 Fabric shall be chain link, hot-dipped galvanized after weaving and having a nominal height of 1,830mm as called for on the Project Drawings.
- .2 Chain link: 50mm x 50mm mesh with steel wire, gauge No. 9, galvanized with an average of 460g of zinc per m² of surface area.
- .3 Top selvedge to have a twisted and barbed finish and bottom selvedge to have a knuckled finish. Top and bottom selvedge of gates only to be knuckled finish.
- .4 Tensile strength of each individual picket to stand a tensile test of 550MPa.

2.2 Fabric Tie Wires

- .1 Fabric to be secured to the posts at approximately 300mm intervals with No. 9 gauge galvanized steel tie wire.
- .2 The fabric is to be fastened to the top rail, braces and tension wire with No. 9 gauge galvanized steel tie wire at approximately 450mm intervals.
- .3 Tension wire is to be No. 6 gauge, single strand, 610g/m² electro-galvanized wire, stretched taut along the bottom of the fabric, and fastened to the fence fabric at 450mm intervals.

2.3 Posts and Rails

- .1 Line posts shall be standard butt-weld Schedule 40 pipe, 60mm O.D. galvanized. Length to be 840mm longer than the height of fabric for concrete encased posts. Minimum weight of 5.4kg per metre. No tubing, conduit or open seam material shall be permitted.
- .2 Terminal posts for ends, corners and straining posts shall be 89mm O.D., standard butt-weld Schedule 40 pipe, galvanized. Length of end, corner and straining posts to be 1,070mm longer than height of fabric. Minimum weight of 11.24kg per metre. No conduit or open seam material shall be permitted.
- .3 Gate posts shall be standard butt-weld Schedule 40 pipe, see Table below for size, galvanized. Length shall be 1,070mm longer than height of fabric.

Frame O.D. (mm)	Gate Opening (mm)	Gate Post O.D. (mm)	Lineal (kg/m)
43	Single to 3,050 or Double to 6,100	89	11.24

- .4 Top rail shall be 43mm O.D. galvanized pipe, plain ends, random lengths, standard butt-weld Schedule 40 pipe. No tubing, conduit or open seam material shall be permitted. Couplings shall be the outside sleeve type, at least 180mm in length for the top rail. The top rail is to pass through line post top and form a continuous brace for each stretch of fence. The top rail is to be secured to each terminal post with receptacle fittings. Couplings shall not be installed at more than 300mm from a post. If required to meet this condition, the top rail shall be cut to suit.
- .5 Bracing shall be 43mm O.D. galvanized, same specifications as top rail. Horizontal brace, spaced midway between top rail and bottom of fence, shall be provided and shall extend from terminal post to first adjacent line post. End and gate posts are to have one brace. Corner and straining posts to have two braces.
- .6 Fittings are to be hot-dipped galvanized, pressed steel, or aluminum moldings of sufficient strength to ensure the integrity of the fence.

2.4 Gates

- .1 Gate frames shall be 43mm O.D., hot-dipped galvanized Schedule 40 steel pipe. Frames are to be electrically welded at all joints.
- .2 Gate fabric shall be the same as fence fabric.
- .3 Gate braces where required shall be 33mm O.D. galvanized steel pipe.
- .4 Gate hardware to include galvanized, malleable iron hinges, pad-lockable hatch and latch catches properly aligned. All gates to be supplied with heavy duty chains and padlocks for locking. (Keyed alike padlocks will be provided by Petroleum Products Division).

- .5 Main pedestrian gates, (Dutch style gates) 1,220mm wide, shall be made in two separate sections, as shown on Standard Detail Drawing, NT-S07.
- .6 Hinges are to permit gate to swing back against fence 180 degrees.

2.5 Signs and Markers

- .1 Safety signs at fences and gates shall be factory fabricated, weatherproof, 350mm X 350mm, fiberglass reinforced plastic, Brady #B-120 as available from Safety Supply Co., or approved equal, to be attached to the metal backing plate as per Standard Detail Drawing NT-S08, bearing the following:

PICTOGRAPHIC SYMBOL	LOCATION
07403 - No Admittance	One required for each gate, mounted on fence. Centreline at 1,500mm from grade and at 500mm from latch side of gate. Sign to be mounted on exterior of fence facing outward.
07404 - No Smoking	One required for each side of main facility or number shown on plot plan(s). Signs to be mounted on exterior of fence facing outward and centreline at 1,500mm above grade and located as per drawings.
Custom Made - CLOSE TANK VALVE AFTER USE	One required on the back of the main gate, facing in, centreline at 1,500mm above grade and located to read 'CLOSE TANK VALVE AFTER USE'. The sign shall be black indication on white background. See also, 2.5.5 below.

- .2 The sign at the spill basin shall be constructed of aluminum sheet. Painted Panorama White, as per Standard Detail Drawing, NT-S17 and indicate the following:
 - .1 On the front of the sign:
 - .1 One GNWT Polar Bear crest to be painted on the aluminum sheet. Template, colour and painting specifications to be provided by the Engineer.
 - .2 In English letters, 75mm high, black lettering on aluminum sheet **"CAUTION: FUEL RESUPPLY CONNECTIONS"**. This wording shall be done in black gloss metal paint. For painting specifications, refer to Section 09900.
 - .3 In the local dialect, the equivalent of **"CAUTION: FUEL RESUPPLY CONNECTIONS"** below the English message in black lettering specified above. Translation to be provided by the Engineer.

- .4 One pictographic “**NO SMOKING**” sign, size 350mm X 350mm.

Sign shall be vinyl, pressure sensitive, factory fabricated Brady #B-946 custom made, available from Safety Supply Co. or approved equal. The sign shall be red indication on white background.
 - .5 One pictographic “**NO TRESPASSING**” sign, size 350mm X 350mm. Pictographic sign shall be vinyl, pressure sensitive, factory fabricated Brady #B-946 custom made, as available from Safety Supply Co., or approved equal. The sign shall be red indication on white background.
 - .6 One pictographic “**FIRE EXTINGUISHER**” sign, size 350mm X 350mm. Pictographic sign shall be vinyl, pressure sensitive, factory fabricated Brady #B-946 custom made, as available from Safety Supply Co., or approved equal. The sign shall be red indication on white background.
- .2 For the back of the sign, mounted on the door of the fire extinguisher cabinet, provide one pictographic “**FIRE EXTINGUISHER**” sign, size 250mm X 250mm. Pictographic sign shall be vinyl, pressure sensitive, factory fabricated Brady #B-946 custom made, as available from Safety Supply Co., or approved equal. The sign shall be red indication on white background.
 - .3 The marker signs along buried pipelines shall consist of a galvanized steel “U” post, perforated in accordance with standard road traffic signs, to the dimensions shown on the Standard Detail Drawing, Nt-S19, with an aluminum plate message board, the front face painted yellow with black letters stating: “**CAUTION - BURIED FUEL PIPELINES**”, and the equivalent in the local language. Translation to be provided by the Engineer. For painting specification, see Section 09900.
 - .4 Provide a sign, manufactured of sheet aluminum, black with white lettering at the top of all tanks, mounted on the railing, in full view of the gauge hatch. The sign is to contain the following information:
 - .1 Tank number
 - .2 Product
 - .3 Height to top of the gauge hatch
 - .4 Maximum fill height
 - .5 Provide a self adhering pressure sensitive vinyl sign, size 350mm X 350mm. Pictographic sign shall be vinyl, pressure sensitive, factory fabricated Brady #B-946 custom made, as available from Safety Supply Co., or approved equal. One for each tank valve, to be placed on the wall of the tank just above the valve, to read ‘CLOSE TANK VALVE AFTER USE’. The sign shall be black indication on white background.
 - .6 For signs at the dispenser buildings, the Contractor shall refer to applicable section of these Specifications.

PART 3 – EXECUTION

3.1 Fencing

- .1 Fence line posts shall be new and spaced a maximum of 2,000mm apart, as shown on the Project Drawings. Fence corner and gate posts shall also be new.
- .2 Concrete footings for line, corner and gate posts and for gate centre rests shall be rough cast in the ground and domed above the ground to shed water.
- .3 Footings shall be no more than 150mm deeper than the end of the posts.
- .4 Existing fence fabric may be used if found acceptable by the Engineer. New fence fabric shall be supplied to complete the Work. If there is a choice, the new fence fabric shall be placed along the front side.
- .5 Fence fabric shall not be installed until footings have cured at least forty-eight (48) hours.
- .6 Stretcher bars and bands shall be new, and fastened to fabric at 300mm intervals at corner and gate posts.
- .7 Assembly of fencing components shall be with new metal fittings designed for the purpose, and in accordance with the manufacturer's instructions.

3.2 Signposting

- .1 Pictographic signs for the fences shall have metallic backing plates as shown on the Standard Detail Drawing No. NT-S08, and the whole assembly shall be attached to the fence fabric using No. 9 galvanized steel wire ties.
- .2 Pictographic signs for other areas shall be installed where shown on the Project Drawings and as per manufacturer's instructions.

3.3 Cleanup

- .1 Touch up damaged galvanizing by cleaning with a wire brush and applying one (1) coat of polyvinyl butyral wash primer and touch up paint for galvanized metal. See Division 9, Section 09900, Painting.
- .2 Clean up all concrete and other construction debris and earth removed from post holes, and re-grade the areas under and along the fence.
- .3 Fill and compact earthworks under the fencing to a maximum of 150mm from the bottom of the fence fabric.

END OF SECTION 02831

DIVISION 3 - SECTION 03100

CONCRETE FORMWORK

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies requirements for concrete formwork, falsework and their accessories.
- .2 The Work includes design, construction, erection and removal of concrete formwork, falsework and accessories.

1.2 Related Work

- | | | |
|----|------------------------|---------------|
| .1 | Summary of the Work | Section 01010 |
| .2 | Site Work | Section 02224 |
| .3 | Concrete Reinforcement | Section 03200 |
| .4 | Cast-in-Place Concrete | Section 03300 |

1.3 Reference Standards (latest edition)

- | | | |
|----|--|---------------|
| .1 | Concrete Materials and Methods of Concrete Construction | CAN/CSA-A23.1 |
| .2 | Methods of Test for Concrete | CAN/CSA-A23.2 |
| .3 | ACI Detailing Manual | ACI 315 |
| .4 | Reinforcing Steelwork Institute of Canada - Manual of Standard Practice (RSIC) | |
| .5 | Falsework for Construction Purposes | CSA-S269.1 |

1.4 Design

- .1 Design of concrete formwork and falsework are the responsibility of the Contractor.

1.5 Submissions

- .1 Submissions shall be in accordance with Section 01300 – Submissions.
- .2 Submit to the Engineer for review, shop drawings of proposed formwork and/or falsework.
- .3 Show material sizes and grades, and spacing of members.
- .4 Indicate rate and sequence of concrete placing used in design of formwork.
- .5 Shop drawings shall bear the stamp of a qualified Professional Engineer registered in the Northwest Territories.
- .6 Submit for review, shoring and re-shoring provisions, and removal schedules.
- .7 Submit for review, proposed curing procedures.
- .8 Submit for review, proposed hoarding and heating methods for cold weather concreting.

PART 2 – PRODUCTS

2.1 Forms

- .1 Use material of suitable strength and quality to produce the specified surface finish.
- .2 Use forms that are watertight, straight, flat, non-absorbent and non-staining.

2.2 Form Ties

- .1 Use only ties with ends removable to a distance of not less than 38mm from the face of the finished concrete.
- .2 Form ties with a removable cone cast in the concrete shall produce a cone hole not more than 25mm in diameter.

PART 3 – EXECUTION

3.1 Inspection

- .1 Notify the Engineer to permit inspection of formwork at least 24 hours prior to placing of concrete.

3.2 Construction and Contraction Joint Layouts

- .1 Construction and contraction joints shall be constructed where required as shown on the plans, as specified and/or according to CAN-A23.1. The Contractor shall prepare, and submit for approval, a location diagram and proposed details for all planned construction joints, and for layout of construction and contraction joints in slabs on grade, sidewalks, and other concrete paved areas.
- .2 Construction joints shall be placed at a maximum spacing of 6 metres unless otherwise detailed or approved by the Engineer.
- .3 Clean all construction joint surfaces that will be inaccessible after the erection of formwork.

3.3 Forms

- .1 Assemble and erect in accordance with the formwork design.
- .2 Allow for deflection of the formwork due to the weight of concrete.
- .3 Make all form joints watertight.
- .4 Make form surfaces smooth and flat.
- .5 Clean forms properly before assembling in position, and as necessary, before concreting.
- .6 Oil or coat forms before assembly in final position.

- .7 Provide 20mm chamfer at all exposed exterior corners with interior angle of 120 degrees or less.
- .8 Provide access for cleaning prior to concreting.
- .9 Do not use temporary removable spacers or blocks to support reinforcement or other items, unless approved by the Engineer.
- .10 Finished concrete exhibiting evidence of excessive form displacement, and/or excessive deflection, shall be cause for rejection of the Work and its removal and replacement at the Contractor's own expense.
- .11 Obtain Engineer's approval before framing openings not indicated on the Drawings.

3.4 Tolerances

- .1 Construct formwork to maintain the tolerances of concrete work in accordance with CAN-A23.1.
- .2 Provide cambers to beam and slab forms as indicated on the Drawings, as directed, or in accordance with the following:
 - Beams - 5mm per 3,000mm of span
 - Slabs - 3mm per 1,000mm of span

3.5 Placing of Concrete

- .1 Make a final inspection and ensure that forms are satisfactory and no deleterious materials are present inside the area to be concreted.
- .2 Observe forms during concreting operations and correct any displacement of the form.

3.6 Form Removal

- .1 Forms shall not be removed until removal operations cause no damage to concrete surfaces.
- .2 Consider the location, character of the structure, weather and other conditions influencing the curing of concrete, in determining the time for removal of forms. Refer to CAN-A23.1.
- .3 Leave shores in place until concrete has attained sufficient strength to adequately support its own weight together with construction loads likely to be imposed. (See CAN-A23.1 for specific requirements.)
 - Vertical Surfaces - minimum 24 hrs provided curing is in accordance with the standards.
 - Other Surfaces - Until concrete has attained 2/3 of the specified 28 day strength, or with the Engineer's approval.
- .4 Re-use of formwork and falsework subject to requirements of CAN-A23.1.

DIVISION 3 - SECTION 03200

CONCRETE REINFORCEMENT

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies requirements for the supply, fabrication and placing of reinforcing steel, including necessary supports, spacers, and related accessories.

1.2 Related Work

- | | | |
|----|------------------------|---------------|
| .1 | Summary of Work | Section 01010 |
| .2 | Site Work | Section 02224 |
| .3 | Concrete Formwork | Section 03100 |
| .4 | Cast-in-Place Concrete | Section 03300 |

1.3 Reference Standards

(latest edition)

- | | | |
|----|---|---------------|
| .1 | Concrete Materials and Methods of Concrete Construction | CAN/CSA-A23.1 |
| .2 | Billet-Steel Bars for Concrete Reinforcement | CSA-G30.12 |
| .3 | Welded Steel Wire Fabric for Concrete Reinforcement | CSA-G30.5 |
| .4 | ACI Detailing Manual | ACI 315 |
| .5 | Concrete Reinforcing Steel Institute (CRSI) - Manual of Standard Practice | |

1.4 Submissions

- .1 Submit shop drawings in accordance with Section 01300, at least 14 days before fabrication.
- .2 Submit bending schedules and placing drawings.
- .3 Show bar size, spacing, location and quantities to permit correct field placement without reference to structural drawings.
- .4 Provide details to show placement of reinforcing where special conditions occur.
- .5 Details shall be in accordance with ACI 315.
- .6 Submit, as requested by the Engineer, certificates and mill tests for the material supplied.

1.5 Product Delivery, Storage and Handling

- .1 Ship bar reinforcement in standard bundles easily identifiable and marked in accordance with the bar lists.
- .2 Store reinforcement to prevent deterioration or contamination by dirt, detrimental rust, loose scale, paint, oil or other foreign substances that will destroy or reduce bond.

- .3 Do not straighten or re-bend reinforcement in any manner.
- .4 Do not use bars kinked or bent by improper handling or storage.

PART 2 – PRODUCTS

2.1 Reinforcing Steel

- .1 Reinforcing steel to meet CSA-G30.12 as shown on Drawings:
 - 10 M bars shall be 300 or 400MPa grade, minimum lap 450mm (unless noted otherwise).
 - 15 M bars and larger shall be 400MPa grade, minimum lap 650mm (unless noted otherwise).
- .2 Welded steel wire fabric to CSA-G30.5, provide in flat sheets only. Minimum lap 150mm.

2.2 Chairs, Bolsters, Bar Supports, Spacers

- .1 Provide adequate support of reinforcement according to CRSI Manual of Standard Practice.
- .2 For exposed or architectural concrete surfaces, use accessories that are plastic coated, stainless steel or as indicated on the Drawings.
- .3 Precast concrete block supports must be equal in strength and quality to the concrete in the structure.
- .4 Chairs, bolster bar supports and spacers shall have sufficient strength to support the reinforcing under normal construction conditions. Bricks, rock or wood blocks shall not be used for bar supports.

2.3 Fabrication

- .1 Fabricate reinforcing steel from bar sizes and grades indicated, within the following tolerances:
 - .1 Sheared length: plus or minus 25mm.
 - .2 Depth of truss bar: plus or minus 13mm.
 - .3 Stirrups, ties and spirals: plus or minus 13mm.
 - .4 Location of bends: plus or minus 25mm.
- .2 Unless otherwise indicated, fabricate in accordance with CAN-A23.1.

PART 3 – EXECUTION

3.1 Inspection

- .1 Notify Engineer to permit inspection after placement is completed. Reinforcing for all concrete pours shall be inspected after placing and prior to concreting.
- .2 Provide adequate notice of scheduled pours to facilitate inspection of reinforcement, minimum of 24 hours.

3.2 Placing of Reinforcement

- .1 Place reinforcement as shown on the reviewed shop drawings and in accordance with CAN-A23.1.
- .2 Support reinforcement in position as follows:
 - .1 Beams, walls, and columns - laterally support reinforcement with supports in pairs on opposite faces.
 - .2 Do not use supports that will be forced into the supporting formwork or soil by the weight of the reinforcement or other construction loads.
 - .3 Separate layers of bars by purpose made spacers, cast mortar blocks, bars or equally suitable devices. Do not use pebbles, pieces of broken stone or brick, metal pipe or wooden blocks.
 - .4 Do **not** place bars on layers of fresh concrete as the Work progresses nor install bars during placing of concrete.
- .3 Provide concrete cover as follows, unless detailed otherwise on the Drawings:
 - .1 Cast against and permanently exposed to earth: 75mm
 - .2 Exposed to earth, weather, or water:

No. 20 through No. 55 bars:	50mm
No. 15 bars, 16mm wire, and smaller:	40mm
 - .3 Not exposed to weather or not in contact with the ground:
 - .1 Slabs, walls and joists:

No. 45 and No. 55 bars:	40mm
No. 35 bars and smaller:	20mm
 - .2 Beams, girders, and columns:

Principal reinforcement, ties, stirrups and spirals	40mm
---	------
 - .3 Slabs on grade (top surface): 40mm

3.3 Welding of Reinforcement

- .1 Welding of reinforcing bars is not permitted.

3.4 Splicing of Reinforcement

- .1 Splice bars only as shown on the Drawings or approved by the Engineer.
- .2 Bar splices shall conform to CAN-A23.3, and as follows:
 - 10 M 450mm
 - 15 M 650mm
 - 20 M 750mm
 - 25 M 1,200mm
- .3 Lap adjacent sheets of wire fabric to provide an overlap of at least one cross wire spacing plus 50mm, measured between outermost cross wires of each sheet. Only flat sheets are allowed, rolled wire fabric is not permitted.

3.5 Details

- .1 Corner Bars: Install corners bars in walls and beams to match the larger size of normal reinforcement, unless otherwise noted on the Drawings.
- .2 Openings in slabs or walls: Unless otherwise noted, install 2 additional 15 M bars on all sides of every opening, one near each concrete face, or the number of bars intercepted, divided equally between the two sides, whichever is greater. Bars to extend one lap length past each side of the opening.

END OF SECTION 03200

DIVISION 3 - SECTION 03300

CAST-IN-PLACE CONCRETE

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies the requirements for design and preparation of the concrete mix, handling, placing, finishing and curing of cast-in-place concrete.

1.2 Related Work

- | | | |
|----|------------------------|---------------|
| .1 | Summary of Work | Section 01010 |
| .2 | Site Work | Section 02224 |
| .3 | Concrete Formwork | Section 03100 |
| .4 | Concrete Reinforcement | Section 03200 |

1.3 Reference Standards

- | | | |
|----|--|------------------|
| .1 | Concrete Materials and Methods of Concrete Construction | CAN/CSA - A23.1 |
| .2 | Methods of Test for Concrete | CAN/CSA - A23.2 |
| .3 | Portland Cement | CAN/CSA - A5 |
| .4 | Chemical Admixtures for Concrete | CAN/CSA - A266.2 |
| .5 | Air-Entraining Admixtures for Concrete | CAN/CSA - A266.1 |
| .6 | Have available on site one copy of CAN - A - 23.1 and CAN - A23.2. These CSA Standards shall form the basis for acceptable standards of concrete practice and methods. | |

1.4 Submissions

- .1 Submit mix design and aggregate gradation curves for review at least 10 days in advance of concreting.
- .2 Submit samples of aggregates, water and cement to be used, to an approved testing agency, if required by the Engineer.
- .3 Submit schedule of proposed construction joints to the Engineer for review.

1.5 Quality Control Testing

- .1 The Contractor will retain and pay for the services of an independent testing agency for testing as follows.
- .2 Allow for casual labour and expenses in conjunction with testing.
- .3 Concrete cylinder tests required for structural concrete:
 - .1 At least one set of 3 cylinders will be made for each type of concrete mix, for each day's concreting, or for each 40 cubic metres of concrete placed.

- .2 Cylinders shall be taken at the point of deposit of the concrete.
- .3 For each test slump, air content will be taken and 3 standard cylinders will be prepared and cured under laboratory conditions.
- .4 One cylinder from each test will be broken at 7 days and the remaining cylinders broken at 28 days.
- .5 When temperatures are below 5°C, additional field-cured cylinders will be prepared to verify that adequate strength is attained.
- .4 Test results shall be distributed directly from the test laboratory to the Engineer and to the Contractor.
- .5 Test reports shall include:
 - .1 Project name
 - .2 Date and time of sampling
 - .3 Supply method
 - .4 Specified strength and admixtures
 - .5 Cement type
 - .6 Exact location in structure
 - .7 Slump and air content
 - .8 Maximum aggregate size
 - .9 Test strength and age at time of test
 - .10 Date cylinder received by lab
 - .11 Testing technician identification
 - .12 Weather and temperature information
- .6 If any tests reveal concrete not meeting specifications, the Engineer may enforce one or more remedial procedures such as:
 - .1 Change in mix design
 - .2 Change in concrete supplier
 - .3 Additional testing by coring or impact hammer
 - .4 Replacement of work
 - .5 Other procedures as necessary
- .7 The costs of remedial work to bring concrete to meet specifications shall be borne by the Contractor.
- .8 Refer to Section 01400 - Quality Control.

1.6 Quality Assurance Testing

- .1 The Owner may retain and pay for the services of an independent testing agency for testing for quality assurance for the Owner's purposes.
- .2 Site Mixed Concrete:
 - .1 Prior to pouring any site mixed concrete the Contractor will submit a mix design and conduct a trial concrete pour, using the proposed mix design and the proposed mixing methods. A set of three concrete test cylinders will be

cast and tested. Slump testing and air entrainment testing will also be employed.

- .2 Measurements for mixing of concrete will be done by weighing of the components or by standard volume measurements approved by the Engineer. Measurement of volume by shovel is **not** permitted.
- .3 If the concrete cylinders do not achieve the required strengths, the Contractor will modify the mix design and retest until a satisfactory mix is achieved. Cost for retesting will be borne by the Contractor.
- .4 Once a procedure is approved, the mixing methods shall not vary.
- .5 Allow at least one month for approval of the test results prior to a concrete pour.

1.7 Product Delivery, Storage and Handling

- .1 Store all material in accordance with CAN - A23.1, Storage of Materials, except as otherwise noted.
- .2 Store each shipment of cement separately to provide access to identification and inspection of each shipment.
- .3 Clean stockpile areas of foreign materials.
- .4 Do not use stockpiled material within 150mm of the ground surface if the stockpile is placed directly on the ground.

PART 2 – PRODUCTS

2.1 Cement

- .1 Cement shall conform to CAN - A5 Portland Cement.
- .2 Use Type 10 Normal Portland Cement unless specified otherwise.

2.2 Water

- .1 Potable water, free of oily substances, alkaline or other organic matter shall be used. Seawater shall not be used.

2.3 Fine and Coarse Aggregates

- .1 All aggregates shall conform to CAN - A23.1.

2.4 Air Entrainment Admixtures

- .1 Air entrainment shall be to CAN - A266.1. SICA AEA air entrainment admixture, or equivalent, may be used with dosage to manufacturer's recommendations.
- .2 No other air entrainment admixture shall be used, regardless of the type of cement selected, unless approved by the Engineer.

2.5 Chemical Admixtures

- .1 Chemical admixtures shall conform to CAN - A266.2.
- .2 Use chemical admixtures only as approved by the Engineer.

2.6 Vapour Barrier

- .1 A 0.15mm (6mil) polyethylene vapour barrier, with 150mm laps, taped and sealed, shall be used, except where noted otherwise on the Drawings.

2.7 Concrete Curing Compound

- .1 Chlorinated rubber type curing compound conforming to CAN - A23.1, Type 1, may be used with the approval of the Engineer.

2.8 Concrete Mix Requirements

- .1 Unless indicated otherwise, the concrete mix design shall conform to the following:

Structural Component	Aggregate Size mm	Minimum Concrete Strength MPa (28 days)	Slump mm	Cement Type	Percent Air Entrainment
Slab on Grade	20	30	75	10	4 - 6
Structural Slab, Wall, Columns and Beams	20	30	75	10	4 - 6
Sidewalks	20	30	25 - 75	10	5 - 7
Other	20	30	75	10	5 - 7

2.9 Mixing

- .1 Ready-mixed concrete:
 - .1 Mix: premixed or Transit-mixed concrete according to CAN - A23.1 and to ASTM C94.
 - .2 Ensure that the concrete supplier has sufficient plant capacity and transporting apparatus to provide delivery so that the interval between successive loads does not exceed 15 minutes.
- .2 Site-mixed concrete shall be in accordance with CAN - A23.1.

PART 3 – EXECUTION

3.1 Inspection

- .1 The Engineer will inspect forms, foundations, reinforcing steel, construction joints, mixing, conveying and placing equipment before concreting.

3.2 Preparation

- .1 Do not place concrete on soil that has been softened by mechanical disturbance or moisture.
- .2 Re-tighten forms at construction joints.
- .3 Roughen, thoroughly remove foreign matter and laitance, and saturate the hardened concrete at construction joints with water prior to concreting.
- .4 Make suitable arrangements to protect fresh concrete from damage due to adverse weather conditions, such as rain, wind or extreme temperatures.
- .5 **Concrete shall not be poured** against frozen ground, frozen concrete or into frosted formwork.
- .6 Prepare all sleeves and ducts to be cast into concrete at the same time as the concrete formwork, to ensure that correct assembly and fit is obtained.
- .7 Check mechanical drawings for sleeves, inserts, etc.
- .8 Set sleeves, ties, anchor bolts, pipe hangers and other inserts and openings in concrete floors and walls as required.

3.3 Placing of Concrete

- .1 Place concrete according to CAN - A23.1, and as specified herein.
- .2 All formwork shall be cleaned of all debris, loose material, snow and ice immediately prior to pouring.
- .3 Ensure proper placement and support of reinforcement and embedded material immediately ahead of a pour.
- .4 Do not temporarily displace reinforcement for convenience in placing concrete.
- .5 Do not use wood or other temporary spreaders or spacers.
- .6 Do not insert reinforcement into fresh concrete.
- .7 Confine concrete in a suitable vertical drop pipe to within 1,000mm or less of the concrete in place.
- .8 Set screeds accurately for level surfaces or to maintain cambers as required.
- .9 Ensure that concrete is adequately consolidated in the forms.

- .10 Place concrete in such a manner that the concrete in the form is still plastic and can be integrated with fresh concrete.
- .11 To prevent segregation, deposit concrete in horizontal layers 300mm to 450mm in thickness, as near as possible to its final position.

3.4 Cold Weather Placing

- .1 When the air temperature is at or below 5°C, or when there is a possibility of it falling to that limit within 24 hours of placing, the requirements according to CAN -A23.1 shall be met.
- .2 No calcium chloride shall to be used.
- .3 Withdraw protection and heating gradually, so that air temperature around the concrete does not drop more than 15°C per day.
- .4 Concrete shall be protected from alternate freezing and thawing for 14 days.
- .5 Provide enclosures for heating such that air circulation is maintained.
- .6 Frozen concrete will be rejected.

3.5 Hot Weather Placing

- .1 Hot weather shall be considered to be an air temperature, in the shade, of 23° C or greater.
- .2 Hot weather methods shall conform to CAN - A23.1.
- .3 The concrete temperature at the time of placing in hot weather shall not exceed those specified in CAN - A23.1. In the event that this limit is exceeded, the concrete operations shall be suspended until the constituent materials of concrete are cooled.
- .4 Retarding admixtures shall only be used, if approved by the Engineer, prior to use in the concrete.
- .5 The use of ice may be required to lower the temperature of concrete for large pours.

3.6 Joints

- .1 Construction, and/or control joints shall be provided where required, and as shown on the plans or according to CAN - A23.1. Control joints shall be spaced at maximum 6 metres, unless otherwise indicated.
- .2 Carefully finish all face edges exposed to view true to line and elevation. Apply a neat cement paste or approved bonding agent to the hardened concrete immediately in advance of the fresh concrete.
- .3 At watertight horizontal joints, apply the first layer of new concrete above the joint with an excess of mortar, obtained by omitting 20 to 50 percent of coarse aggregate from the normal mix.

- .4 Make all construction or control joints in accordance with details shown on the Shop Drawings. The layout shall be submitted, by the Contractor, for approval by Engineer.
- .5 Allow at least 2 hours after placing concrete in supporting columns or walls before placing beams, girders or slabs above.
- .6 Place beams, girders, brackets, column capitals and haunches monolithically with the floor system, unless otherwise approved by the Engineer.
- .7 See typical details for isolation joints at columns, and other locations.
- .8 Construction joint layouts shown on the Drawings take precedence over the above requirements.

3.7 Vapour Barrier

- .1 Install vapour barrier under concrete slabs-on-grade.
- .2 Lap vapour barrier a minimum of 150mm at joints and seal with mastic cement.
- .3 Seal punctures in vapour barrier before placing concrete. Use vapour barrier material at least 150mm larger than puncture and seal each patch with mastic cement.

3.8 Curing

- .1 Curing shall be according to CAN - A23.1 and as specified herein.
- .2 Prevent loss of moisture from concrete surfaces for at least 7 days after concreting.
- .3 Protect unformed surfaces using the following methods, subject to approval by the Engineer.
 - .1 Curing compound
 - .2 Waterproof covering
 - .3 Sprinkling or ponding
 - .4 Damp sand, burlap or other suitable material
- .4 Protect formed surfaces as follows, subject to approval by the Engineer.
 - .1 Leave forms in place and keep concrete wet by pouring water between concrete and forms.
- .5 Maintain concrete temperatures as recommended according to CAN - A23.1.

3.9 Patching and Finishing of Hardened Concrete

- .1 Patching, if required and if allowed, shall be done immediately after stripping.
- .2 Methods of patching and repair shall be submitted to the Engineer and accepted before repair work is started.

- .3 All form ties shall be cut back a minimum of 25mm and all tie holes shall be neatly patched and rubbed down.

3.10 Damp Proofing and Waterproofing

- .1 Preparation of concrete surfaces for damp proofing and waterproofing shall conform to CAN - A23.1.
- .2 Application of damp proofing and waterproofing shall conform to manufacturer's recommendations.

3.11 Concrete Specialties

- .1 Provide and install all concrete specialties as shown on the Drawings, and/or as necessary to complete the concrete work.
- .2 Included are fibreboard expansion joint covers, water stop and bond breakers.

END OF SECTION 03300

DIVISION 5 - SECTION 05120

STRUCTURAL STEEL

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies the requirements for supply, fabrication and installation of structural steel.
- .2 The Work includes design, installation and removal of any bracing or other measures necessary to ensure stability of the steel framework during construction.

1.2 Related Work

- | | | |
|----|---------------------|---------------|
| .1 | Summary of Work | Section 01010 |
| .2 | Site Work | Section 02224 |
| .3 | Miscellaneous Metal | Section 05500 |
| .4 | Painting | Section 09900 |

1.3 Reference Standards (latest edition)

- | | | |
|----|---|-----------------|
| .1 | Steel Structures for Buildings | CAN/CSA 3-S16 |
| .2 | Welded Steel Construction (Metal Arc Welding) | CSA-W59 |
| .3 | Structural Quality Steels | CAN/CSA -G40.21 |

1.4 Design

- .1 Design in accordance with standards in Clause 1.3 above.
- .2 Design all the temporary systems to maintain stability of the Work at all phases of construction.
- .3 Design of all members and connections not detailed on the Project Drawings shall be carried out and stamped by a Professional Engineer registered in the Northwest Territories.

1.5 Submissions

- .1 Submit mill test certificates for the material supplied, as requested by the Engineer.
- .2 Submit erection diagram and shop detail drawings for review by the Engineer ten (10) days in advance of fabrication.
- .3 Complete shop fabrication and erection drawings shall be provided for all work and items.
- .4 Provide separate layout plans and setting details for all bearing and attachment devices supplied under this Section.
- .5 Shop drawings shall include details of all temporary bracing systems required for stability during construction, and shall show the extent of prior work that is required to be in place for the temporary bracing system.

- .6 Bracing and stability systems, as shown on Project Drawings, are for stability of the completed structure and shall not be assumed as adequate for the various stages of construction.
- .7 Before the placing of material orders, the Contractor shall submit for review by the Engineer, sketch drawings showing the general description of the proposed fabrication scheme. This shall include the general arrangement of plates or shapes, the location of all shop and field splices, and such other information as may be required by the Engineer to permit an assessment of the acceptability of the proposal.
- .8 Shop drawings showing all details shall be prepared by the Contractor and submitted for review by the Engineer prior to fabrication.
- .9 Fabrication executed before review of the shop drawings shall be at the Contractor's own risk.
- .10 In addition to specific details, the shop drawings must include the following items:
 - .1 Drawings showing details of connections designed by the Contractor.
 - .2 All dimensions shall be correct at 20°C unless otherwise shown.
 - .3 Weld procedure identification shall be shown on the shop detail drawings.
 - .4 All material splice locations shall be shown on the Drawings.
- .11 The Contractor shall submit copies of erection diagrams to the Engineer three weeks in advance of the scheduled start of erection. The proposal shall include all drawings and documents necessary to describe the following:
 - .1 Access to work.
 - .2 Sequence of Operation: Position of cranes, trucks with members and traffic accommodations.
 - .3 Position of Cranes: Particularly relative to substructure elements such as abutment backwalls, with details of load distribution of wheels and outriggers.
 - .4 Lifting Devices and Lifting Points: Devices shall grip girders near web/flange joints, not at outside edges of flange.
- .12 All shop drawings, details, and erection drawings shall be signed and sealed by a Professional Engineer registered in the Northwest Territories. Drawings not sealed will be rejected unchecked.

1.6 Quality Control

- .1 Refer to Section 01400, Quality Control.
- .2 The Contractor shall perform as many tests as are necessary to ensure that the Work conforms to the requirements of the Contract.

- .3 Inspections and tests shall include fabrication, welding and fastening.

PART 2 – PRODUCTS

(all standards shall be to the latest edition)

2.1 Structural Steel

- .1 Unless noted otherwise, steel to conform to the following.
- .2 Steel Sections and Plate: to CAN/CSA -G40.21-300W.
- .3 Hollow Structural Sections: to CAN/CSA -G40.21- 350W Class C or H.
- .4 Structural pipe: to CSA Z245.1, ASTM A 36, Grade B or ASTM A 53, Grade B or equivalent. Low temperature structural pipe: to ASTM A 333

2.2 Bolts

- .1 Bolts, nuts and washers: to ASTM A325.
- .2 Anchor bolts, studs, nuts and washers: to ASTM A307.

2.3 Welding

- .1 Welded steel construction (metal arc welding): to CSA-W59M.
- .2 Certified electrodes and welding procedures: to CSA W48 series.

2.4 Primer

- .1 Shop paint primer shall be applied as specified in Section 09900, Painting.

2.5 Hot Dip Galvanizing

- .1 Hot Dip galvanizing shall be to CSA-G164-M.

PART 3 – EXECUTION

3.1 Inspection

- .1 Notify the Engineer in advance as required to allow inspection of fabrication (including welding) and erection.
- .2 Provide access to allow inspection of fit-up, welding, bolting and other aspects of the Work.

3.2 Surface Preparation, Priming and Painting

- .1 Shop painting to be as specified in Section 09900, Painting.
- .2 Blast cleaning: Unless otherwise noted, all steel components shall be blast cleaned after fabrication in accordance with the Society for Protective Coatings standard (SPC) No. SP6, Commercial Blast Cleaning. Essentially, this is a surface from which

all oil, grease, dirt, rust, scale and foreign matter have been completely removed except for slight shadows, streaks, or discolourations caused by rust stain or mill scale oxide binder.

- .3 Any damage on galvanized metal shall be given one coat of touch-up coating for galvanized metal with a prime coat of polyvinyl-butyl wash primer.
- .4 Shop Primer: Unless otherwise noted, all steel surfaces shall receive one shop coat of inorganic zinc primer. Contact surfaces and areas in contact with concrete shall be blast cleaned, but not painted, and shall be kept free from over spray.
- .5 Application Conditions: Application of primer or paint must be maintained at a temperature of not less than 5°C, for a period of not less than 12 hours, to dry the paint. During primer application and curing, all necessary means shall be taken to assure that the members are protected against the effects of weather. Primer shall not be applied over damp or frosted surfaces.

3.3 Fabrication

- .1 Take field measurements as necessary to ensure that items fabricated in the shop will fit the structure.
- .2 Reinforce hanger holes or openings for pipes or ducts with steel plates sized and welded in place to restore member to original design strength.
- .3 Provide holes for attachment of other work only after obtaining Engineer's approval.

3.4 Welding

- .1 Shop Qualifications: The Contractor shall be fully approved by the Canadian Welding Bureau (CWB) as per CSA-W47.1. Welding procedures shall be submitted for each type of weld used in the structure. The procedures shall bear the approval of the Canadian Welding Bureau and must also be approved by the Engineer prior to use on the structure.
- .2 Welder Qualifications: Only welders, welding operators and tackers approved by the Canadian Welding Bureau, in the particular category, may be permitted to perform weldments. Their qualifications must be current and be available for examination by the Engineer.
- .3 Welding Code: Except as otherwise noted on the Drawings, all welding, cutting and preparation shall be in accordance with the CSA-W59.
- .4 Cleaning: All weld areas shall be clean and free of mill scale, dirt, grease, paint, etc., prior to welding.
- .5 Preheat material and provide heated enclosures as required for all field welding or cutting to maintain the steel at temperatures above 10°C, unless qualified procedures are in place for welding at lower temperatures.
- .6 Filler Metals: Low hydrogen electrodes, fluxes and low hydrogen welding practices are to be used throughout. The low hydrogen covering and flux shall be protected

and stored in a warm dry container, as specified by CSA-W59.

- .7 Automatic Welding Process: All flanges and web butt joints and all stiffener to web fillet welds shall be made by an approved semi or fully automatic submerged arc process. All webs to flange fillet welds shall be made by an approved fully automatic submerged process. These weld areas must be clean, free of mill scale, dirt, grease, etc., and be preheated as required, just prior to welding.
- .8 Tack and Temporary Welds: Tack and temporary welds are not allowed, unless they are to be incorporated in the final weld.
- .9 Methods of Weld Repair: Repair procedures for unsatisfactory welds must be submitted for approval by the Engineer prior to Work commencing.
- .10 Arc Strikes: Arc strikes shall not be permitted. In the event of accidental arc strikes, the Contractor shall submit to the Engineer for approval his proposed repair procedure. The repair procedure shall include the complete grinding out of the crater produced by the arc strike. These areas shall be examined by the Engineer to ensure complete removal of the metal in the affected area.
- .11 Grinding of Welds: Web members to chord members shall be ground flush in all locations exposed to view. All other welds ground to meet the requirements of CSA-W59-M.

3.5 Material Splices

- .1 Additional splices, other than those shown on the detail drawings, will require approval of the Engineer. The Contractor shall bear the cost of inspection of these splices.

3.6 Handling and Storage

- .1 All lifting and handling shall be done using devices that do not mark, damage, or distort the assemblies or members in any way. Girders shall be stored upright, supported on sufficient skids and safely shored to maintain the proper section without buckling, twisting, or any other damage or misalignment to the material.

3.7 Approval of Erection Scheme

- .1 Before starting the Work of erection, the Contractor shall inform the Engineer fully in writing as to the method of erection he proposes to follow, and the amount and character of equipment he proposes to use. This work plan shall be subject to the approval of the Engineer. The Engineer's approval shall not be considered to be relieving the Contractor of the responsibility for the safety of his methods or equipment, nor from carrying out the Work in full accordance with the Drawings and Specifications. No work shall be done until such written approval, by the Engineer, has been obtained.
- .2 Erect in accordance with CAN/CSA -S16.1.
- .3 Final touch up of the primer coating shall be carried out for complete coverage of the steelwork, including all field connections.

- .4 Provide details of blocking for bearings, where necessary, to restrain movements due to horizontal forces and/or gravity effects.
- .5 Provide details of grouting procedures, including design mix and aggregate gradation of grout, or specifications for other materials, proposed for setting anchor bolts and/or constructing grout pads. Non-metallic, non-shrink grout shall be used.
- .6 Carry out field measurements of the constructed substructure.
- .7 Bearing and Anchorage:
 - .1 Bearing plates shall not be placed upon bearing areas which are improperly finished, deformed, or irregular.
 - .2 Bearing plates shall be set level and in exact position.
 - .3 The Contractor shall accurately set anchor bolts, except where bolts are cast into concrete, which he shall coordinate in order to ensure their correct locations.
 - .4 When bearings are employed in conjunction with grout pockets in the substructure, bearings shall be set accurately on steel shims and grouted as detailed on the Drawings after erection has been completed.

END OF SECTION 05120

DIVISION 5 - SECTION 05500

MISCELLANEOUS METAL

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies requirements for the supply, fabrication and installation of miscellaneous metals, including stiles, catwalks, stairways, pipe supports, sea hose anchors and bollards.

1.2 Related Work

- | | | |
|----|------------------------|---------------|
| .1 | Summary of Work | Section 01010 |
| .2 | Site Work | Section 02224 |
| .3 | Cast-in-Place Concrete | Section 03300 |
| .4 | Structural Steel | Section 05120 |
| .5 | Painting | Section 09900 |

1.3 Reference Standards

- .1 Materials shall be in accordance with the latest edition of CSA, CGSB, ASTM and any other applicable Standards.
- .2 Submit mill test certificates for the materials supplied, as requested by the Engineer.

1.4 Quality Assurance

- .1 Employ tradesmen skilled in the trade and proficient in the use of the various materials specified.
- .2 Perform Work in accordance with material manufacturers' instructions.
- .3 Refer to Section 01400, Quality Control.

1.5 Submissions

- .1 Submit detailed shop drawings for all miscellaneous metals, showing fabrication and erection details. Design of all connections to be carried out and sealed by a Professional Engineer registered in the Northwest Territories.
- .2 Submit examples of aluminum or galvanized steel grating, handrails, and ladders for review and approval by the Engineer.
- .3 Submit details and shop drawings for review and approval, by the Engineer, at least 10 days in advance of fabrication.

1.6 Product Delivery, Storage, Handling

- .1 Deliver items on site in a safe manner.
- .2 Deliver items in sufficient quantity to allow continuity of Work.
- .3 Deliver products to the site in the largest practical sections. Tag and mark items for identification.
- .4 Deliver items to be built in adjoining construction at proper time.

- .5 Store items on site under cover in positions to ensure that no bending, warping or marring takes place.
- .6 Prevent staining by concrete, mortar, plaster, oil, grease or other foreign substances.
- .7 Do not paint or place crayon or other markings on exposed surfaces.

1.7 Job Conditions

- .1 Give timely and accurate instructions to other trades for locations, levels, holes, and connections of anchors, sleeves and frames.
- .2 Examine site conditions and take site measurements to ensure accurate and proper fitting, and clearance of obstructions.

PART 2 – PRODUCTS

2.1 Materials

- .1 Steel: to conform to CSA-G40.21-M, Grade 300W.
- .2 Steel pipe: to conform to ASTM A53 Grade B or equal. Thickness of pipe wall to suit the application.
- .3 Aluminum: to Alloy 6063-T6; 6351-T6 and 6061-T6 as specified herein.
- .4 Galvanizing: to conform to CSA-G164-M.
- .5 Stainless Steel: to ASTM A167 or A276, type 304 or Type 316, as shown on the Drawings.

2.2 Fastenings and Anchor Bolts

- .1 Nuts, bolts, washers, rivets and screws: to ASTM A325M.
- .2 Anchor bolts: to ASTM A307, unless specified otherwise.
- .3 For fastenings in stainless steel and aluminum, use stainless steel ASTM A167, Type 316 ELC.
- .4 All welding shall conform to CSA W47.1 and CSA W59. Use E70XX electrodes.
- .5 For anchors or fastening required to fix equipment after concrete has been poured, use anchorage in accordance with the equipment Manufacturer's recommendations.
- .6 Provide angles, brackets, inserts, bolts, frames and all other items required to fasten metalwork to concrete, to metal framing or other parts of the structure, as shown on the Drawings.

2.3 Corrosion Protection

- .1 Clean and paint all steel to conform to Section 09900, Painting.
- .2 Use stainless steel where shown on Drawings.
- .3 Hot dip galvanize all ferrous metal fixings and miscellaneous parts, including hangers, bolts, nuts and washers. Galvanize in accordance with CSA-G164M.

2.4 Steel Grating

- .1 Design grating for uniform live load not less than 4.8kN/m^2 or a point load of 8.0kN whichever produces largest stresses with maximum live load deflection $1/240$ of span, or maximum of 6mm .
- .2 Where removable sections of grating are called for, they shall be installed in sections not exceeding 0.25kN in weight.
- .3 Band around openings with 3mm thick by 38mm high steel plate leaving 25mm clearance all around openings. All edges to be banded, see details on Drawings.
- .4 Grating to be Safety-Grip® grating, pre-galvanized steel, standard lock channels as manufactured by IGS Safety Grating Products Ltd., or approved equivalent.
- .5 Submit shop drawings of grating for approval of the Engineer, including grating fastening details including sizes, gauges and centres.

2.5 Stair Treads

- .1 Design treads for uniform live load not less than 4.8kN/m^2 or point load of 8.0kN , whichever produces largest stresses, with maximum live load deflection of $1/240$ of span, or maximum 6mm .

2.6 Checker Plate

- .1 Frames and covers - clear anodized aluminum to CSA HA Series.
- .2 Frames - (steel) structural sections with mitered corners, anchor lugs and flat surround, as detailed on Drawings.
- .3 Covers - raised, frame diamond pattern checker plate with frame and lifting handles of Stainless Steel, Type 304 or 316.
- .4 Design - for loads and deflection limits as specified for gratings.
- .5 Minimum thickness 6mm , not including raised diamonds, unless specified otherwise.

2.7 Safety Chains

- .1 Removable 5mm proof chain $13\text{mm} \times 29\text{mm}$ c/w oval shaped 316 SS stainless steel links, snap hooks and eyes, unless noted otherwise.

2.8 Lifting Hooks and Rail Supports

- .1 Lifting hooks and rail supports shall be installed according to details on Drawings.
- .2 Hot dip galvanized steel construction.
- .3 Submit shop drawings.

PART 3 – EXECUTION

3.1 Inspection

- .1 Notify the Engineer to allow inspection of fit, welding, bolting and other items.
- .2 Take field measurements as necessary to ensure proper fit of miscellaneous metal items into structures.

3.2 Fabrication

- .1 Perform steel welding according to CSA W47.1 and W59 Specifications. All electrodes to be E70XX.
- .2 Perform aluminum welding according to CSA S244.
- .3 Trim and bevel ends and other items to enable satisfactory welding.
- .4 Keep painting back from areas requiring welding after fabrication.

3.3 Finishing

- .1 Apply touch up paint for galvanized metal after applying a coat of polyvinyl butyral wash primer.
- .2 Clean and touch up shop primer after installation.
- .3 Refer to Section 09900, Painting, for details of finishes.

3.4 Fastening, Anchoring

- .1 Cast anchor bolts in concrete, as shown on the Drawings.
- .2 Do not use self-drilling anchors or friction anchors where cast-in-place anchor bolts are specified.

3.5 Installation

- .1 Aluminum plates cast into concrete shall be coated with bitumastic to prevent contact between aluminum and concrete.

3.6 Installation of Handrail

- .1 Affix welded steel hand railing to the locations shown on the Project Drawings.
- .2 Provide continuous top rail across the top of the posts and fit the mid-height and kick plates between the posts. Maximum spacing between posts 1.4 metres, unless otherwise indicated on Drawings. Join railings as required.
- .3 Grind, polish and buff welds to a smooth even finish. Ensure the overall finish of the hand railing is even prior to painting. Restrict face width of weld and grinding to 30mm.
- .4 Provide hand railing as detailed on Drawings, and provide handrail posts at every change in direction. Provide smooth transition between handrails (no sharp offsets will be allowed).
- .5 Where called for, removable posts and handrail sections as detailed on Project Drawings.
- .6 Set posts vertical and in line, one with others, both in line of the railings and structure. Erect rails horizontal without wave or bend in any direction to the configuration exactly fitting supporting structures.
- .7 **Handrails on vertical tank roofs shall not be continuous**, if the frangible shell to roof weld is to be effective in acting as an emergency vent failure joint.

3.7 Installation of Grating and Treads

- .1 Unless indicated otherwise, grating sections shall be welded to the supporting structures. Uniform rigidity between supports can be achieved by welding adjacent grating channels together. Grating sections may also be fastened to the steel supports with galvanized bolts and 'S' hook assemblies as per manufacturer's standard practice.
- .2 Stairway treads shall be welded to stringers all around.

3.8 Stiles, Stairways and Catwalks

- .1 Construction shall be all welded construction, except where shown otherwise on the Drawings.
- .2 Provide shop drawings for approval by the Engineer prior to fabrication.
- .3 Catwalks and saddles at horizontal tanks **shall not be welded** to the tank shells.
- .4 No welding or open flame shall be permitted at or near tanks or piping which contain product, or which have not previously been rendered safe by gas freeing. See Sections 15010 and 15060 for details.

3.9 Checker Plate

- .1 Provide checker plate covers and frames where shown on the Drawings.

- .2 Frames to consist of angle mitered at corners, complete with anchors and packing bars. Covers to be fitted with lifting handles and neoprene gaskets.

3.10 Access Ladders

- .1 Position access ladders as shown on the Project Drawings.
- .2 Access ladders to be in accordance with details on Drawings.

3.11 Removable Safety Chains

- .1 Removable safety chains shall be complete with approved snap hooks fastened at each end to posts, all in 304 or 316 Stainless Steel.
- .2 Provide 20mm diameter eyes fixed on posts.

3.12 Ladder Rungs

- .1 Position ladder rungs as indicated on Drawings.

3.13 Pipe Supports, Spill Basins, Sea Hose Anchors, Spill Pads and Bollards

- .1 Pipe supports shall be provided at the facilities for pipelines and for piping where indicated on the Project Drawings.
- .2 Where practical, all steel to be painted should be shop blasted and prime coated per Section 09900, Painting, with inorganic zinc primer, before shipping. Field painting of structures and miscellaneous steel shall be as specified in Section 09900, Painting.
- .3 The maximum spacing of pipe supports inside and outside diked areas shall be as per the following (unless noted otherwise on the Project Drawings):

Pipe Size mm	Spacing of Supports mm
50	3 000
75	4 300
100	4 600
150	6 000

- .4 Granular pads shall be provided under pipe supports, as per Section 02224, Site Work.
- .5 Sea hose anchors and bollards shall be provided where called for on the Project Drawings.

END OF SECTION 05500

DIVISION 9 – SECTION 09900

PAINTING

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PART 1 – GENERAL

1.1 Scope

- .1 It is the intent of this Specification to provide for the complete painting of fuel storage facilities, phased in accordance with the equipment and material delivery schedules and weather conditions. Shop blasting and priming is encouraged wherever practical.

1.2 Reference Standards

- .1 Society for Protective Coatings (SSPC)

<u>SSPC Specification</u>	<u>Title</u>
SP1	Solvent Cleaning
SP2	Hand Tool Cleaning
SP3	Power Tool Cleaning
SP5/NACE 1	White Metal Blast Cleaning
SP6/NACE 3	Commercial Blast Cleaning
SP7/NACE 4	Brush-off Blast Cleaning
SP10/NACE 2	Near White Metal Blast Cleaning
SPI2/NACE 5	High Pressure Water Jetting
SSPC VIS.1	Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning
SSPC VIS.2	Visual Standard No. 2, Standard Method of Evaluating Degree of Rusting on Painted Steel Surfaces
PA 1	Shop, Field and Maintenance Painting of Steel
PA 2	Measurement of Dry Paint Thickness with Magnetic Gauges
PA 8/NACE 11	Thin-Film Organic Linings Applied in New Carbon Steel Process Vessels

- .2 American Society for Testing and Materials (ASTM)

<u>ASTM Specification</u>	<u>Title</u>
D1186	Measurement of Dry Film Thickness of Non-magnetic Organic Coatings Applied on a Magnetic Base
D2200	Pictorial Surface Preparation Standards for Painting Steel Surfaces

1.3 Submissions

- .1 Submit full details of all products to be used for approval by the Engineer. List each product in relation to finish formula and include the following:
 - .1 Finish formula designation
 - .2 Product type and use

- .3 Canadian Government Standards Board (CGSB) number
- .4 Manufacturer's product number
- .5 Colour number [numbers]
- .6 Manufacturer's Material Safety Data Sheets (MSDS)
- .7 Maximum VOC classification
- .8 ECOLOGO certification
- .2 Submit manufacturer's application instructions for each product specified for prior approval by the Engineer. Bind reviewed copy into operations and maintenance manuals.
- .3 Submit full range of colour chips to be utilized on this Contract in accordance with Section 01340, Shop Drawings. Indicate location for each colour.

1.4 Quality Assurance

- .1 Retain purchase orders, invoices and other documents to prove that all materials utilized in this contract meet the requirements of the Specifications. Produce documents when requested by the Engineer.
- .2 The surface preparation methods as described by the Society for Protective Coatings (SSPC) are the minimum preparation specifications for each system. Proper surface preparation is essential.
- .3 The materials approved in this Specification are designed for application by **professionally trained personnel**, using proper equipment under controlled conditions, and in accordance with SSPC, PA 1, Shop, Field and Maintenance Painting of Steel. Before using any of the products, the manufacturer's product data sheets, application procedures and safety precautions must be read and thoroughly understood.
- .4 The surface preparation, primer and finish coats for painting tankage, piping and steelwork, in the particular location for this Work (the mild Mackenzie Valley region or the severe Arctic coast region) requires the preparation and application of one of the painting systems, as summarized in the following tables:
 - **Table 4- Epoxy Coating System Summary**
 - **Table 5- Moisture Cure Polyurethane Coating System Summary**
 - **Table 6- Encapsulating RAVCS Paint System Summary (Interior Region)**
 - **Table 7- Encapsulating Urethane Paint System Summary (Interior Region)**

Specification Note: Specifier to select a painting system table for the particular project and location, and delete reference to the unsued systems.

- .5 All work and materials applied under this Specification shall be subject to inspection by the Engineer, or his designated representative.

1.5 Delivery, Storage and Handling

- .1 Prior to purchasing paint materials obtain written confirmation from the manufacturer, that the paint materials can be stored for a year without problems, and under what conditions. This requires that newly manufactured paint materials be supplied. Painting needs to be applied during the best weather, usually June, July and August, requiring that the paint materials be delivered on the sealift of the previous year, unless the materials are flown to site.
- .2 Deliver and store materials in original containers, sealed, with labels intact.
- .3 Indicate on containers or wrappings:
 - .1 Manufacturer's name and address
 - .2 Type of paint
 - .3 Compliance with applicable standard
 - .4 Colour number in accordance with established colour schedule
 - .5 Expiry date of coating materials
- .4 Remove damaged, opened and rejected materials from site.
- .5 Provide and maintain a dry, temperature controlled, weatherproof, secure storage.
- .6 Observe manufacturer's recommendations for storage and handling.
- .7 Store materials and supplies away from heat generating devices.
- .8 Store materials and equipment in a well ventilated area with a temperature range of 7°C to 30°C. Extreme ambient temperature changes, +30°C to -46°C, are common in most regions and are detrimental to paint storage.
- .9 Store temperature-sensitive products above minimum temperature, as recommended by the manufacturer.
- .10 Keep areas used for storage, cleaning and preparation, clean and orderly to the approval of the Engineer. After completion of operations, return areas to clean condition to the approval of the Engineer.
- .11 Provide a minimum of one 9kg, Type ABC, dry chemical, fire extinguisher adjacent to the storage area.
- .12 Remove only in quantities required for same day use.
- .13 Fire Safety Requirements:
 - .1 Store oily rags, waste products, empty containers and materials subject to

spontaneous combustion in ULC-approved, sealed containers and remove from site on a daily basis.

- .2 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada and the Canadian Environmental Protection Act.

1.6 Environmental Requirements

- .1 Painting shall **not** be carried out:
 - .1 During a rain if the surface to be painted will be exposed to or is wetted by rain.
 - .2 When the temperature of the air, product and the steel surface to be painted is lower than 5°C, or when less than 3°C above the dew point, **unless approved, in writing, by the paint manufacturer.**
 - .3 When the relative humidity is greater than 85%, **unless approved, in writing, by the paint manufacturer.**
 - .4 If the atmospheric temperature is expected to drop below 0°C before the paint is dry, **unless otherwise recommended, in writing, by the paint manufacturer.**
- .2 If agreed upon with the Engineer, and where it is practical to do so, painting may be carried out when the outside temperatures are below the minimum described above, provided that heated shelter conditions are employed in which the paint work is protected from rain, sleet, snow and the temperature of the air and steel substrate, and paint is maintained at not less than the minimum specified above. **Open flame heaters shall not be used because combustion moisture and oil fumes tend to condense on the colder steel resulting in loss of coating bond when the weather warms.**
- .3 Adequate ventilation shall be supplied in the sheltered areas, so that a buildup of toxic and/or flammable fumes does not occur which would present a fire, explosion or health hazard to the workers.
- .4 The shelter conditions shall be maintained during the painting, and for a sufficient length of time after the painting, such that the coatings will have dried or cured sufficiently, that recoating will not produce such deleterious effects as lifting, loss of adhesion, or loss of serviceability.
- .5 Information should be obtained from the paint manufacturer concerning the period that his product shall be sheltered.

1.7 Safety Precautions

- .1 Along with the safety procedures described below, the Contractor shall comply with the General Requirements of the Contract.

- .2 Many of the paints and coatings listed in this Specification contain volatile and flammable solvents, oils and resins. Therefore, to ensure safety, the precautions identified by the paint manufacturer must be adhered to and all sources of ignition, i.e., flames, sparks, pilot lights, etc., shall be eliminated from the work area.
- .3 Breathing of sand blast dust, vapour, and/or spray mist shall be avoided. Coatings should be applied when ventilation is adequate. When available ventilation may not be adequate, workers shall wear appropriate respiratory protection.
- .4 When mixing two component systems, special care should be taken to prevent the curing agent or mixed liquid from coming in contact with the skin or eyes. Also, always read the labels of both components, since the mixture may possess the hazards of both components.
- .5 During the application of all coating material, all flames, welding and smoking must be prohibited from the area.
- .6 Explosion proof equipment must be used when coating with certain of these materials in confined areas. Keep containers closed and away from heat, sparks and flame when not in use.
- .7 **IMPORTANT!**
 - .1 When applying coatings by spray equipment observe all precautionary safety measures.
 - .2 Spray equipment must be handled with due care and in strict accordance with manufacturer's recommendations for personal safety, and to prevent a fire.
 - .3 If precautions are not taken, spraying of any material can be hazardous, particularly when using high pressure airless equipment.
 - .4 High pressures may inject coating into the skin, causing serious injury requiring immediate hospital treatment.
 - .5 When using or handling spray equipment, hoses and the like, observe all safety practices. In addition, when spraying paint or coatings, wear respirator recommended for the product being handled.
 - .6 In all cases wear the proper type of protective eye equipment.
- .8 Smoking shall not be permitted within the work area or the limits prescribed by local fire regulations. All matches, lighters and smoking materials shall be left outside these areas.
- .9 On existing tanks, care must be exercised in the use of power wire brushing. Power wire brushes should be air driven, or if electric motors are used, they must be rated for Class 1, Group IIA Hazardous Location Use. Operators must **REMEMBER THIS IS A HAZARDOUS AREA**, and use only non-sparking metal brushes, scrapers, etc.

- .10 Every precaution shall be exercised to prevent contamination of the tanks or their contents. **To prevent entry of contaminants into the tanks during cleaning operations, all inspection ports, breathers or other openings in the tanks shall be sealed with heavy duty polyethylene hoods securely taped into position.** Cleaning and rust removal from these areas shall be carried out by hand-cleaning methods under direct supervision.

PART 2 – MATERIALS

2.1 Qualified Products

- .1 Paint materials for each coating formula to be the products of a single manufacturer.
- .2 Materials shall be new, first line brands of recent blend, delivered to site in original containers with seals intact.
- .3 In selecting the coating system to be used over old paintwork, compatibility of coating systems must be considered.
- .4 In maintenance painting, it is generally desirable to use the same generic type of paint as was used in the original painting, however, newer surface-compatible coatings require only that the compatibility be carefully checked.

2.2 Colours

- .1 All colours to be prepared by factory tinting.
- .2 For finish colours refer to Table 1 - Finish Colour Schedule, as follows:

TABLE 1 – FINISH COLOUR SCHEDULE

STRUCTURE	PRODUCT OR PART	FINISH COLOUR
STORAGE TANKS	Jet A-1 aviation fuel	Panorama Tank White with black , identification at inlet/outlet nozzles, loading valves, joint valves, fittings and also on diametrically opposite sides.
	Low Sulphur Diesel Light fuel (LSDL)	Panorama Tank White with Galway Green, identification at inlet/outlet nozzles and also on diametrically opposite sides
	Gasoline	Panorama Tank White with Orange, identification at inlet/outlet nozzles and also on diametrically opposite sides
	Any piping up the side of the tank: manways and nozzles, gauge hatch, brackets for piping, electrical conduits and light fixture supports, stairway handrails	Colour of tank
	Structural members, stairs and platforms	Colour of tank
	Tank skids	Colour of tank

STRUCTURE	PRODUCT OR PART	FINISH COLOUR
PIPING, FLANGES and FITTINGS (Tankage Areas and Pipelines) (new and existing)	Vents or gauges that are white metal or aluminum Touch-ups at spot welds on galvanized metal Buried pipes with protective wrapping or Yellow Jacket Above ground pipe and fittings	Not painted Zinc base Not painted Light Gray product with colour ID. For Jet A-1 the colour coding is 2 black bands 100 mm wide and not more than 6 m apart.
ALL VALVES and CHECK VALVES	On LSDL fuel	Galway Green
and 1.0m of PIPING	On Gasoline	Orange
	On Jet A-1 aviation fuel	Black
	Brass caps, valve stems, brass tags and nameplates	Not painted (Paint will have to be removed if inadvertently applied) (Do Not Sand Blast)
FLEXIBLE CONNECTORS	Flanges	Light Gray
	Braided portions	Not painted
PIPE SUPPORTS, ANCHORS, GUIDES, ISLAND COVER PLATES and FASCIA	Metal	Light Gray
	Concrete	Not painted
STILES, CATWALKS and STAIRWAYS (not on tanks)	Stringers and Handrails	Light Gray with Black trim
	Galvanized grating and treads	Not painted or colour of railings
	Touch-ups at spot welds on galvanized metal	Zinc base
LIGHT FIXTURES, POSTS and BRACKETS (not on tanks)	Electrical conduits up stairways and along catwalks, boxes, and light fixture supports	Light Gray
DIKE DRAIN, SUMP PUMP, PIPING and SUPPORTS	Metal piping and supports and interior of sump surface	Light Gray
	Hoses and pump body	Not painted
FLOODLIGHTING	Metal poles and cross arms	Light Gray
POLES and POWER ENTRANCE POLE	Wood pole and lighting fixtures	Not painted
YARD ELECTRICAL CONDUIT and BOXES	All galvanized conduit and boxes	Colour of adjacent piping or tank
	Conduits supports and clamps	Light Gray
	Conduits, boxes and supports up side of tank, stairs and stiles	Same colour as tank

STRUCTURE	PRODUCT OR PART	FINISH COLOUR
NEW BUILDING		See applicable Section
FENCE and GATES	New galvanized metal fence and gate	Not painted
	Back-up metal plates for signs	Light Gray or galvanize
BOLLARDS & SEA HOSE ANCHORS	Pipe	Yellow with silver reflective tape 75mm wide, Safety Supply Catalogue #517A064
	Concrete Cap	Yellow
EMERGENCY LADDER RUNGS ON GATES	Horizontal pipes	Red
NAMEPLATES, TAGS and GLASS SURFACES	These surfaces shall be protected during painting operation with masking tape (to be removed on completion)	Not painted (paint will have to be removed) (Do Not Sand Blast)

2.3 Coating Systems

For tank, piping and other structural painting, coating system alternatives are offered between an epoxy coating system and a moisture-cured polyurethane coating system, depending on site location. For approved coating systems, refer to *Table 2 - Epoxy Coating System Summary* and *Table 3 - Moisture Cure Polyurethane Coating System Summary*. Also refer to the Material Safety Data Sheets (MSDS).

Specification Note: Specifier to select a painting system table for the particular project and location, and delete reference to the unused systems.

.1 Epoxy Painting System

The following Epoxy Painting System, listed below in *Table 2, Epoxy Coating System*, describes the tank steel, structural steel, appurtenance and piping painting using an epoxy system. The epoxy systems are recommended for severe corrosion conditions and have been proven in the NWT. However, there can be difficulty in applying the product properly in coastal regions of the Arctic, due to poor environmental conditions. The manufacturer shall be consulted for any particular application requirements recommended for the site location.

TABLE 2 – EPOXY COATING SYSTEM SUMMARY

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
NEW or EXISTING TANK (EXTERIOR) Tanks & railings, platforms, piping and other associated steel works (6 to 9mils total)	A, B, C, D or H	SP10, Near White Metal Blast Cleaning SP12/NACE 5 High Pressure Water Jet Cleaning, see Table 3, for lead based paint removal	Reinforced Inorganic Zinc Primer Shop/Field Primed with 1 coat 25 - 75 µm (1 – 3mils) Devoe Catha-Coat 302H, or approved equal.	Low Temp. Cure Hi-Build Epoxy 2 coats , 100 - 150µm (4 - 6mils total) Low Temp. Cure Hi-Build Epoxy Devoe Bar-Rust 236, or approved equal.

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
EXISTING TANKS (Encapsulation of Lead Based Paint) (EXTERIOR) Tanks & railings, platforms, piping and other steel works (6 to 10mils total)	E, F or G or H	SP6 Commercial Blast Cleaning, with vacuum pickup or SP7 Brush-off Blast Cleaning SP12/NACE No. 5 High Pressure Water Jet Cleaning, see Tables 6 & 7, for lead based paint removal	Reinforced Inorganic Zinc Primer Spot Prime with <u>1 coat</u> 25 - 75µm (1 - 3mils) Devoe Catha-Coat 302H, or approved equal.	Low Temp. Cure Hi-Build Epoxy 2 coats , 100 - 150µm (4 - 6mils total) Devoe Bar-Rust 236, or approved equal.
MAINTENANCE Previously coated with epoxy Existing tanks, railings, platforms, piping and other steel works. (5 - 8mils total)	E, F or G	SP2 or SP3 Hand/Power Tool Cleaning Rusted Areas and SP1 Solvent Cleaning, see Tables 6 & 7, for epoxy coating maintenance	Reinforced Inorganic Zinc Primer Feather and Spot Prime Rusted Areas with <u>1 coat</u> 25 - 75µm (1 - 3mils) Devoe Catha-Coat 302H, or approved equal.	Low Temp. Cure, Hi-Build Epoxy 1 coat 75-100µm (3 - 4mils) Devoe Bar-Rust 236, or approved equal.
SURFACE Stairs, railings and platforms, gratings, conduit and appurtenances (5-8mils total)	Alum/galv	SP1 Solvent Cleaning	Ethyl Silicate Inorganic Zinc Coating Leave unpainted or <u>1 coat</u> 50-100 µm (2 - 4mils) Devoe Catha-Coat 304V, or approved equal	Low Temp. Cure, Hi-Build Epoxy Optional for Colour: 1 coat 75-100µm (3 - 4mils) Devoe Bar-Rust 236, or approved equal.
FENCING Touch-up	Alum/galv	SP1 Solvent Cleaning	Ethyl Silicate Inorganic Zinc Coating Clean and Spot Prime Rusted Areas with <u>1 coat</u> 25 - 75µm (1 - 3mils) Devoe Catha-Coat 304V, or approved equal.	
DISPENSER and SHELTER BUILDINGS Skids, piping and equipment (4 - 5mils total)	A, B, C or D	SP2 or SP3 Hand/Power Cleaning	<u>1 coat</u> 38 µm (1.5mils) Alkyd Machinery Enamel System Aluminum Primer see <i>Division 13 and Particular Specification Section.</i>	2 coats 75 to 100µm (3 to 4mils total) Alkyd Machinery Enamel System see <i>Division 13 and Particular Specification Section.</i>

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
DISPENSER and SHELTER BUILDINGS Exterior (4 - 5 mils total)	A, B, C or D	SP7 Brush-off Blast Cleaning	1 coat 38µm (1.5mils) Alkyd Machinery Enamel System Aluminum Primer see <i>Division 13 and Particular Specification Section.</i>	2 coats 75 to 100µm (3 to 4mils total) Alkyd Machinery Enamel System see <i>Division 13 and Particular Specification Section.</i>

Note: 1. **A pre-wash treatment using a chloride removal agent, such as Devprep 88 or Chlor*Rid, with a hot water medium pressure Hydro Blaster (3 500 to 5 000 psi) shall be done on all tanks exposed to a marine environment.**

2. **Care must be taken with use of low temperature cure accelerators; total loss of adhesion may result. Consult with paint manufacturer for direction.**

.2 Moisture Cure Polyurethane Painting System

The following Moisture Cure Polyurethane Painting System, listed below in *Table 3, Moisture Cure Polyurethane Coating System Summary*, describes the tank steel, structural steel, appurtenance and piping painting system using a moisture cure polyurethane system. The moisture cure polyurethane coating system is a new generation coating system which has also been proven to be quite user friendly in the north, particularly in the Arctic Coastal Regions, where high humidity and lower cure temperatures are encountered.

TABLE 3 – MOISTURE CURE POLYURETHANE COATING SYSTEM SUMMARY

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
NEW or EXISTING TANK (EXTERIOR) Tanks & railings, platforms, piping and other associated steel works, Piping and Pipelines (7 - 9 mils total)	A, B, C, D	SP10 Near White Blast Cleaning	Moisture Cure, Polyurethane Zinc Primer Shop or field prime with 1 coat , 50 to 75 µm (2 to 3 mils) Xymax MonoZinc ME III or Wasser MC-Zinc; or approved equal and Moisture Cure, Polyurethane Intermediate Coat 1 coat , 50 to 75 µm (2 to 3 mils) Xymax MonoFerro, or Wasser MC-CR; or approved equal	Moisture Cure, Aliphatic Polyurethane 1 coat , 50 to 75 µm (2 to 3 mils) Xymax MaxCoat A, or Wasser MC-Luster, or approved equal (may be applied by roller or brush)

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
EXISTING TANKS (Encapsulation of Lead Based Paint) (EXTERIOR) Tanks & railings, platforms, piping and other associated steel works, Pipelines and Piping (7 - 9 mils total)	E, F, G or H	SP6 Commercial Blast Cleaning, with vacuum pickup or SP7 Brush-off Blast Cleaning SP12/NACE 5 High Pressure Water Jet Cleaning, see Tables 6 & 7, for lead based paint removal	Moisture Cure, Polyurethane Zinc Primer (Spot Prime) <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Xymax MonoZinc ME III or Wasser MC-Zinc; or approved equal and Moisture Cure, Polyurethane Intermediate Coat <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Xymax MonoFerro, or Wasser MC-CR; or approved equal	Moisture Cure, Aliphatic Polyurethane <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Xymax MaxCoat A, or Wasser MC-Luster, or approved equal (may be applied by roller or brush)
SURFACE Stairs and platforms, gratings, conduit, appurtenances and fence touch-up (4- 6 mils total)	Alum/galv	SP1 Solvent Cleaning	Moisture-cured, Polyurethane Zinc Primer. <u>1 coat</u> 50 to 75 µm (2 or 3 mils) Xymax Monozinc 390, Wasser MC- Miozinc, or approved equal.	Moisture Cure, Aliphatic Polyurethane (optional for colour) <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Xymax MaxCoat A, or Wasser MC-Luster, or approved equal
STRUCTURAL STEEL Stiles and railings, floodlight poles and cross arms (if not shop primed), island spiffy fascia and cover plates. (7 - 9 mils total)	All	SP6 Commercial Blast Cleaning	Moisture Cure, Polyurethane Zinc Primer <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Xymax MonoZinc ME III or Wasser MC-Zinc; or approved equal And Moisture Cure, Polyurethane Intermediate Coat <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Xymax MonoFerro, or Wasser MC-CR; or approved equal	Moisture Cure, Aliphatic Polyurethane <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Xymax MaxCoat A, or Wasser MC-Luster, or approved equal (may be applied by roller or brush)
DISPENSER and SHELTER BUILDINGS Exterior (3 - 4 mils total)	A, B, C or D	SP7 Brush-off Blast Cleaning	Moisture-cured, Polyurethane Zinc Primer. <u>1 coat</u> 50 µm (2 mils) Xymax Monozinc 390, Wasser MC- Miozinc, or approved equal.	Moisture Cure, Aliphatic Polyurethane <u>1 coat</u> , 50 µm (2 mils) Xymax MaxCoat A, or Wasser MC-Luster, or approved equal

- Note: 1. A **pre-wash treatment using a chloride removal agent, such as Devprep 88 or Chlor*Rid**, with a hot water medium pressure Hydro Blaster (3 500 to 5 000 psi) shall be done on all tanks exposed to a marine environment.
2. **Care must be taken with use of low temperature cure accelerators**; total loss of adhesion may result. Consult with paint manufacturer for direction.
3. The above coating systems (Table 2 and Table 3) can also be applied in the Mackenzie Valley interior regions.

.3 Encapsulation of Lead Based Paint (Severe Coastal Environment)

For severe coastal regions, where existing tank, piping and other structural painting systems contain lead based paint, alternatives are offered between an epoxy coating system and a moisture cure polyurethane coating system, depending on site location. Coating systems provided in *Table 2 - Epoxy Coating System Summary* and *Table 3 - Moisture Cure Polyurethane Coating System Summary*, can be used with the appropriate cleaning method.

- .1 For existing paint conditions E, F and G, the rust blisters and failed coating areas can be removed by *SP6 Commercial Blast Cleaning* or *SP7 Brush-off Blast Cleaning*, provided the paint and sand removed is contained and disposed of in an environmentally friendly manner.
- .2 For existing paint condition H, the remaining coating shall be removed, by either *SP6 Commercial Blast Cleaning* or *SP12/NACE 5 High Pressure Water Jet Cleaning*, provided the lead contaminated paint removed is contained and disposed of in an environmentally friendly manner.

Specification Note: Specifier to select a painting system table for the particular project and location, and delete reference to the unsued systems.

.4 Encapsulation of Lead Based Paint (Interior Regions)

- .1 Preparation and encapsulation as outline in Clause 2.3.3 above, can also be used for interior regions.
- .2 For the milder interior regions, where tank, piping and other structural painting systems contain lead based paint, additional alternatives are offered between a new *Reacted Alkaline Viscolastic Calcium Sufonate (RAVCS)* coating system and a new *Moisture Cure Urethane/ Two Component Polyurethane* coating system, depending on site location. Coating systems provided in *Table 4 - Reacted Alkaline Viscolastic Calcium Sufonate (RAVCS) System Summary* and *Table 5 - Moisture Cure Urethane/ Two Component Polyurethane System Summary*, can be used with the appropriate cleaning method.
- .1 For existing paint conditions E, F and G, the rust blisters and failed coating areas can be removed by *SP6 Commercial Blast Cleaning* or *SP7 Brush-off Blast Cleaning*, provided the paint and sand removed is contained, and disposed of in an environmentally friendly manner.
- .2 For existing paint condition H, the remaining coating shall be removed, by either *SP6 Commercial Blast Cleaning* or *SP12/NACE 5 High Pressure Water Jet Cleaning*, provided the lead contaminated paint removed is contained, and disposed of in an environmentally friendly manner.

- .3 The *Reacted Alkaline Viscolastic Calcium Sulfonate (RAVCS)* self priming coating is a new generation coating system which has also been proven to be a good encapsulating coating. It is surface tolerant, so it can be applied over hand/power tool cleaned surfaces. It is a high solids coating that can be applied in one coat and has superior anti-corrosion properties.
- .4 The *Moisture Cure Urethane/ Two Component Polyurethane* coating system is a new generation coating system which has also been tested and appears to be successful for encapsulation lead based alkyd paint on smaller tanks in the Mackenzie region of the NWT.

TABLE 4 – ENCAPSULATING RAVCS PAINT SYSTEM SUMMARY (INTERIOR REGIONS)

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
EXISTING TANKS (Encapsulation of Lead Based Paint) (EXTERIOR) Tanks and railings, platforms, piping and other associated steel works, Pipelines and Piping (8 - 10 mils total)	E, F, G or H	SP6 Commercial Blast Cleaning, with vacuum pickup or SP7 Brush-off Blast Cleaning SP12/NACE 5 High Pressure Water Jet Cleaning, see Tables 6 & 7, for lead based paint removal	Reacted Alkaline Viscolastic Calcium Sulfonate Self Priming Spot prime , 50 to 100 µm (2 to 4 mils), Termarust or approved equal	Reacted Alkaline Viscolastic Calcium Sulfonate Self Priming Topcoat: 1 coat , 150 to 200 µm (6 to 8 mils) Termarust or approved equal
SURFACE Stairs and platforms, gratings, conduit, appurtenances (4- 6 mils total)	Alum/galv	SP1 Solvent Cleaning	Reacted Alkaline Viscolastic Calcium Sulfonate Self Priming Spot prime , 50 to 100 µm (2 to 4 mils), Termarust or approved equal	Reacted Alkaline Viscolastic Calcium Sulfonate Self Priming Topcoat: 1 coat , 50 to 75 µm (2 to 3 mils) Termarust or approved equal
DISPENSER and SHELTER BUILDINGS Exterior (3 - 4 mils total)	A, B, C or D	SP7 Brush-off Blast Cleaning	Moisture-cured, Polyurethane Zinc Primer. 1 coat 50 µm (2 mils) Xymax Monozinc 390, Wasser MC-Miozinc, or approved equal.	Moisture Cure, Aliphatic Polyurethane 1 coat , 50 µm (2 mils) Xymax MaxCoat A, or Wasser MC-Luster, or approved equal

Note:1. **Care must be taken with use of low temperature cure accelerators; total loss of adhesion may result. Consult with paint manufacturer for direction.**

TABLE 5 – ENCAPSULATING URETHANE PAINT SYSTEM SUMMARY
(INTERIOR REGIONS)

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
EXISTING TANKS (Encapsulation of Lead Based Paint) (EXTERIOR) Tanks and railings, platforms, piping and other associated steel works, Pipelines and Piping (5 - 8 mils total)	E, F, G or H	SP6 Commercial Blast Cleaning, with vacuum pickup or SP7 Brush-off Blast Cleaning SP12/NACE 5 High Pressure Water Jet Cleaning, see Tables 6 & 7, for lead based paint removal	Moisture Cure, Urethane Prime Coat <u>Spot prime and 1 coat</u> , 50 to 100 µm (2 to 4 mils) Superior Products International, Rust Grip (Supplied by Energy Efficient Technologies Inc., Fort Simpson, NT) or approved equal	Moisture Cure, Two Component Polyurethane Finish Coat <u>1 coat</u> , 75 to 100 µm (3 to 4 mils) Moisture Cure, Two Component Polyurethane Finish Coat Superior Products International, Enamo Grip (Supplied by Energy Efficient Technologies Inc., Fort Simpson, NT) or approved equal
SURFACE Stairs and platforms, gratings, conduit, appurtenances (4- 6 mils total)	Alum/galv	SP1 Solvent Cleaning	Moisture Cure, Urethane Prime Coat <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Superior Products International, Rust Grip (Supplied by Energy Efficient Technologies Inc., Fort Simpson, NT) or approved equal	Moisture Cure, Two Component Polyurethane Finish Coat <u>1 coat</u> , 50 to 75 µm (2 to 3 mils) Moisture Cure, Two Component Polyurethane Finish Coat Superior Products International, Enamo Grip (Supplied by Energy Efficient Technologies Inc., Fort Simpson, NT) or approved equal
STRUCTURAL STEEL Stiles and railings, floodlight poles and cross arms, island fascia and cover plates. (5-8 mils total)	All	SP6 Commercial Blast Cleaning, with vacuum pickup or SP7 Brush-off Blast Cleaning SP12/NACE 5 High Pressure Water Jet Cleaning, see Tables 6 & 7, for lead based paint removal	Moisture Cure, Urethane Prime Coat <u>Spot prime and 1 coat</u> , 50 to 100 µm (2 to 4 mils) Superior Products International, Rust Grip (Supplied by Energy Efficient Technologies Inc., Fort Simpson, NT) or approved equal	Moisture Cure, Two Component Polyurethane Finish Coat <u>1 coat</u> , 75 to 100 µm (3 to 4 mils) Moisture Cure, Two Component Polyurethane Finish Coat Superior Products International, Enamo Grip (Supplied by Energy Efficient Technologies Inc., Fort Simpson, NT) or approved equal

SURFACE	CONDITION	SSPC PREP SPEC.	PRIMER	FINISH COATS
DISPENSER and SHELTER BUILDINGS Exterior (3 - 4 mils total)	A, B, C or D	SP7 Brush-off Blast Cleaning	Moisture-cured, Polyurethane Zinc Primer. 1 coat, 50 µm (2 mils) Xymax Monozinc 390, Wasser MC-Miozinc, or approved equal.	Moisture Cure, Aliphatic Polyurethane 1 coat, 50 µm (2 mils) Xymax MaxCoat A, or Wasser MC-Luster, or approved equal

Note: 1. **Care must be taken with use of low temperature cure accelerators;** total loss of adhesion may result.
Consult with paint manufacturer for direction.

2.4 Thinners

- .1 Whenever required, thinners shall be used only in accordance with paint manufacturer's written recommendations.

2.5 Trim and Product Identification

- .1 All paint used for trim and product identification shall be a high gloss alkyd enamel, 2 mils minimum dry film thickness, applied over a coating system specified above.

PART 3 – EXECUTION

3.1 Surface Cleaning and Preparation

- .1 General:
 - .1 Typical contaminants that shall be removed during surface preparation are moisture, oil, grease, **chloride salts**, loose paint, rust, loose mill scale, corrosion products and dirt. Tightly adhered or intact mill scale does not have to be removed unless SP6 blast cleaning is specified.
 - .2 The surfaces before sandblasting or other cleaning method (particularly in Arctic Coastal Regions) shall be tested for chloride residual salts and if detected shall be removed. Medium pressure 24 150 to 31 000kPa (3,500 to 4,500 psi) Hydro Blast water washing with a surface passivator chemical additive, such as Devprep 88, CHLOR*RID and/or HOLD*BLAST, shall be used to remove traces of residual salts from the surfaces to be cleaned. The Hydro Blast wash is done before sandblasting so that the blasting doesn't drive the salt residue into the cleaned steel surfaces.
 - .3 Paint manufacturer shall provide minimal allowable remaining surface salt concentrations and make recommendations for methods of verification or testing for salt levels.
 - .4 After cleaning, the steel surfaces shall be primed as soon as possible. If the cleaned steel surfaces become contaminated by flash rust, dirt, grease or oil after the initial cleaning but before the priming paint can be applied, the surfaces shall be re-cleaned to meet the requirements specified for the initial

cleaning of the steel. Some light flash rusting is acceptable if cleaning is by water blasting.

- .5 Particular attention shall be given to edges, crevices, nuts, bolts, rivets and weld seams. Sharp edges, weld spatter, etc., shall be ground smooth before cleaning.
- .6 Tight, inaccessible metal to metal plates, etc., shall be sealed with a compatible joint sealing compound, as approved by the manufacturer.
- .7 All dirt, stones and other debris must be cleaned out of the skid beams of the buildings, from the bases of the horizontal and vertical tanks and from the steel bases of the pipe supports.
- .8 Any existing paint film shall be sound and firmly bonded to the substrate and prepared in accordance with this Section.
- .9 Prior to painting, all metal surfaces shall be blown down and free of all surface dust.
- .10 Clean no more surface than can be dried and primed the same day.
- .11 Cleaning shall be approved by the Engineer prior to painting.

3.2 Tank and Steel Surface Preparation Systems

.1 General:

As a general rule, the *SSPC Surface Preparation* Specifications, shown in Table 6, shall be applied to surfaces being prepared for painting:

TABLE 6 – SURFACE PREPARATIONS PRIOR TO PAINTING

SSPC SPECIFICATION	DESCRIPTION
SP1 - Solvent Cleaning	Removal of oil, grease, dirt, soil, salts and contaminants by cleaning with solvent, vapour, alkali, emulsion or steam.
SP2 - Hand Tool Cleaning	Removal of loose rust, loose mill scale and loose paint to the degree specified, by hand chipping, scraping and wire brushing.
SP3 - Power Tool Cleaning	Removal of loose rust, loose mill scale and loose paint to the degree specified, by power tool chipping, descaling, sanding, wire brushing and grinding.
SP5 - White Metal Blast Cleaning	Blast clean until 100% of the surface is a gray-white, uniform metallic color, slightly roughened to form a suitable anchor pattern for coatings. The surface shall be free of all oil, grease, dirt, visible mill scale, rust, corrosion products, oxides, paint or any other foreign matter.

SSPC SPECIFICATION	DESCRIPTION
SP6 - Commercial Blast Cleaning	Blast clean until at least two-thirds of the surface area is free of all visible residues.
SP7 - Brush-Off Blast Cleaning	Blast clean to remove loose rust, loose mill scale and loose paint to the degree specified, by power tool chipping, descaling, sanding, wire brushing and grinding.
SP10 - Near White Metal Blast Cleaning	Blast clean until 95% of the surface is a gray-white, uniform metallic color, slightly roughened to form a suitable anchor pattern for coatings. The surface, when viewed without magnification, shall be free of all oil, grease, dirt, visible mill scale, rust, corrosion products, oxides, paint or any other foreign matter.
SP12/NACE 5 - High Pressure Water Jet Cleaning	Water blast clean to remove all salt, oil, grease, dirt, soil, loose paint scale etc. Water pressure in excess of 34 475kPa (5 000 psi) up to 137 900kPa (20 000 psi) is required.

.2 Surface Preparation Specifications:

- .1 The following Steel Surface Preparation Specifications, listed below in *Table 7, Tank Surface Preparation Specifications*, describes the tank steel condition and the SPC/SSPC Surface Preparation Specifications, with a brief description of the process, that shall be used to prepare the steel surfaces for painting, as specified in the Contract documents:

TABLE 7 – TANK SURFACE PREPARATION SPECIFICATIONS

PAINT CONDITION	SURFACE PREPARATION
Conditions A, B, C and D (Unpainted Steel)	SPC/SSPC Surface Preparation Specification SP6 - Commercial Blast Cleaning or SP10 – Near White Metal Blast Cleaning. The surfaces after sandblasting shall be free from detrimental foreign matter such as oil, grease, smoke film, dirt, mill scale or rust, and shall have a suitable anchor pattern for the prime coat.
Condition E (Sound Epoxy Paint System or Sandblasted and Shop Primed Systems) where the existing paint system is known to be compatible with the paint system to be applied and less than 0.1% of the area, as evaluated in accordance with SPC/SSPC Visual Standard No. 2, is covered by rust	SPC/SSPC Surface Preparation Specification SP1 - Solvent Cleaning. The surfaces after cleaning shall be free from detrimental foreign matter such as oil, grease, soil, cutting and drawing compounds and other contaminants. All blisters and defects shall be removed by sanding and feathering.

PAINT CONDITION	SURFACE PREPARATION
<p>Conditions F and G (Slightly Deteriorated Paint Systems) Where the existing paint system is mainly intact but shows a slight film degradation, including any or all of the following defects:</p> <ul style="list-style-type: none"> • slight blistering, flaking or peeling of the paint; • light rust staining but no pitting of the steel substrate; • where 0.1% to 10% of the area, as evaluated in accordance with SPC/SSPC Visual Standard No. 2, is covered by rust or rust blisters (exclusive of rust stains). 	<p>SPC/SSPC Surface Preparation Specification SP2 - Hand Tool Cleaning or SP3 - Power Tool Cleaning or SP12 – Hydro Blasting or Brush-Off Blast Cleaning.</p> <p>When cleaned, the surface shall be free from loose rust, loose, cracked and blistered paint, chalk accumulation, oil, grease, smoke film, dirt, dust and any other detrimental foreign matter. Thick edges of the remaining old paint shall be feathered. All remaining old paint shall have sufficient adhesion that it cannot be lifted by inserting the blade of a putty knife under it.</p>
<p>Condition H (Severely Deteriorated Paint Systems) Where the existing paint system shows severe degradation, including any or all of the following defects:</p> <ul style="list-style-type: none"> • considerable peeling of the paint film; • considerable blistering, cracking, flaking or loose chalking; • considerable rust staining with severe pitting of the steel substrate; • where greater than 10% of the area as evaluated in accordance with SPC/SSPC Visual Standard No. 2, is covered by rust or rust blisters, exclusive of rust stains. 	<p>SPC/SSPC Surface Preparation Specification SP6 - Commercial Blast Cleaning or SP10 – Near White Metal Blast Cleaning.</p> <p>For lead based paint system removal, SP12/NACE 5 - High Pressure Water Jet Cleaning may be used.</p> <p>All rust deposits shall be chipped off and the area sufficiently abraded to provide a good anchor pattern for paint. All accessible weld flux and spatter shall be removed. The prime coat shall be applied as soon as possible after cleaning, before deterioration of the cleaned surface occurs.</p>

.2 Condition E, F and G (Lead Free Paint Systems):

.1 When cleaned, the surface shall be free from loose rust, salt residues, loose cracked or blistered paint, chalk accumulation, oil, grease, smoke film, dirt, dust and any other detrimental foreign matter. Thick edges of the remaining paint shall have sufficient adhesion that it cannot be lifted by inserting the blade of a putty knife under it.

.2 Thick edges of remaining paint shall be sanded and feathered.

.3 Conditions F, G and H (Deteriorated Lead-Based Paint Systems):

.1 Where the existing paint system contains hazardous levels of lead, it shall be cleaned in accordance with *SSPC-SP SP6 - Commercial Blast Cleaning or SP7 - Brush-Off Blast Cleaning*, or it may be cleaned in accordance with *SSPC-SP 12/NACE 5 STANDARDS to WJ-2/SC-2 cleanliness - High Pressure Jet Washing*.

- .2 An alkaline cleaning agent such as Devoe Devprep 88 or CHLOR*RID and/or HOLD*BLAST shall be applied to the tank before cleaning.
- .3 Where high pressure water jetting (**Hydro Blast Cleaning**) is specified, all surfaces to be re-coated shall be cleaned in accordance with *SSPC-SP 12/NACE 5 STANDARDS to WJ-2/SC-2* cleanliness. The method of high-pressure (HP) water jetting (WJ) ultimately selected by the Contractor will be based on the Contractor's confidence in the capabilities of the equipment and its components. A minimum of 34,475kPa (5,000psi) to 137,900kPa (20,000psi) shall be used, unless otherwise authorized in writing. The WJ-2 surface shall be cleaned to a matte finish with all loose paint and rust blisters removed. The nozzle may include a rotating head and must be held a minimum of 50mm to a maximum of 250mm from the surface being cleaned.

NOTE: Hydro Blast Cleaning shall only be used if the surface had been initially sandblasted and has an adequate anchor pattern (50µm [2mils] minimum) for the primer.

- .4 All rust and loose paint shall be collected on a geotextile filter fabric mat secured around the tank base during cleaning. Proper disposal of the contaminated material will be required.
- .4 Unpainted surfaces:
 - .1 Brass and bronze surfaces shall be cleaned but not painted.
 - .2 All working parts of valves, pumps, meters and all name plates shall be cleaned but not painted.
 - .3 Pumps, meters and unpainted aluminum tank fittings shall be cleaned but not painted.
 - .4 Any paint accidentally applied to such areas shall be removed immediately, and all masking tape shall be removed after painting. **Sand blasting shall not be permitted to remove the paint from these surfaces (only solvent cleaning and scraping).**
- .5 Piping surfaces:
 - .1 All piping, valves and fittings shall be cleaned and prepared for painting in accordance with *SSPC Surface Preparation Specification SP SP6 – Commercial Blast Cleaning, SP7 - Brush-Off Blast Cleaning, SP2 - Hand Tool Cleaning or SP3 - Power Tool Cleaning*, depending on the painting system specified.
 - .2 Where severely pitted piping is encountered, the Contractor shall advise the Engineer of the condition of the piping and await further instructions before proceeding with the surface preparation.

.6 Structural and other steel surfaces:

- .1 All structural and other steel surfaces shall be cleaned and prepared for painting in accordance with *SSPC Surface Preparation Specification SP SP6 - Commercial Blast Cleaning*, *SP7 - Brush-Off Blast Cleaning*, *SP2 - Hand Tool Cleaning* or *SP3 - Power Tool Cleaning*, depending on the painting system specified.
- .2 Galvanized or aluminum surfaces (conduit, stair treads, catwalks, etc.) shall be cleaned as above, except for new surfaces, which shall be cleaned in accordance with *SSPC Surface Preparation Specification SP1 - Solvent Cleaning*. The cleaned surface shall be immediately coated with a polyvinyl-butyril wash primer or other primer recommended by the manufacturer.

.3 Lead Paint Removal and Disposal:

.1 Lead and Silica Dust Hazards:

- .1 Metallic lead is not water soluble between pH ranges of 5 to 12, and, if prevented from contacting water or water vapour, it will not leach into the environment. Lead particulate matter however, which is 10 microns in size or smaller, generated by sandblasting is available for immediate absorption into the human blood stream. Metallic lead can enter the body by inhalation of fumes or breathing lead dust particles.
- .2 Free silica dust has been classified as a carcinogenic to humans when inhaled in the form of quartz or cristobalite from occupational sources.
- .3 Sandblasting of leaded paint creates particulates of all sizes that become airborne and disperse into the environment. Prevention of silica and lead dispersion into the environment, worker protection and safe disposal constitute responsible management of silica and lead-containing products.
- .4 Hydro Blasting to remove loose paint from the tanks and collecting it on a geotextile filter mat will contain any lead hazard and thus allow for proper disposal.

.2 Painted Steel Structure Evaluation:

- .1 Sampling of tank paint or paint on other structures for confirmation of lead and the lead concentration is recommended prior to removal or encapsulation of the paint. A paint sample should be collected from a 25mm square of tightly adhered paint, comprised of all layers of the paint. Make sure to scrape down to the substrate, being careful not to include the substrate in the sample. Analysis of the paint should be done by an accredited laboratory.

- .2 Sandblasting, because of the potential health and environmental hazards, should only be considered after a thorough evaluation of the tank and other paint removal options. Options other than complete paint removal and repainting include:
 - power tool removal with vacuum pick-up;
 - power tool rotary cleaning;
 - needle guns with vacuum pick-up;
 - ultra-high pressure water jetting;
 - chemical strippers.
- .3 Containment of Paint and Abrasive Debris:
 - .1 A containment system includes the cover panels, screens, scaffolds, supports and shrouds used to enclose an entire work area or a vacuum paint removal tool. The purpose is to minimize and prevent debris generated during surface preparation from entering into the environment, and to facilitate the controlled collection of the debris for disposal. Containment systems may also employ the use of ground covers or water booms.
 - .2 Lead paint debris is a contaminant as defined under the Environmental Protection Act, and is also a public health hazard and must be contained on site. The debris must be collected and packaged into drums or other secure containers, pending approved disposal.
 - .3 Containment devices include drop sheets or tarps, shrouding or free-hanging enclosures, total structure enclosures and negative pressure containment and filter fabric collection.
- .4 Recovery of Abrasive and Paint Debris:
 - .1 Collection of paint residues must be undertaken frequently to prevent dispersal by wind or sandblasting operations. A vacuum is recommended as a rapid on-site collection method. Sweeping and shoveling are also used for cleaning abrasives from ground covers. Collection of water blast debris can be collected in a geotextile filter fabric mat.
 - .2 Collection containers, which are used for waste collection and storage pending disposal, must not allow sandblasting wastes to spill or leak materials into the environment.
 - .3 Debris removal techniques include:
 - capture from surface at point of cleaning;
 - capture from containment enclosures;
 - capture from the ground or water channeling debris to specified collection points;
 - capturing paint and debris from high pressure water cleaning in a geotextile filter fabric mat.

.5 Disposal:

- .1 Contaminant generator registration is required by the Department of Resources, Wildlife and Economic Development (RWED) Environmental Protection Division of the Government of the Northwest Territories.
- .2 Lead waste must be transported to disposal facilities in compliance with Transportation of Dangerous Goods Regulations.
- .3 Waste disposal and/or transportation manifests are to be obtained from the Department of Resources, Wildlife and Economic Development (RWED) Environmental Protection Division of the Government of the Northwest Territories.
- .4 Disposal approvals for lead-containing material is based on a case-by-case basis as determined by lead concentration, volumes and location.

3.3 Coating Application

.1 General:

- .1 All painting to be performed under this contract shall be performed in conformance with the best practices of the trade, in conformance with the recommendations of the coating manufacturer, and in conformance with applicable portions of the Steel Painting Council Specification SSPC-PA1, when those specifications are not in conflict with these standard specifications.
- .2 All surfaces cleaned to bare metal shall be coated with the specified prime coat the same working day. Any cleaned surface which rusts before the application of the prime coat shall be re-cleaned.
- .3 The methods of application, thinning instructions, drying interval and film thickness requirements for each of the coating systems as described hereunder shall be in accordance with the reviewed manufacturer's Product Data Sheets and recommended application procedures.
- .4 All the protective coatings in this specification will require certification from the manufacturer as to what maximum relative humidity and minimum temperature restrictions apply. The surface shall be visibly dry and free from condensate at the time of application. The surface must be verified to be free of any frozen water products by an approved third party inspector when application is below Zero (0°C), the use of 20X power magnifier is recommended.
- .5 All paint shall be prepared at the factory ready for application. The addition of thinner or other material to the paint after the paint has been shipped shall not be permitted, except as recommended by the manufacturer and by permission of the Engineer. The Contractor shall furnish the paint manufacturer's certification that the paint complies with the paint system requirements specified.

- .6 Tinting: All tinting materials required shall be added to the paint at the time of the paint's manufacture. Field tinting will not be allowed.
 - .7 All containers shall be labeled showing the exact title of the paint, the manufacturer's name, date of manufacture, the manufacturer's batch number, and the specification number as well as the lot number, if appropriate. Containers shall be packaged in new approved cans.
 - .8 Precautions concerning the handling and application of paint shall be shown on the labels on paint and solvent containers.
 - .9 Proprietary coatings shall be applied equivalent in all respects and at the same film thickness as the specified coating.
 - .10 If, when measured by SSPC PA-2 or ASTM D1186, it is evident that the specified minimum dry film thickness has not been attained, additional coating shall be applied until the specified thickness is obtained. For coating systems whose total thickness does not meet the minimum specified, additional primer or intermediate coats shall be applied until the specified thickness of the system is obtained.
 - .11 Sufficient time shall elapse between successive coats to permit them to dry properly for recoating. Consult specific product data sheets, and/or paint manufacturer, for proper cure times.
 - .12 The dry film thickness measurements shall be made in accordance with SSPC PA-2, Measurement of Dry Paint Thickness with Magnetic Gauge, or ASTM D1186. The minimum dry film thickness shall be 200µm (8mils), or as specified in the applicable Coating System Summary table, as per 3.2.3.10.
 - .13 The tolerances, unless otherwise specified, shall be in accordance with SSPC PA-2.
 - .14 **Caution: The use of a low temperature cure accelerator may reduce the surface compatibility qualities. Check all details with the paint manufacturer before using.**
- .2 Primer:
- .1 Spot Priming:
 - .1 Priming paint shall be uniformly applied by a brush after all sharp edges, weld spatter, etc. has been ground smooth.
 - .2 A primer stripe coat shall be applied to all surfaces where there are edges or corners (all bolts shall be brush stripe coated), with additional brush applications of a penetrating nature into tight metal-to-metal areas prior to application of an approved joint sealer compound as prescribed in 3.1.1.10.
 - .3 When runs or sags occur in the applied primer, to be brushed out.

- .4 The applied primer shall be free from pin holes, coarse particles and dirt.
- .5 All welds and crevice areas shall be spot primed prior to application of the full primer coat.
- .2 Complete Primer:
 - .1 Priming paint may be applied by brush or spray; rollers will not be allowed, unless it can be shown that the total dry film thickness and good coverage can be attained.
 - .2 The primer shall be applied uniformly over the entire surface to be protected.
 - .3 Unless specified, the first coat of a multi-topcoat system shall be tinted sufficiently and as recommended by the manufacturer to differentiate it from the second coat, i.e. gray coats and white coats can be alternated.
 - .4 Each successive top coat shall be applied only after the previous coat has been cured in accordance with the requirements of the paint manufacturer
 - .5 Where runs or sags occur, they shall be brushed out.
 - .6 The primer shall be carefully applied by brush around rivets, bolt heads, plates, crevices, welds, corners, edges and other areas from which all of the rust could not be removed, to ensure complete wetting of these areas.
 - .7 **The applied primer shall be free from pin holes, coarse particles and dirt.**
 - .8 Care shall be exercised in the application in the lap-in area to allow sufficient time for curing of the first application.
- .3 Thinning:
 - .1 When thinning is required, only thinners recommended by the paint manufacturer shall be used, and shall be used as recommended by the manufacturer.
- .4 Drying Time:
 - .1 Before applying additional primer or coating topcoats, the minimum drying interval required under particular temperature conditions shall be as recommended by the paint manufacturer.
 - .2 Where conditions are near the lower limit of temperature or the upper limit of relative humidity, or both (i.e., not 'good' conditions), and they appear detrimental to the curing of the applied coating, a longer drying interval will be required. Therefore, before applying additional

coats, the painter shall assure himself that the applied coating is sufficiently dry or cured, as applicable.

- .3 Low temperature cure accelerators are available for some coating materials. Before using low temperature cure accelerators, confirm with the paint manufacturer that loss of adhesion will not result. Reduced cure time does reduce the bonding strength for some coatings.
- .4 Films shall be considered dry for re-coating or top coating when the succeeding coating can be applied without the development of any detrimental failure of either the undercoat, topcoat or failure of the system to reach complete cure, under the application temperatures.

.5 Film Thickness:

- .1 Each coat of primer shall have a dry film thickness as specified in the applicable Coating System Summary table, and shall be within the minimum average thickness tolerances specified.
- .2 The film thickness of approved equal proprietary primers shall be the same as the film thickness of the related primer specified.
- .3 In the event the required thickness is not attained, additional primer shall be applied until the thickness is obtained.

.3 Topcoat:

- .1 The topcoat described in the applicable Coating System Summary table, shall be applied by brush or, when thinned in accordance with the manufacturer's recommendations, by spraying. Airless spray is the preferred method of application.
- .2 The finish, when applied by any of these methods, shall be smooth and uniform in appearance, colour, sheen and texture.
- .3 There shall be no ridges or sagging. **The finish shall be free from pin holes, coarse particles and dirt.**
- .4 The lap-in area shall exhibit uniformity with the rest of the area being painted.
- .5 Each successive intermediate or top coat shall be applied only after the previous coat has been cured in accordance with the requirements of the paint manufacturer.

NOTE: Some coating systems have a maximum cure time when further coating applications require additional special preparation.

.6 Film Thickness

- .1 Sufficient primer or intermediate coating shall be applied to achieve the minimum dry film thickness of each coat as specified in the applicable Coating System Summary table (above) and as per Item 3.2.3.10 (below).
- .2 These minimum film thicknesses should be maintained, whether the painting is over unpainted surfaces or over previously painted surfaces.
- .3 The film thickness of approved equal proprietary topcoats shall be the same as film thickness of the related system as specified in the applicable Coating System Summary table.
- .7 The topcoat shall be suitable for application over the primer and shall not cause wrinkling, lifting, loss of adhesion or other defects.
- .8 Unless specified, the first coat of a multi-topcoat system shall be tinted sufficiently and as recommended by the manufacturer to differentiate it from the second coat, i.e. white and gray coats can be alternated.
- .9 In all cases, the paint manufacturer's application instructions, recommendations and specifications shall be followed, in preference to this specification, with the written approval of the Engineer.
- .10 The total dry film thickness, including primer and intermediate coats, shall be within the tolerances specified in the applicable *Coating System Summary Table* selected.

3.4 Identification

.1 Tank numbers and product:

- .1 The number and product name of each tank is to be painted in black on each tank, using letters 150mm high by 25mm stroke.
- .2 The tank number is to be centered in a colour coded identification box (75mm wide border) to the dimensions suitable for the wording, i.e., leave a 150mm minimum spacing between words and the border, and located 1,500mm above the base of each tank.
- .3 The location of the identification box is to be centered over the inlet and outlet nozzles of the tank, and/or diametrically opposing sides, or each end of horizontal tanks, or as otherwise directed by the Engineer.

.2 Piping product:

- .1 All piping in the tank area shall be painted light gray.

- .2 All valves and a one metre (1,000mm) portion of piping on both sides of the valve or fitting shall be colour coded to indicate the product. Also, a one metre (1,000mm) section of piping at the tanks and buildings shall be colour coded.
- .3 All resupply pipeline valves, and a portion of piping one metre (1,000mm) long on each side of the valves, shall be colour coded to identify the product at each of the following locations:
 - .1 at the sea hose or truck unloading point and at loading points;
 - .2 at buildings;
 - .3 on each side of every valve.
- .3 Painting information:
 - .1 The date of painting, together with the name of the paint manufacturer and paint system are to be shown in 32mm high black letters below the tank number and product identification box.
 - .2 This information is to be placed on all tanks 100mm below the tank number and product identification box above the inlet/outlet valve.

3.5 Patch Test for Compatibility

- .1 Conduct a patch test on a 600mm by 600mm square test panel or equivalent area.
- .2 Select an area where the existing paint system is sound or, if no completely sound area is available, the best area this is available.
- .3 Remove all dirt, dust and grease by wiping with a clean cloth wetted with mineral spirits.
- .4 Remove any loose paint or loose rust by scraping and feathering any rough edges with fine sandpaper.
- .5 Apply the coating material being proposed for the job, to the patch area by brush. The environmental conditions described above shall prevail at the time of painting.
- .6 Examine the patch area during, immediately after and 24 hours after the painting for softening, lifting, blistering, bleeding, alligatoring or streaking discoloration. Any of these defects are indicative of incompatibility.

END OF SECTION 09900

DIVISION 13 - SECTION 13227

GASOLINE AND LSDL FUEL DISPENSER BUILDING

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies the requirements for the supply, assembly and installation in the field of a building, complete with steel skid frame, all equipment and accessories. The intended use of the building is to dispense Gasoline and Low Sulphur Diesel Light (LSDL) fuel products.

1.2 Related Work

- | | | |
|-----|---|---------------|
| .1 | Summary of the Work | Section 01010 |
| .2 | Identification Systems | Section 01080 |
| .3 | Shop Drawings | Section 01340 |
| .4 | Substantial Completion Inspection Requirements | Section 01650 |
| .5 | Structural Steel | Section 05120 |
| .6 | Miscellaneous Metal | Section 05500 |
| .7 | Painting | Section 09900 |
| .8 | Operators Shelter Building | Section 13229 |
| .9 | Automatic Temperature Compensating Metering Systems | Section 13420 |
| .10 | General Mechanical Provisions | Section 15010 |
| .11 | General Electrical Provisions | Section 16010 |

1.3 Reference Codes and Standards

- .1 National Building Code of Canada (NBC)
- .2 Canadian General Specifications Board (CGSB)
- .3 Canadian Standards Association (CSA)
- .4 American Society for Testing and Materials (ASTM)
- .5 National Fire Code of Canada (NFC)

1.4 Submissions

- .1 The Contractor shall provide all manufacturer's literature, operation and maintenance data, and recommended spare parts lists to the Engineer, as per Section 01700.
- .2 The building manufacturer shall provide five (5) complete sets of installation instructions, accompanied by fabrication drawings and identification of all panels, doors, etc.

1.5 Contractor's Duties

- .1 The Contractor shall be responsible to complete the design to accommodate the approved equipment and components.
- .2 The Contractor shall provide and pay for all other facilities and services necessary for proper execution and completion of the Work, including testing and calibration of the meters.

1.6 Protection

- .1 The Contractor shall provide the necessary protection to safeguard the building,

building contents, equipment and accessories from damage during transit and handling.

- .2 The Contractor shall make adequate provision to avoid structural over stressing.
- .3 No part of the structure shall be loaded during construction or transportation with a load greater than it is calculated to bear safely when assembled.

1.7 Location of Fixtures

- .1 The location of fixtures, apparatus, outlets, etc., shown or specified, is indicated with as much accuracy as possible and shall be adhered to whenever possible.
- .2 The Contractor shall be responsible to modify the actual location to suit equipment substitution or variation due to manufacturer's changes.
- .3 Before installation, the Contractor must inform the Engineer of the impending installation and consult with him for actual location. Prior approval by the Engineer is required for all material or equipment changes.

1.8 Guarantees

- .1 The Contractor shall guarantee the complete Gasoline and Low Sulphur Diesel Light (LSDL) fuel dispensing assemblies against all defects.

PART 2 – MATERIALS

2.1 Signs and Signposting

- .1 The Contractor shall refer to Drawing A-GP-01 for location of signs.
- .2 A Process and Instrumentation Diagram and operating instructions shall be provided in a convenient location in the building, under a plastic protective cover. Provide a laminated schematic in the dispenser building 280mm x 380mm in size, identifying the following:
 - .1 Each piece of equipment, each valve indicating the valve number and all instrumentation.
 - .2 Arrows indicating the flow of fuel.
 - .3 What valves need to be opened and closed when filling the fuel delivery vehicle tanks.
 - .4 What valves should be opened and closed when filling up vehicles.
- .3 Safety signs inside the building shall be factory fabricated, weatherproof, 200mm x 200mm, vinyl, pressure sensitive as available from Safety Supply Co., or approved equivalent, bearing the Pictographic symbol described as follows:

PICTOGRAPHIC SYMBOL	LOCATION
07207 - “No Smoking”	One mounted on back wall of the building centred in room with centreline 1,800 mm above floor.

.4 Safety signs for the building exterior shall be as follows:

- .1 One Pictographic **“No Smoking”** sign on the pedestrian door to the building. The sign shall be factory fabricated, weatherproof 200mm x 200mm Vinyl Pressure Sensitive as available from Safety Supply Co., or approved equivalent, bearing the same Pictographic symbol as indicated above. The sign shall be mounted centered with door and top of sign to be just below the lower side of the window framing.
- .2 Provide on the dispenser building doors a self-adhering sign to read **“CLOSE TANK VALVE AFTER USE”**.
- .3 Other signs for building exterior shall be factory fabricated, weatherproof Vinyl, Pressure Sensitive as available from Safety Supply Co., or approved equivalent. Pictographic symbols, legends, location and other details as follows:

CATALOGUE NO. and SYMBOL	LOCATION
88450 - “No Smoking/Stop Your Motor” (One in English and one in Local Dialect)	Signs to be 250mm X 360mm mounted 50mm apart about centerline of each loading door and bottom of signs to be just above the 13mm wide black decal stripe.
09082 - “Gasoline”	One sign 270mm X 270mm mounted center at 160mm to the left of the Gasoline/Low Sulphur Diesel Light (LSDL) fuel loading door, top of sign in line with bottom of 13mm wide black stripe.
09082 - “LSDL Fuel”	One sign 270mm X 270mm mounted centered with the Low Sulphur Diesel Light (LSDL) fuel loading door, top of sign in line with bottom of 13mm wide black stripe.

- .5 Arrows to indicate direction of flow shall be installed on the Gasoline and Low Sulphur Diesel Light (LSDL) fuel piping at approximately the locations indicated on the Drawings. See Section 01080.
- .6 Valve Tags shall be provided at valves on both systems where shown on Drawings. See Section 01080.

2.2 Type of Building

- .1 The building proper shall consist of pre-engineered and prefabricated, insulated, sectional, metal components of the type used in prefabricated refrigerated buildings, except that in this case the interior may be heated occasionally to 15°C, while the exterior may be down to -46°C.
- .2 The building details and specifications included in this section are based on manufacturer's data from Maklok Buildings Inc. of Nisku, Alberta. Polyurethane insulated buildings manufactured by Coldstream Products of Canada Ltd., of Winnipeg, Canada or Bally Refrigeration of Canada Ltd., or other approved alternates, with equal or better insulation may be considered. The PPD Standard Detail Drawings are based on use of a Coldstream type building, should an another building type be accepted, the Contractor shall, at his expense, provide shop drawings showing positions of all equipment to suit the requirements of the building specifics and any modifications for these Specifications.
- .3 In the design of the components, consideration shall be given to the climate in which it will be installed, the skid mounting setup, the requirements for anchoring the building, as well as anchoring the equipment to the floor panels, the number as well as size and location of pedestrian and loading doors and window, and the necessary wall openings for passage of piping, ventilation ducts and electrical conduits.
- .4 The building shall consist of self-framing members designed to withstand, within acceptable deflection limitations, transportation stresses, their own weight, acceptable snow loads, dead loads and live loads, and minimum design loads due to pressure and suction of wind as calculated in accordance with the National Building Code (NBC). For particular climatic design data, the Contractor and/or manufacturer shall refer to Section 01010.

2.3 Wall Panel Construction

The following minimum wall construction standards shall apply:

- .1 Panels shall consist of galvanized sheet steel fabricated from steel conforming to ASTM A446, Grade B, minimum 0.76mm (22 ga.) thick, with a coating of zinc conforming to Class Z275.
 - .1a Alternatively, the panels may consist of interior and exterior 0.76mm zinc-coated, die-formed, steel sheets firmly bonded to foamed-in-place polyurethane insulation with a minimum 75mm thickness.
- .2 The walls shall be insulated with fiberglass friction fit batts, R20 minimum.
 - .2a Alternatively, polyurethane insulation having a minimum density of 35.2kg/m³ and a minimum R20 insulation value, after aging. The polyurethane panels shall be self extinguishing in a fire situation. The panels shall be manufactured with die-formed polyurethane tongue and groove edges, so designed as to provide a polyurethane to polyurethane fit, without air space between panels when they are joined.
- .3 The interior wall panel liner shall consist of galvanized sheet steel fabricated from steel conforming to ASTM A446, Grade B, minimum 0.70mm (24 ga.) thick with a coating of zinc conforming to Class Z275.

- .3a All polyurethane insulated panels shall be equipped with a cam-locking or other clamp to draw and hold sections tightly together, operable from the interior of the building by the use of an 8mm hex key. Access to the locking device shall be through a 16mm diameter opening on the interior steel panel. After erection, this opening shall be sealed with snap-in type, chrome-plated button. Cams shall be provided on centres not exceeding 1,220mm.
- .4 The trim and flashing shall be the same materials and colour as that to which it is to be attached.
- .5 Fasteners shall be as specified by the manufacturer of the panel systems.

2.4 Roof (Ceiling) Panel Construction

- .1 The roof (ceiling) panel construction shall be as per construction described above for the wall panels. All roof panels shall be full length, without splices or laps.
- .1a On the exterior of the polyurethane insulated roof panels, provide preformed, galvanized steel sheeting, 0.70mm (24 ga.) thick, with interlocking joints to provide weather protection. The sheeting panels shall turn down 125mm minimum along the perimeter of the building to protect the wall-to-ceiling joint.

2.5 Joints, Reinforcements and Sealing (for Coldstream Buildings only)

- .1 For Coldstream Buildings, the following particular joint reinforcement and sealing is required for outdoor installation. Equivalent reinforcement and sealing may not be required for alternate building designs.
- .2 The cam-locking clamps shall draw and hold panels tightly together. Joints shall be sealed with high adhesion, non-hardening, non-skinning, moisture-resistant, Gasoline, and oil-resistant, odourless caulking compound. Walls exposed to the weather shall have an additional flush silicone seal.
- .3 At the perimeter of the building, provide 50mm x 50mm x 1.897mm galvanized steel angles, riveted to wall and floor panels and to wall and roof (ceiling) panels.
- .4 The interior vertical wall joints between the wall panels shall be covered with a galvanized steel strapping, 76mm x 1.897mm thick.
- .5 All interior corners at bottom and at top shall further be reinforced with galvanized steel angles, 50mm x 50mm x 1.897mm thick x 200mm long.
- .6 At the exterior perimeter of the building, provide a cover plate 125mm x 100mm x 0.759mm galvanized, riveted to wall and floor panels, so as to cover the floor-to-wall panel joint as shown on the Drawings. Vertical portion of plate to be notched at pedestrian door.
- .7 Fasteners shall be of the type, sizes and spacings shown on the building detail drawings.
- .8 In addition, once the building is installed at the permanent location in the field, the Contractor shall examine all joints and supply and apply an additional coat of sealant at all damaged portions of joints.

2.6 Skid Frame

The building shall be skid mounted, unless prior approval is obtained for an alternate foundation and floor option, from the Petroleum Products Division, Manager, Operations.

- .1 The steel for the skids shall conform to Section 05120.
- .2 The skid frame shall be of welded steel construction complete with floor-bearing plates and anchoring points as detailed on the building detail drawings.
- .3 The building shall be attached to the skid frame by means of bolts, washers and nuts as shown on the building detail drawings.
- .4 All fasteners going through the skid frame shall be fixed so that access under the skid shall not be required for fastening purposes.

2.7 Floor Panel Construction

- .1 Floor panels shall be constructed with 75mm nominal foamed-in-place polyurethane insulation with 1.897mm galvanized steel interior and exterior, or an approved equal.
- .2 Floor panels shall be anchored to the skid frame by means of galvanized steel bolts, nuts and washers, 16mm diameter, using a minimum of two bolts per panel and spaced as per details on the Drawings.
- .3 Stationary floor loads shall be limited to a maximum of 15kN/m².

2.8 Pedestrian and Loading Doors

- .1 All doors shall be a minimum 45mm thick insulated hollow metal doors. Doors shall be constructed of 1.0mm (20 ga,) zinc coated galvanized steel. The doors shall be insulated with polyurethane insulation. Double doors shall be equipped with a removable centre post, located between the two door swings.

The door opening shall be sufficient to allow pre-fabricated dispenser skids, complete with pumps, piping and meters, to be brought into the building without requiring the doorframe to be removed.

Fabrication of all doors shall comply with the Canadian Manufacturing Standards for steel doors and frames, published by the Canadian Steel Door and Frame Manufacturing Association.

- .1a The Coldstream building doors shall be freezer type, equipped with two chrome-plated, satin finish, heavy duty hinges operating on nylon bearings. The sizes and location of doors shall be as shown on the building drawings complete with polyurethane foamed-in-place insulation, zinc-coated, die-formed steel sheets 0.76mm all around.

The doors shall be internally reinforced at the periphery to prevent separation of the interior and exterior leaves. The pedestrian door shall **not** be equipped with a heating element.

- A latch shall be provided at all doors: Coldstream Door #0055000028 safe guard latch K-5, chrome-plated with padlocking features for use with 10mm shank. Inside push rod shall be capable of opening pedestrian door when the door is closed.
- .2 Chains shall be provided on the exterior of the building to hold doors open. The chains shall be galvanized 3mm diameter, complete with one 'S' hook at one end, and inserted in an eye bolt at the other end.
 - .3 All doors shall be equipped with heavy duty storm door chain, complete with double spring installed at the top of the doors and adjusted to limit the door swing to 100°.
 - .4 All doors shall be provided with weather stripping, all around, resistant to petroleum products and freezing.
 - .5 In addition to the door latches as described above, all doors shall have a heavy duty steel hasp and catch suitable for padlocking, with the catch perpendicular to the door.
 - .6 The pedestrian door shall be equipped with a 50mm diameter, two way air relief valve.
 - .7 The pedestrian and loading doors shall be equipped with prefabricated, preformed rain hoods.
 - .8 The pedestrian door shall have a 400mm x 560mm rectangular glass window equipped with Tru View double glass insulating unit. The fabrication shall be in accordance with the manufacturer's standard practice. The window shall be provided with a polycarbonate cover.

2.9 Flooring

- .1 The Contractor shall provide non-skid surfacing at areas where pedestrian traffic will occur and as shown on the Drawings.
- .2 The non-skid surfacing shall be 'Safety Tread' flooring sheet, aluminum, 3mm thick c/w button holes and attached to the floor by galvanized metal screws. Non-skid surfacing shall be as manufactured by I.S.G. Safety Grating Products Ltd., or approved equivalent.

2.10 Openings in Floor and Walls

- .1 Openings shall be made in walls and floor for passage of piping, ventilation ducts and other features. The openings shall be reinforced as called for on the Drawings. Sealant shall be applied to the interior and the exterior after the installation of pipes, ducts, etc. to provide weather tight joints. Sealants shall be used that are resistant to gasoline and LSDL fuels.

2.11 Ventilation for Building

1. The ventilation system is designed to provide ventilation inside the building and render it safe for breathing and from explosive atmosphere due to vapours originating from the presence of Gasoline and Low Sulphur Diesel Light (LSDL) fuel. The system shall monitor continuously mixtures of hydrocarbon vapour and air via a

sensor and a remotely-located control module, which will activate the exhaust fan, a motorized damper at the fresh air intake duct, a pilot light located inside the building and a hazard warning light located outside the building, when the vapour/air mixture reaches a predetermined point.

- .2 Ductwork and accessories:
 - .1 Fabrication and assembly of all ductwork and accessories shall conform to ASHRAE guidelines.
 - .2 Ducts shall be fabricated from galvanized steel sheets, commercial type ASTM A525, with thickness of sheets and duct sizes as shown on the building detail drawings.
 - .3 Duct walls with width dimensions larger than 200mm shall have diagonal breaks to prevent vibration. Longitudinal corner joints shall be of the 'Pittsburgh-Lock' type.
 - .4 Reinforcing steel shall be galvanized, bolted and/or riveted at 200mm maximum spacings. The joint between two galvanized steel angles shall be gasketed. The gasket shall be closed cell vinyl, 'Perma-Stick' type 136-M. Steel angles shall be bolted at 150mm maximum spacings.
 - .5 Elbows shall be as called for on the building detail drawings. Square elbows shall be provided with interior double wall vanes as manufactured by Duro-Dyne, or equivalent.
 - .6 Ducts shall be braced and fastened to the building as shown on the building detail drawings with galvanized bolts and stainless steel pop rivets.
- .3 An exhaust fan shall be provided on the exhaust duct outlet. The exhaust fan shall be direct drive, horizontal discharge, 1725 RPM, aluminum propeller, capacity 680L/s free air and 280L/s at 60Pa total static pressure, Leader Fan Industries Ltd. Cat AX12-4 fan or approved equivalent, complete with XBG-12 back guard and aluminum louvers to automatically open when the fan starts and close when the fan stops.
- .4 A motorized damper shall be provided on the fresh air intake duct complete with horizontal parallel blades, blade and jamb seals for tight fit and mounted in a galvanized steel frame. The damper shall be provided with an extended shaft equipped with nylon bearings for connection to an electric actuator to be mounted outside of the duct.
- .5 The damper actuator shall be two position, spring return, complete with damper linkage accessories, Barber-Coleman Model MA6-405, 120V, 60Hz, 2.0Nm minimum torque c/w AM-401 explosion-proof housing for Class 1, Group IIA hazardous location, or approved equivalent. The actuator shall be complete with all accessories and suitable for operation at ambient temperatures to -46°C. The actuator shall be ULC listed and CSA certified.
- .6 The grilles for ductwork shall be of extruded aluminum, double deflection, vertical front fins, Aero-Guide Ltd. Model 20DH or approved equivalent, size as shown on the Drawings.

- .7 Bird screens shall be provided in all ductwork openings outside of the building. The screens shall be of galvanized steel wire mesh, 12mm square, wire diameter 2mm, fastened to ducts with galvanized screws.
- .8 Air flow control shall be provided in the fresh air intake via a two-way deflection grille. The Contractor shall make the necessary field adjustments on the two-way deflection grille in order to optimize air volume and sweep of the floor area.

2.12 Mechanical in Building

- .1 All work shall conform to Section 15010 and all other particulars outlined in this Section.
- .2 The system function is to meter and dispense Gasoline and Low Sulphur Diesel Light (LSDL) fuel from the storage tanks to tank trucks and island dispenser(s) as shown on the building detail drawings.
- .3 The assemblies shall conform to applicable API, ULC, NFC and CSA Standards.
- .4 The assemblies shall be fabricated to this specification and shall conform and be tested to the Statutory Orders and Regulations of the Weights and Measures Act.
- .5 All material and equipment supplied under this Section shall be acceptable to the Electrical/Mechanical Safety Section, Department of Public Works and Services (PW&S) of the Government of the Northwest Territories (GNWT) with respect to their application.
- .6 Unless otherwise specified below, the Contractor shall refer to Section 15010 for specifications on pipes, valves, fittings, flanges, gaskets, bolts, nuts and jointing of threaded fittings. Socket weld and butt weld fittings and flanged connections shall be used whenever possible with a minimum number of threaded fittings.
- .7 The Low Sulphur Diesel Light (LSDL) fuel pump shall be a long-coupled, self-priming, centrifugal, electric motor driven Gorman-Rupp Model O3B31-B, size 75mm x 75mm c/w 3 H.P. motor, explosion-proof, Class 1, Group IIA, 115/230V, single phase, 60Hz, 3450 RPM; all mounted on a common steel base and properly aligned. Pump to have a bronze impeller, self-lubricated mechanical seal, coupling and coupling guard. Pump capacity to be 7.6L/s at 22.8m head; product specific gravity 0.85. Pump to be provided with 75mm threaded companion flanges and compatible gaskets at suction and discharge.
- .8 The Gasoline pump shall be close-coupled, self-priming, centrifugal, electric motor driven Gorman-Rupp Model O2C3-X $\frac{3}{4}$; size 50mm x 50mm c/w $\frac{3}{4}$ H.P. motor, explosion-proof, Class 1, Group IIA, 115/230V, single phase, 60Hz, 3450 RPM; bronze impeller, self-lubricated mechanical seal; capacity 3.8L/s at 13.7m head; product specific gravity 0.72.
- .9 The Motive Low Sulphur Diesel Light (LSDL) fuel pump shall be close-coupled, self-priming, centrifugal, electric motor driven Gorman-Rupp Model O2C3-X $\frac{3}{4}$; size 50mm x 50mm c/w $\frac{3}{4}$ H.P. motor, explosion-proof, Class 1, Group IIA, 115/230V, single phase, 60Hz, 3450 RPM; bronze impeller, self-lubricated mechanical seal; capacity 3.8L/s at 13.7m head; product specific gravity 0.85.

- .10 Pressure gauge, compound pressure gauge and gauge valves:
 - .1 A compound pressure gauge and gauge valve shall be installed on the piping at the suction of each of the Low Sulphur Diesel Light (LSDL) fuel and Gasoline pumps.
 - .2 The pressure gauge and gauge valve shall be installed on the piping at the discharge of the Low Sulphur Diesel Light (LSDL) fuel and Gasoline pumps.
 - .3 The dials on the gauges shall indicate the pressure in metric (kPa) and Imperial units (psig).
 - .4 The pressure gauges shall be Ametek Model 540, 100mm dial, 12mm NPT male pipe connection, all stainless steel, dry, range 0-700kPa (0-100psig), or approved equivalent.
 - .5 The compound pressure/vacuum gauges shall be the same as the pressure gauge above with range -100/0/700kPa (-15/0/100psig).
 - .6 The gauge valves shall be 12mm NPT, one male end and one female end, stainless steel to ANSI 316 specifications, Teflon seal, metal seat series, General Screw Products Co. or approved equivalent.
- .11 The Low Sulphur Diesel Light (LSDL) fuel metering assembly shall comprise the following:
 - .1 One Neptune Compact Meter Type 4, size 75mm, including an auto-stop valve at the outlet, a threaded companion flange at the inlet, a strainer/air eliminator assembly, metric model with metal gears, configuration as shown on the Drawings. **No substitute accepted.**
 - .2 The meter shall be mounted with a Neptune Model 844-L55 Register comprising a direct reading reset counter with zero start, a print-o-meter, a metric totalizer and preset quantity controls.
 - .3 The counter shall register in litres and tenths of a litre. The accumulative totalizer shall indicate litres.
 - .4 The strainer shall be equipped with a 20 mesh stainless steel screen.
 - .5 Flow rate maximum 9.5L/s, minimum 1.9L/s.
- Specification Note: Designer to modify as required.**
- .6 Where automatic temperature compensation metering systems are specified delete the register and counter and provide the components specified in Section 13420.
- .12 The Gasoline metering assembly, *for sales to the public*, shall comprise the following:
 - .1 One Neptune Compact Meter Type 4, size 32mm, with mating 38mm threaded companion flanges at the inlet and outlet, metric non auto-stop

model with **metal** gears, including a strainer/air eliminator assembly, configuration as shown on the Drawings. **No substitute accepted.**

- .2 The meter shall be complete with a **Midwest Computer Corporation - Mid:Com Series 8000** (complete with RAM Card) electronic temperature compensating register and ticket printer system, complete with all wiring and brackets. The counter and register must be explosion proof, Class 1, Group IIA, hazardous location, and the computer and ticket printer module shall be remotely mounted in a heated insulated cabinet located at least 6,000mm from the dispenser building, or in the Operators Shelter Building.
- .2a Note: (if the sales are not to the public a Veeder-Root petroleum products Model 7890 register with ticket printer and zero start reset, accumulative totalizer and a Veeder-Root to Neptune adapter, may be used.
- .3 A micro-switch, explosion-proof, Class 1, Group IIA, hazardous location, Veeder-Root Model 312020-387 tray sensing kit shall be installed at the back of the register. The micro-switch shall be 120 V, DPDT, 3 amp rating minimum.
- .4 The counter shall have 5 figures and shall register in litres and hundredths of a litre. The ticket printer shall print in litres and tenths of a litre. The accumulative totalizer shall indicate litres.
- .5 The strainer shall be equipped with a 40 mesh stainless steel screen.
- .6 Flow rate maximum 1.9L/s, minimum 0.315L/s.

Specification Note: Designer to modify as required.

- .7, Where automatic temperature compensation metering systems are specified, delete the register and counter and provide the components specified in Section 13420.
- .13 Motive Low Sulphur Diesel Light (LSDL) fuel metering assembly:
 - .1 The product dispensed via the LSDL fuel metering assembly shall be dispensed as Motive LSDL fuel and will be a Low Sulphur grade Diesel Light (LSDL) fuel.
 - .2 The metering assembly shall comprise the same equipment as for the Gasoline meter above, except that the strainer shall be equipped with a 20 mesh stainless steel screen.
- .14 The Low Sulphur Diesel Light (LSDL) fuel air release vessel complete with air eliminator shall comprise the following:
 - .1 One Neptune Type HH, horizontal air release vessel c/w Liquid Controls Corp. Model A-8110, Air Eliminator, maximum pressure 1 034kPa assembly or approved equivalent, 75mm flanged inlet and outlet nozzles at each end, 1,034kPa, raised face, one flanged outlet at top c/w matching air release float unit, two support legs and two 25mm drain plugs at bottom, one center and one near inlet end, as per standard manufacturer's design. The air

eliminator vent on this unit is to be piped to the drip recovery vessel as shown on the building detail drawings.

- .15 Hose assembly for Gasoline (unleaded) and Motive Low Sulphur Diesel Light (LSDL) fuel dispensing at the building shall comprise the following (one set complete per product or as indicated):
 - .1 One 19mm I.D. x 4,500mm long, flexsteel curb pumphose suitable for operation at -46°C and complete with male and male Scovill fittings at each end.
 - .2 Two OPW 33 'Swivette' two-plane swivels, 19mm male NPT x 19mm female NPT, one on each end of the hose.
 - .3 One OPW Model 11-AP nozzle, Viton fitted, 19mm female inlet c/w built-in check valve and OPW 5-BP spout, 21mm O.D., and full red hand insulator for unleaded Gasoline only.
 - .4 One OPW Model 11-A nozzle, Viton fitted, 19mm female inlet c/w built-in check valve and OPW 5-B spout, 24mm O.D., and full green hand insulator for Motive Low Sulphur Diesel Light (LSDL) fuel only.
- .16 The hose assembly for Low Sulphur Diesel Light (LSDL) fuel dispensing shall comprise the following:
 - .1 One hose shall be 65mm I.D. X 4,500mm long Continental Hose for Aircraft Fueling, complete with male and male Scovill fittings with a reducer at each end, shall be provided. One end of the hose shall be terminated with a 75mm dry-break coupler and dust cap. The hose shall be rated for a maximum working pressure of 690kPa and shall retain complete flexibility down to -50°C. The hose shall be totally resistant to Gasoline and Low Sulphur Diesel Light (LSDL) fuel, abrasion and weather.
- .17 The dry-break coupler shall be Emco Wheaton Model No. J-1407, aluminum construction and low temperature Buna-N seals, 75mm female NPT inlet, or approved equivalent.
- .18 The dry-break adapter shall be Emco Wheaton Model No. J-1302, 75mm, stainless steel with low temperature Buna-N seals, complete with matching aluminum dust cap, two 'S' hooks and a 300mm long chain, or approved equivalent. The adapter is to be used on the bottom load tank truck.
- .19 The nozzle for top loading of Low Sulphur Diesel Light (LSDL) fuel truck shall be assembled from the following items:
 - .1 One high flow top loading nozzle OPW Model 190 or Husky Model 1690, size 50mm, c/w an aluminum 50mm spout and also an interchangeable 50mm X 1,500mm Aluminum submerged fill spout.
 - .2 One 65mm ø x 50mm ø malleable iron galvanized reducer.
 - .3 One 50mm ø x 65mm ø long carbon steel galvanized pipe.

- .4 The Contractor shall store the adapter and the nozzle inside the dispenser building or as directed by the Engineer.
- .20 Low temperature lubricant, Esso Low Torque Grease Beacon 325 suitable to -75°C or manufacturer's equivalent, shall be used for all pumps and motors described above. Manufacturer to confirm adequacy of specified lubricant.
- .21 The Contractor shall provide one free standing drip recovery vessel for each product, Gasoline and Low Sulphur Diesel Light (LSDL) fuel. The vessels shall be fabricated from steel and of construction as shown on Drawing S-GP-03, Detail 6. Each vessel shall include the following:
 - .1 One threaded opening at the bottom, 19mm diameter, for a drain valve and piping to pump suction for draining.
 - .2 One threaded opening on top, 19mm diameter for drain line from air eliminators, and one threaded 19mm diameter opening for vent piping to the outside of the building.
 - .3 One threaded opening 100mm diameter on top of vessel for a gauge hatch.
 - .4 One gauge hatch, Shand & Jurs Model 95020, welding flange mounting.
- .22 The Contractor shall install in-line thermal pressure relief valves, where shown on the building detail drawings, to relieve thermal pressure in the piping towards the storage tanks. Pressure relief valves shall be 12mm diameter carbon steel, male NPT ends, NUPRO Catalogue No. S-8CPA2-3 set to relieve pressure at 103kPa. The pressure relief valves shall be engraved with an arrow showing the direction in which the pressure is relieved and figures showing the relief pressure. *NOTE: The engraving shall not be painted over.*
- .23 The Contractor shall provide pipe and equipment supports and hangers to adequately support the piping and equipment as shown on the Drawings. Additional supports shall be provided if actual conditions dictate. Base plates and supports shall be all welded construction, drilled for anchor bolts. Hangers shall be of stock or production parts as manufactured by ITT Grinnell or approved equivalent. Pipe hangers shall be capable of supporting the pipe under all conditions of operation. They shall allow free expansion and contraction of the piping and prevent excessive stress to be induced in the pipe or transmitted to the equipment.
- .24 All floor mounted equipment shall be replaceable without the need for access to the underside of the building. Bolts or nuts shall be tack welded as required.

2.13 Electrical and Grounding

- .1 General:
 - .1 All Work shall be in conformity with Section 16010 and with the Canadian Electrical Code (CEC) Part 1, latest edition, with particular reference to Sections 10, 18 and 20 and all other particulars outlined in this section.

- .2 The entire building shall be considered as Class 1, Group IIA, and all fixtures, motors, heater, switches, starters and related accessories and electrical equipment shall be suitable for Class 1, Group IIA, Hazardous Location installation.
- .3 The Contractor is advised to verify with the Electrical/Mechanical Safety Section, Asset Management Division, Department of Public Works and Services of the Government of the Northwest Territories for local by-laws or other particular special requirements that may be applicable to the Work and to obtain Electrical Certification of the dispenser building when completed on site.
- .2 Voltage Ratings:
 - .1 Operating voltages shall be within those defined in CSA Standard C235, latest edition.
 - .2 All motors, electrical heating, control and distribution devices and equipment shall operate satisfactorily at 60Hz within normal operating limits established by the above standard. Equipment must be able to operate in extreme operating conditions established in above standard without damage to equipment down to minus 46°C, although the building will normally be heated to minus 10°C.
 - .3 The phase, voltage and amperage ratings of all equipment installed shall meet the ratings indicated on the Drawings or in the specifications.
- .3 All electric motors shall be explosion-proof, Class 1, Group IIA, as called for on the Drawings and shall be supplied with equipment.
- .4 All motors shall be lubricated for operation at temperatures to minus 46°C.
- .5 Motor Starters:
 - .1 The manual starter switches for the hose reel and the exhaust fan motors shall be explosion-proof, EEMAC Type 7D and 9EFG, enclosure Class 1, Group IIA, single phase, 1 H.P. rating at 115/230V, 2 pole toggle lever type c/w one type 'P' overload heater element sized for the motor amperage, Allen-Bradley Cat. No. 600-TEX5-12 or approved equivalent.
 - .2 The full voltage magnetic starters for the Gasoline pump and Low Sulphur Diesel Light (LSDL) fuel pump motors shall be remotely installed in the Operator's Shelter Building but shall be provided with this building. The starters shall be as indicated on Drawing E-SB-02.
 - .3 An emergency shutdown button shall be installed on the exterior of the building beside the door.
- .6 Lighting Fixtures:
 - .1 The lighting fixtures for interior and exterior of the building shall be explosion-proof and weather resistant, Class 1, Group IIA, incandescent type. Lamps shall be 150 watt incandescent, A-23, medium base, 120V,

extended service, clear.

- .2 The Type 'A' interior fixtures shall be ceiling-mounted type, factory-sealed, hub size 13mm, complete with cast aluminum guard and lamp. Appleton Code-Master 'C' Cat. No. AEC-1550-CG, or approved equivalent.
- .3 The Type 'B' exterior fixture shall be wall-mounted, long bracket type, factory-sealed, hub size 19mm, complete with cast aluminum guard and lamp. Appleton Code-Master 'C' Cat. No. AELB-1575-CG complete with polycarbonate covers, or approved equivalent.
- .4 The interior hazard warning red pilot light shall be Allen-Bradley Cat. No. 800H-HVX7 base, c/w Cat. No. 800H-NP-30 cover and Cat. No. 800H-PP16R red pilot light transformer type c/w colour cap and lamp. The pilot light shall automatically be turned "ON" when an unsafe vapour concentration is reached inside the building. The pilot light shall be explosion-proof, Type 7CD approved for Class 1, Group IIA, hazardous locations.
- .5 The exterior hazard warning lighting fixture shall be a one lamp unit, Appleton Cat. No. TVA 1170, with one red polycarbonate globe and guard, complete with Type A-21 Clear Traffic Signal incandescent lamp, 125V, 69 watts, CSA approved. The hazard warning light located above the roof shall automatically be turned "ON" when an unsafe vapour concentration is reached inside the building.
- .7 Heater:
 - .1 The heater shall be two Chromalox Type CEP-15-C, 120V, single phase, 1500 watt heaters, c/w terminal box at one end with 19mm hub, with wall mounting brackets, protective cover and located as shown on the Drawings.
 - .2 The heater shall be a heavy duty finned steel pipe body, specially coated for rust protection. Heating elements shall be low watt density and completely sealed in accordance with CSA Code requirements. The heater shall be thermostatically controlled by two thermostats, see following.
- .8 Thermostats:
 - .1 The two thermostats shall be explosion-proof, CSA approved, Class 1, Group IIA, non-adjustable from exterior, capillary bulb type, range minus 18°C to + 38°C, single phase, D.P.S.T. contacts, rating 25A maximum, at 277 V max., Chromalox Cat. No. AR-0464-EP-2. The location of thermostats and temperature settings shall be as shown on the Drawings. Thermostats shall be installed on a plywood backing and capillary wire and bulb inserted into the conduit as shown on the Drawings.
 - .2 One thermostat set at the lower temperature (about minus 10°C) controls the room temperature at all times when the power switch is turned "ON". The second thermostat, set at the higher temperature (about +10°C), overrides the first thermostat and will operate the heater when the start/stop push button is activated. A timer will automatically cut out this second thermostat

after a predetermined period of time. This second thermostat can also be cut out by depressing the stop push button. A pilot light will indicate that the timer is "ON". A switch located in the building will cut out the heating entirely.

- .9 The automatic reset timer shall turn off the heater from the high setting to the lower setting after one hour of operation or as otherwise specified by the Engineer. The timer shall be as shown on Drawing E-SB-02 and shall be remotely installed in the general purpose enclosure in the Operators Shelter Building.
- .10 The push button stations shall be heavy duty, explosion-proof, Type 7CD and 9EFG approved for Class 1, Group IIA, hazardous locations. The push buttons are to be as indicated on the building detail drawings or approved equivalents.
- .11 Switches:
 - .1 The switches for building lighting and heater circuit shall be Crouse-Hinds EFS series, with tumbler switch, front operated, single or two gang, single pole, 20A rating at 120V, shallow enclosure or approved equivalent as shown on the Drawings.
 - .1 Single gang: Cat. No. EFSC 2129, feed through
 - .2 Two gang: Cat. No. EFS 1229, dead end
 - .2 The selector switch for the ventilation system shall be as indicated on the building detail drawings.
 - .3 The disconnect tumbler switches for the Gasoline and the Low Sulphur Diesel Light (LSDL) fuel pump motors shall be as described on the building detail drawings.
- .12 The control relay for the heater shall be as described on the building detail drawings and shall be installed in the operator's shelter building.
- .13 The contactors for the heating and ventilation system shall be as described on the building detail drawings and shall be remotely installed in the Operators Shelter Building.
- .14 The terminal block shall be as described on the building detail drawings. All wiring shall be identified at the terminal block and referenced to the shop drawing of the terminal block. A diagram showing the equipment connected and the wire number shall be placed in the junction box at the time of shipping.
- .15 Polygas surveillance and detection system:
 - .1 The Contractor shall supply all equipment required for the Polygas Surveillance and Detection System as described in Section 13229.
 - .2 The system shall continuously detect and analyze the concentration of hydrocarbon vapours in the air of the building and automatically control the ventilation system in the building, as well as the hazard pilot light inside the building and the hazard warning light outside above the building roof.

- .3 The Contractor shall install the sensor for the detection of hydrocarbon vapours in the building as shown on the building detail drawings and as per the manufacturer's recommendations. All other equipment, i.e., the cabinet enclosing the control module(s), the connection blocks and relays together with power transformer and contactor(s), shall be installed on site by the Contractor in the Operators Shelter Building.
- .4 The Contractor must ascertain that the ventilation system will go "ON" as soon as the concentration of vapours in the room reaches an unsafe level for breathing, as recommended in the API 2015 Publication, or as the vapour concentration reaches a maximum of 10% of the lowest flammable limit of products under consideration.
- .5 The Polygas Surveillance and Detection System shall be verified, calibrated, certified, and tested both at the shop and on site by a qualified technician and a one year Security Certificate shall be issued to the Engineer in the name of the Government of the Northwest Territories.
- .16 Fittings, conduits, seals and wiring shall be as per Section 16010. Two hole clamps shall be used for anchoring conduit.
- .17 The Contractor shall refer to the Drawings for details on static electricity grounding of the building, the pipes and for ground cable and clamp for grounding of the tank trucks.
- .18 Electrical System Grounding:
 - .1 The continuity of ground throughout the non-current carrying parts of the electrical system shall be established by the Contractor according to Section 10 of the Canadian Electrical Code and to the satisfaction of the Inspecting Authority and the Engineer.
 - .2 The ground wires shall be brought to the ground lugs at the point of the power supply.
- .19 Markings:
 - .1 All switches, contactors, timer, etc., shall be identified with permanent labels, stainless steel type, attached to covers of enclosure boxes. Refer to Section 16010.
 - .2 Identify all wiring and colour codes and numbers at the terminal blocks and at the junction box at the point of entry into the building. Same numbers shall be applied to wires in the operator's shelter building.
- .20 Installation:
 - .1 All electrical equipment, switches, heater, etc. shall be tested and checked for satisfactory operation at the shop prior to shipping and in the field after installation, also see Section 16010.
 - .2 All tests shall be carried out in the presence of the Engineer and shall be to his satisfaction.

2.14 Fire Protection Equipment

- .1 Supply and install one portable fire extinguisher where shown on the Drawings. The portable dry chemical fire extinguisher shall be Type ABC, Multipurpose Foray Powder, fitted with external nitrogen operated cartridge, 9 kilogram capacity. The fire extinguisher shall be ANSUL Model LT-A20E, ULC rating 10-A-80-BC, complete with wall hanger and mounted at floor level.

PART 3 – EXECUTION

3.1 Finishes - Building Panels and Components

- .1 The interior and exterior faces of the building wall panels and doors, and the rainhoods, shall be finished in smooth baked white acrylic enamel on zinc-coated steel as per manufacturer's standard practice.
- .2 The building roof (ceiling) panels shall be finished galvanized on the exterior and smooth baked white acrylic enamel on the interior as per manufacturer's standard practice.
- .3 The building floor panels shall be finished galvanized both sides as per manufacturer's standard practice.
- .4 The reinforcing angles and plates shall be finished to match the panels.
- .5 The turn down of roof galvanized steel sheeting shall be finished galvanized.
- .6 The exterior edge of the floor panels shall be finished in smooth baked black acrylic enamel as per manufacturer's standard practice.

3.2 Surface Preparation for Painting

- .1 Surface preparation for painting skid frame, base plates, supports, steel reinforcing rings, drip pan, anchor bolts, nuts and washers shall be as per Section 09900.

3.3 Painting

- .1 The skid frame, base plates, supports, steel reinforcing rings, drip pan, anchor bolts and washers shall receive:
 - .1 One shop applied primer coat as per CGSB 1-GP-140 M.
 - .2 Followed by one intermediate and one final coat, shop applied, of aluminum paint as per CGSB 1-GP-69.
- .2 The piping, valves, fittings, equipment framing and housings (e.g. pump housing, meter housings, etc.) shall be colour coded and identified as per product as follows:
 - .1 For all, one shop applied primer coat as per CGSB 1-GP 140M.

- .2 Followed by:
 - .1 For Low Sulphur Diesel Light (LSDL) fuel system, two coats CGSB 1-GP-12C-503-107 Galway Green.
 - .2 For Gasoline system, two coats CGSB 1-GP-12C-508-101 Orange.
- .3 The galvanized steel ducts for ventilation intake and exhaust, the galvanized steel panels, the electrical conduits and fixtures shall **not** be painted.
- .4 Name plates, markers and tags, relief valves in particular, shall **not** be painted over, and masking tape shall be removed once painting is completed. All paint applied over name plates shall be removed with solvent.

3.4 Shop Testing, Inspection and Calibration

- .1 The Contractor shall notify the Engineer in advance of the date when shop testing of the building equipment will take place.
- .2 The Contractor shall perform air pressure tests at 690kPa on both the Gasoline and Low Sulphur Diesel Light (LSDL) fuel systems and maintain the pressure for a minimum of two (2) hours. The time, pressure and air temperature shall be noted at the beginning and at the end of the tests. While the system is under pressure, all joints shall be verified with soapy water or oil. Any leaks found shall be repaired immediately and piping re-tested until all joints hold tight.
- .3 Once the air testing is satisfactorily complete, the Contractor shall test both systems as described below with appropriate product. The product to be used for testing the Gasoline system shall be regular unleaded Gasoline and for the Low Sulphur Diesel Light (LSDL) fuel system shall be Low Sulphur Diesel Light (LSDL) fuel.
 - .1 All air must first be removed from the system prior to making the tests.
 - .2 The Contractor shall circulate product through the systems to verify the performance of the pumps and meters.
 - .3 Pressure readings shall be recorded at the suction and discharge of the pumps at the following flow conditions:
 - .1 zero flow
 - .2 at approximately one-half full flow
 - .3 at full flow condition.
 - .4 Motor amperage draw and voltage of motor shall be recorded at all three conditions, for each pump, as per the Test Sheet for Electrical Installations form provided at the end of this section. Use one sheet for each motor.
 - .5 While performing product testing, the Contractor shall inspect piping and equipment for possible leaks. Any leaks discovered shall be repaired immediately, and the testing undertaken until no leaks are found.

- .6 The meters and the automatic temperature compensating systems shall be calibrated properly, tested, certified, and sealed to the Department of Consumer and Corporate Affairs Canada, Volumetric Legal Metrology, Weights and Measures Canada procedures.
- .7 The size of the prover tank to be used shall not be less than 500 litres. Meter counter should run a minimum of one minute at full flow.
- .8 After adjusting the meter for calibration, a minimum of three consecutive runs shall be carried out, and volumes recorded for each run shall match within allowable limits. This procedure shall be repeated until proper calibration of the meter is obtained.
- .9 The meter shall be sealed after calibration and testing, and the calibration certificate shall be presented to the Engineer.
- .4 All building equipment, lighting fixtures, heater, etc. shall be tested at the shop prior to shipping.
- .5 The Polygas Surveillance and Detection System shall be calibrated and tested by a qualified technician at the shop as per the manufacturer's specifications, and a certificate shall be issued.
- .6 The ventilation system shall be tested in conjunction with the Polygas Surveillance and Detection System.
- .7 The entire building shall be inspected, and any deficiency corrected immediately.
- .8 The Contractor shall record all test data from the tests and submit to the Engineer for acceptance.

3.5 Flushing and Sealing for Shipment

- .1 Following testing, the Contractor shall thoroughly flush and drain the Gasoline and Low Sulphur Diesel Light (LSDL) fuel systems, clean the strainers and remove any sediment. Piping portions protruding outside the building shall be dismantled, as required, and placed inside of the building for field installation on the site. Open ends of piping shall be capped or plugged.

3.6 Packaging

- .1 All items shall be suitably packaged for transportation and delivery to the site.

3.7 Final Hookups on Site

- .1 Set in place and make final piping, grounding and electrical hookups at site of building complete as required and as described in Section 01010.

END OF SECTION 13227

**TEST SHEET FOR ELECTRICAL INSTALLATIONS
(USE SEPARATE SHEET FOR EACH MOTOR)**

SITE: _____ PROJECT NO.: _____

Contractor: _____

DATE: _____ MOTOR H.P.: _____ PHASE: _____

TEST: Installation resistance to ground _____ megohms.

Voltage at panel mains section:

(1) Between phases: A - B _____ B - C _____ A - C _____
Line to neutral: A - N _____ B - N _____ C - N _____

(Note for 120/240 V read A - B only and A - N and B - N only)

(2) Running amperes
of motor: A _____ B _____ C _____

(Note for 120/240V read A and B only)

Motor Serial No.: _____ Model No.: _____

Manufacturer: _____

Pump Duty (Product pumped or other use): _____

SIGNATURE: _____

(print name after signature)

DIVISION 13 - SECTION 13229

OPERATORS SHELTER BUILDING

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies the requirements for the supply, assembly and installation in the field of a metal building, complete with steel skid frame, all equipment and accessories.

1.2 Related Work

- | | | |
|----|---|---------------|
| .1 | Summary of the Work | Section 01010 |
| .2 | Shop Drawings | Section 01340 |
| .3 | Substantial Completion Inspection Requirements | Section 01650 |
| .4 | Structural Steel | Section 05120 |
| .5 | Miscellaneous Metal | Section 05500 |
| .6 | Painting | Section 09900 |
| .7 | Automatic Temperature Compensating Metering Systems | Section 13420 |
| .8 | General Mechanical Provisions | Section 15010 |
| .9 | General Electrical Provisions | Section 16010 |

1.3 Reference Standards

- .1 National Building Code of Canada (NBC)
- .2 Canadian General Standards Board (CGSB)
- .3 Canadian Standards Association (CSA)
- .4 American Society for Testing and Materials (ASTM)

1.4 Submissions

- .1 The Contractor shall provide all manufacturer's literature and data and recommended spare parts lists to the Engineer, as per Section 01700.
- .2 The building manufacturer shall provide five (5) complete sets of installation instructions, accompanied by erection drawings and identification of all panels, doors, etc.

1.5 Contractor's Duties

- .1 The Contractor shall be responsible to complete the design to accommodate the approved equipment and components.
- .2 The Contractor shall provide and pay for all other facilities and services necessary for proper execution and completion of the Work.

1.6 Protection

- .1 The Contractor shall provide the necessary protection to safeguard the building, building contents, equipment and accessories from damage during transit and handling.
- .2 The Contractor shall make adequate provision to avoid structural over stressing.

- .3 No part of the structure shall be loaded during construction or transportation with a load greater than it is calculated to bear safely when assembled.

1.7 Location of Fixtures

- .1 The location of fixtures, apparatus, outlets, etc., shown or specified on the standard building drawings, are indicated with as much accuracy as possible and shall be adhered to whenever possible.
- .2 The Contractor shall be responsible to modify the actual location to suit equipment substitution or variation due to manufacturer's changes.
- .3 Before installation, the Contractor must inform the Engineer of the impending installation and consult with him for actual location. Prior approval by the Engineer is required for all material or equipment changes.

PART 2 – MATERIALS

2.1 Type of Building

- .1 The building proper shall consist of a skid mounted, pre-engineered and prefabricated, insulated, sectional, metal components of the type used in prefabricated refrigerated buildings, except that in this case the interior may be heated occasionally to 15°C, while the exterior may be down to minus 46°C.
- .2 The building details and specifications included in this section are based on manufacturer's data from Maklok Buildings Inc. of Nisku, Alberta. (Polyurethane insulated buildings manufactured by Coldstream Products of Canada Ltd., of Winnipeg, Canada or Bally Refrigeration of Canada Ltd., or other approved alternates, with equal or better insulation may be considered). The PPD Standard Detail Building Drawings are based on use of a Coldstream type building, should another building type be accepted, the Contractor shall, at his expense, provide shop drawings showing positions of all equipment to suit the requirements of the building specifics and any modifications for these Specifications.
- .3 In the design of the components, consideration shall be given to the climate in which it will be installed, the skid mounting setup, the requirements for anchoring the building, as well as anchoring the equipment to the floor panels, the number as well as size and location of pedestrian and loading doors and window, and the necessary wall openings for passage of electrical conduits.
- .4 The building shall consist of self-framing members designed to withstand, within acceptable deflection limitations, transportation stresses, their own weight, acceptable snow loads, dead loads and live loads, and minimum design loads due to pressure and suction of wind as calculated in accordance with the National Building Code (NBC). For particular climatic design data, the Contractor and/or manufacturer shall refer to Section 01010.

2.2 Wall Panel Construction

The following minimum wall construction standards shall apply:

- .1 Panels shall consist of galvanized sheet steel fabricated from steel conforming to ASTM A446, Grade B, minimum 0.76mm (22 ga.) thick with a coating of zinc conforming to Class Z275.
- .1a Alternatively, the panels may consist of interior and exterior 0.76mm zinc-coated, die-formed, steel sheets firmly bonded to foamed-in-place polyurethane insulation with a minimum 75mm thickness.
- .2 The walls shall be insulated with fiberglass friction fit batts, R20 minimum.
- .2a Alternatively, polyurethane insulation having a minimum density of 35.2kg/m³ and a minimum R20 insulation value, after aging. The polyurethane panels shall be self extinguishing in a fire situation. The panels shall be manufactured with die-formed polyurethane tongue and groove edges, so designed as to provide a polyurethane to polyurethane fit, without air space between panels when they are joined.
- .3 The interior wall panel liner shall consist of galvanized sheet steel fabricated from steel conforming to ASTM A446, Grade B, minimum 0.70mm (24 ga.) thick with a coating of zinc conforming to Class Z275, and pre-painted white.
- .3a All polyurethane insulated panels shall be equipped with a cam-locking or other clamp to draw and hold sections tightly together, operable from the interior of the building by the use of an 8mm hex key. Access to the locking device shall be through a 16mm diameter opening on the interior steel panel. After erection, this opening shall be sealed with snap-in type, chrome-plated button. Cams shall be provided on centres not exceeding 1,220mm.
- .4 The trim and flashing shall be the same materials and colour as that to which it is to be attached.
- .5 Fasteners shall be as specified by the manufacturer of the panel systems.

2.3 Roof (Ceiling) Panel Construction

- .1 The roof (ceiling) panel construction shall be as per construction described above for the wall panels. All roof panels shall be full length, without splices or laps.
- .1a On the exterior of the polyurethane insulated roof panels, provide preformed, galvanized steel sheeting, 0.70mm (24 ga.) thick with interlocking joints to provide weather protection. The sheeting panels shall turn down 125mm minimum along the perimeter of the building to protect the wall-to-ceiling joint.

2.4 Joints, Reinforcements and Sealing (for Coldstream Buildings only)

- .1 For Coldstream Buildings the following particular joint reinforcement and sealing is required for outdoor installation. Equivalent reinforcement and sealing may not be required for alternate building designs.
- .2 The cam-locking clamps shall draw and hold panels tightly together. Joints shall be sealed with high adhesion, non-hardening, non-skinning, moisture-resistant, oil-resistant, odourless caulking compound. Walls exposed to the weather shall have an additional flush weatherproof caulking seal.

- .3 At the perimeter of the building, provide 50mm x 50mm x 1.897mm galvanized steel angles, riveted to wall and floor panels and to wall and roof (ceiling) panels.
- .4 The interior vertical wall joints between the wall panels shall be covered with a galvanized steel strapping, 76mm x 1.897mm thick.
- .5 All interior corners at bottom and at top shall further be reinforced with galvanized steel angles, 50mm x 50mm x 1.897mm thick x 200mm long.
- .6 At the exterior perimeter of the building, provide a cover plate 125mm x 100mm x 0.76mm galvanized, riveted to wall and floor panels, so as to cover the floor-to-wall panel joint as shown on the standard building drawings. Vertical portion of plate to be notched at pedestrian door.
- .7 Fasteners shall be of the type, sizes and spacings shown on the standard building detail drawings.
- .8 In addition, once the building is installed at the permanent location in the field, the Contractor shall examine all joints and supply and apply an additional coat of sealant at all damaged portions of joints.

2.5 Skid Frame

The building shall be skid mounted, unless prior approval is obtained from the Petroleum Products Division, Manager, Operations (867) 920-3413, for an alternate foundation and floor option.

- .1 The steel for the skids shall conform to Section 05120.
- .2 The skid frame shall be of welded steel construction complete with floor-bearing plates and anchoring points as detailed on the standard building drawings.
- .3 The building shall be attached to the skid frame by means of bolts, washers and nuts as shown on the standard building drawings.
- .4 All fasteners going through the skid frame shall be fixed so that access under the skid shall not be required for fastening purposes.

2.6 Floor Panel Construction

- .1 Floor panels shall be constructed with 75mm nominal foamed-in-place polyurethane insulation with 1.897mm galvanized steel interior and exterior, or an approved equal.
- .2 Floor panels shall be anchored to the skid frame by means of galvanized steel bolts, nuts and washers, 16mm diameter, using a minimum of two bolts per panel and spaced as per details on the Standard building drawings.
- .3 Stationary floor loads shall be limited to a maximum of 15kN/m².

2.7 Pedestrian Door

- .1 All doors shall be a minimum 45mm thick insulated hollow metal doors. Doors shall be constructed of 1.0mm (20 ga,) zinc coated galvanized steel. The doors shall be

insulated with polyurethane insulation. Double doors shall be equipped with a removable centre post, located between the two door swings.

The door opening shall be sufficient to allow pre-fabricated dispenser skid, complete with pumps, piping and meters, to be brought into the building without requiring the doorframe to be removed.

Fabrication of all doors shall comply with the Canadian Manufacturing Standards for steel doors and frames, published by the Canadian Steel Door and Frame Manufacturing Association.

.1a The Coldstream building doors shall be freezer type, equipped with two chrome-plated, satin finish, heavy duty hinges operating on nylon bearings. The sizes and location of doors shall be as shown on the building standard building drawings complete with polyurethane foamed-in-place insulation, zinc-coated, die-formed steel sheets 0.76mm all around.

The doors shall be internally reinforced at the periphery to prevent separation of the interior and exterior leaves. The pedestrian door shall **not** be equipped with a heating element.

A latch shall be provided at all doors: Coldstream Door #0055000028 safe guard latch K-5, chrome-plated with padlocking features for use with 10mm shank. Inside push rod shall be capable of opening pedestrian door when the door is closed.

- .2 Chains shall be provided on the exterior of the building to hold doors open. The chains shall be galvanized 3mm diameter, complete with one 'S' hook at one end, and inserted in an eye bolt at the other end.
- .3 All doors shall be equipped with heavy duty storm door chain complete with double spring installed at the top of the doors and adjusted to limit the door swing to 100°.
- .4 All doors shall be provided with weather stripping, all around, resistant to petroleum products and freezing.
- .5 In addition to the door latches as described above, all doors shall have a heavy duty steel hasp and catch suitable for padlocking, with the catch perpendicular to the door.
- .6 The pedestrian door shall be equipped with a 50mm diameter, two way air relief valve.
- .7 The pedestrian and loading doors shall be equipped with prefabricated, preformed rain hoods.
- .8 The pedestrian door shall have a 400mm x 560mm rectangular glass window equipped with Tru View double glass insulating unit. The fabrication shall be in accordance with the manufacturer's standard practice. The window shall be provided with a polycarbonate protective cover.

2.8 Windows

- .1 Three windows, 700mm x 560mm, shall be provided on exterior walls of the building as shown on the Drawings. Windows shall be provided with additional polycarbonate exterior protective covers. The fabrication shall be as per manufacturer's standard practice.

2.9 Flooring

- .1 Flooring shall consist of interlocking tiles, 100% recycled PVC, non-skid surface with round raised embossing on the surface. Sides to have a 'jigsaw' interlocking system. Tiles to be 495mm x 495mm by approximately 8mm thick.
- .2 Flooring to be "LOCK TILE" as available from RCM International or approved equivalent.
- .3 Installation to start from centre of the room and work towards the walls. The covering shall cover the entire floor of the building and shall be notched out at floor openings. No adhesive required.

2.10 Shelving

- .1 Provide two 1,220 mm long sections of free standing galvanized steel shelving units as shown on Standard Drawing NT-A-SB-03, and each comprising the following:
 - .1 Item 1: six (6) metal shelves, 305mm wide x 1,220mm long, 25mm deep returns on all 4 sides, 16 gauge.
 - .2 Item 2: four (4) legs, 57mm x 35mm x 1,900mm long, heavy duty 10 gauge, perforated and slotted.
 - .3 Assembly: Shelves to be bolted to legs at each corner with 10 dia. x 19mm long hex head machine bolts and hex nuts. Top of first shelf at 150mm above floor, with subsequent shelves at 350mm spacing.
 - .4 Shelving shall be as manufactured by Redirack Dexion Co. or approved equivalent.

2.11 Desk

- .1 Provide a free-standing metal desk, 1,070mm high x 610mm wide x 1,220mm long, as shown on Standard Drawing NT-A-SB-03, and comprising:
 - .1 three shelves, one shelf compartmented;
 - .2 one lockable drawer.

2.12 Openings in Floor And Walls

- .1 Openings shall be made in walls and floor for passage of piping, ventilation, and other features. The openings shall be reinforced as called for on the Standard building drawings. Sealant shall be applied to the interior and the exterior after the installation of pipes, ducts, etc., to provide weather tight joints.

2.13 Electrical And Grounding

.1 General:

- .1 All Work shall conform with Section 16010 and with the Canadian Electrical Code (CEC) Part 1, latest edition, with particular reference to Sections 10, 18, and 20, and all other particulars outlined in this section.
- .2 The entire operator shelter building shall be classified ordinary location, non-hazardous area. Electrical equipment may be installed in EEMAC Type 1, General Purpose Enclosures.
- .3 The Contractor shall verify with the Electrical/Mechanical Safety Section, Asset Management Division, Department of Public Works and Services of the Government of the Northwest Territories for local by-laws or other particular special requirements that may be applicable to the Work and to obtain Electrical Certification of the building when completed on site.
- .4 All materials and equipment shall be new as called for on the Standard building drawings, CSA approved, manufactured to minimum standards quoted, or better, and shall incorporate additional features as specified or as required by the installation.
- .5 Any item or equipment described or identified by use of manufacturer's type, model or catalogue number shall be provided with additional features or modifications as specified herein or as shown on the Standard building drawings.
- .6 All switches, timers, relays, contactors, and thermostats shall be identified with permanent labels, lamicoid type, attached to the cover of the enclosure boxes. Black background with white engraved lettering shall be used. Also refer to Section 16010.
- .7 Identify all wiring and colour code and number at the terminal blocks in the junction box at the point of entry to the building. Same numbers shall be applied to wires inside the building.
- .8 Supply and install all equipment and make all connections necessary to provide complete and operative systems.

.2 Voltage Ratings

- .1 Operating voltages shall be within those defined in CSA Standard C235, latest edition.
- .2 All motors, electrical heating, control and distribution devices and equipment shall operate satisfactorily at 60Hz within normal operating limits established by the above standard. Equipment must be able to operate in extreme operating conditions established in the above standard, without damage to equipment down to minus 46°C, although the building will normally be heated.

- .3 The phase, voltage and amperage ratings of all equipment installed shall meet the ratings indicated on the Standard building drawings or in the Specifications.
- .3 The wall heater shall be surface mounted 240V, single phase, Chromalox type RFI, c/w terminal box, without built-in thermostat and capacity, as indicated on the Standard building drawings.
- .4 The thermostat shall be general purpose enclosure, adjustable from exterior, range 5°C to 25°C, single phase, D.P.S.T. contacts, rating 5000 watts at 240V maximum, Honeywell Model T4988 c/w B29-0183 metal guard.
- .5 Polygas Surveillance and Detection System Control Panel (Located in the Operator's Shelter Building):
 - .1 The Contractor shall supply all equipment required for the Polygas Surveillance and Detection System and install same in the Operators Shelter Building. The Polygas Surveillance and Detection System shall be Vulcaine Alarm Inc. Model No. VA-201C Controller comprising the following:
 - .1 For one dispenser building, Model No. VA-201C Controller comprising the following:
 - Two sensors VA-301-D2 (one for each dispenser building or product) plus a spare c/w Killark Cat. No. HKGL 0703 type mounting box or approved equal;
 - one power transformer, 120/12VAC;
 - one control module;
 - connection blocks and relay;
 - one dustproof cabinet.
 - .2 For two or more dispenser buildings at the same site, the Model No. VA-201C Controller is able to handle several sensors at different locations (consult the manufacturer for details).
 - .2 For number of dispenser buildings at each site refer to Section 01010.
- .6 One hole, malleable iron clamps, shall be used for anchoring conduits inside the buildings.
- .7 Lighting: provide lighting fixtures inside and outside the building as shown on the Standard building drawings.
- .8 Electrical System Grounding
 - .1 The continuity of ground throughout the non-current carrying parts of the electrical system shall be established by the Contractor according to Section 10 of the Canadian Electrical Code and to the satisfaction of the Inspecting Authority and the Engineer.
 - .2 The ground wires shall be brought to the ground lugs at the point of the power supply.

2.14 Fire Protection Equipment

1. Supply and install one portable fire extinguisher in the building where shown on the Drawings. The portable dry chemical fire extinguisher shall be Type ABC, Multipurpose Foray Powder, fitted with external nitrogen operated cartridge, 9 kilogram capacity. The fire extinguisher shall be ANSUL Model LT-A20E, ULC rating 10-A-80-BC, complete with wall hanger and mounted at floor level.

PART 3 – EXECUTION

3.1 Finishes - Building Panels and Components

- .1 The interior and exterior faces of the building, wall panels, doors, and the rainhoods, shall be finished in smooth baked white acrylic enamel on zinc-coated steel, as per manufacturer's standard practice.
- .2 The building roof (ceiling) panels shall be finished galvanized on the exterior and smooth baked white acrylic enamel on the interior, as per manufacturer's standard practice.
- .3 The building floor panels shall be finished galvanized both sides, as per manufacturer's standard practice.
- .4 The reinforcing angles and plates shall be finished to match the panels.
- .5 The turn down of roof galvanized steel sheeting shall be finished galvanized.
- .6 The exterior edge of the floor panels shall be finished in smooth baked black acrylic enamel as per manufacturer's standard practice.

3.2 Surface Preparation

- .1 Surface preparation for painting skid frame, steel plates, reinforcing rings, anchor bolts and washers shall be as per Section 09900.

3.3 Painting

- .1 The skid frame, base plates, supports, reinforcing rings, anchor bolts, nuts and washers shall receive:
 - .1 One shop applied primer coat as per CGSB 1-GP-140 M;
 - .2 followed by one intermediate and one final coat, shop applied, of aluminum paint as per CGSB 1-GP-69.
- .2 The primer and finish coats shall have minimum thicknesses as given in Section 09900, Painting.
- .3 The Contractor shall provide sufficient quantity of paint for touch-ups at final destination.
- .4 The Contractor shall make the necessary final touch-ups to the areas of skids damaged by transportation, when at final destination on the site.

- .5 The desk shall be pre-finished and shall not be painted.
- .6 Galvanized steel shelves, panels, the electrical conduits and fixtures **shall not** be painted.
- .7 Name plates, markers and tags **shall not** be painted over and masking tape shall be removed once painting is completed.

3.4 Shop Testing, Inspection And Calibration

- .1 The Contractor shall notify the Engineer in advance, of the date when shop testing of the building equipment will take place.
- .2 All building equipment and all portions of the electrical work shall be tested and checked for satisfactory operation at the shop prior to shipping, and in the field after the installation is complete.
- .3 All tests shall be carried out in the presence of the Engineer and shall be deemed satisfactory.
- .4 The Contractor shall notify the Engineer sufficiently in advance of the date when the building is ready for inspection.
- .5 The entire building shall be inspected and any deficiency corrected immediately.
- .6 The Contractor shall record all test data from the tests and submit to the Engineer for acceptance.

3.5 Packaging

- .1 All items shall be suitably packaged for transportation and delivery to the site, including crating all equipment to prevent damage.

3.6 Final Hookups on Site

- .1 Set in place and make final grounding and electrical hookups at site of building complete as required and as described further in Section 01010.

END OF SECTION 13229

DIVISION 13 - SECTION 13230

JET A-1 AVIATION FUEL DISPENSER BUILDING

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies the requirements for the supply, assembly, and installation in the field, of a building, complete with steel skid frame, all equipment, and accessories. The intended use of the building is to dispense Jet A-1 Aviation Fuel product and is designed for both loading fuel trucks from a bulk fuel storage facility and for refueling aircraft at an airport facility.

1.2 Related Work

- | | | |
|-----|---|---------------|
| .1 | Summary of the Work | Section 01010 |
| .2 | Identification Systems | Section 01080 |
| .3 | Shop Standard Building Drawings | Section 01340 |
| .4 | Substantial Completion Inspection Requirements | Section 01650 |
| .5 | Structural Steel | Section 05120 |
| .6 | Miscellaneous Metal | Section 05500 |
| .7 | Painting | Section 09900 |
| .8 | Operator's Shelter Building | Section 13229 |
| .9 | Automatic Temperature Compensating Metering Systems | Section 13420 |
| .10 | General Mechanical Provisions | Section 15010 |
| .11 | General Electrical Provisions | Section 16010 |

1.3 Reference Standards

- .1 National Building Code of Canada (NBC)
- .2 Canadian General Standards Board (CGSB)
- .3 Canadian Standards Association (CSA)
- .4 American Society for Testing and Materials (ASTM)
- .5 National Fire Code of Canada (NFC)

1.4 Submissions

- .1 The Contractor shall provide all manufacturer's literature, maintenance and operating manual data and recommended spare parts lists to the Engineer, as per Section 01700.
- .2 The building manufacturer shall provide five (5) complete sets of installation instructions, accompanied by erection standard building drawings and identification of all panels, doors, etc.

1.5 Contractor's Duties

- .1 The Contractor shall be responsible to complete the design to accommodate the approved equipment and components.
- .2 The Contractor shall provide and pay for all other facilities and services necessary for proper execution and completion of the Work, including testing and calibration of meters.

1.6 Protection

- .1 The Contractor shall provide the necessary protection to safeguard the building, building contents, equipment and accessories from damage during transit and handling.
- .2 The Contractor shall make adequate provision to avoid structural overstressing.
- .3 No part of the structure shall be loaded during either construction or transportation with a load greater than it is calculated to bear safely when assembled.

1.7 Location of Fixtures

- .1 The location of fixtures, apparatus, outlets, etc. shown or specified, is indicated with as much accuracy as possible and shall be adhered to whenever possible.
- .2 The Contractor shall be responsible to modify the actual location to suit equipment substitution or variation due to manufacturer's changes.
- .3 Before installation, the Contractor must inform the Engineer of the impending installation and consult with the Engineer for actual location. Prior approval by the Engineer is required for all material or equipment changes.

1.8 Guarantees

- .1 The Contractor shall guarantee the complete Jet A-1 Aviation Fuel dispensing assembly against all defects as called for in the Contract Documents.

PART 2 – MATERIALS

2.1 Signs and Signposting

- .1 The Contractor shall refer to the Standard building drawings for location of signs.
- .2 A Process and Instrumentation Diagram and operating instructions shall be provided in a convenient location in the building, under a plastic protective cover. Provide a laminated schematic in the dispenser building 280mm x 380mm in size, identifying the following:
 - .1 Each piece of equipment, each valve indicating the valve number and all instrumentation.
 - .2 Arrows indicating the flow of fuel.
 - .3 What valves need to be opened and closed when filling the Jet A-1 Aviation Fuel delivery truck.
 - .4 What valves should be opened and closed when refuelling aircraft.
 - .5 What valves need to be opened and closed when recirculating fuel back to the tanks, to remove impurities.

- .3 Safety signs inside the building shall be factory fabricated, weatherproof, 200mm x 200mm vinyl pressure sensitive, as available from Safety Supply Co., or approved equivalent, bearing the Pictographic symbol described as follows:

PICTOGRAPHIC SYMBOL	LOCATION
07207 - "No Smoking"	One mounted on back wall of the building centred with room with centreline, 1,800mm above floor.

- .4 Safety signs for the building exterior shall be as follows:

- .1 One Pictographic '**No Smoking**' sign on the pedestrian door to the building. The sign shall be factory fabricated, weatherproof, 200mm x 200mm vinyl, pressure sensitive, as available from Safety Supply Co., or approved equivalent, bearing the same Pictographic symbol as indicated above. The sign shall be mounted centered with the door, and the top of the sign is to be just below the lower side of the window framing.
- .2 Provide on the dispenser building doors a self-adhering sign to read: '**CLOSE TANK VALVE AFTER USE**'.
- .3 Provide on the dispenser building near the static electricity ground reel a sign, visible to the aircraft crew, to read:
'DO NOT REMOVE FUEL TANK CAPS UNTIL THE AIRCRAFT IS BONDED TO THE REFUELLER/DISPENSER'.

- .5 Other signs for the building exterior shall be factory fabricated, weatherproof, vinyl, pressure sensitive, as available from Safety Supply Co., or approved equivalent. Pictographic symbols, legends, location and other details as follows:

CATALOGUE NO. & SYMBOL	LOCATION
88450 - "No Smoking/Stop Your Motor" (One in English & one in Local Dialect)	Signs to be 250mmX 60mm mounted 50mm apart about centerline of each loading door and bottom of signs to be just above the 13mm wide black decal stripe.
09082 - "Jet A-1 Aviation Fuel"	One sign 270mm X270 mm mounted centered with Jet A-1 loading door, top of sign in line with bottom of 13mm wide black stripe.

- .6 Arrows to indicate direction of flow shall be installed on the Jet A-1 Aviation Fuel piping at approximately the locations indicated on the Standard building drawings, see Section 01080.
- .7 Valve Tags shall be provided at all valves on the Jet A-1 Aviation Fuel system where shown on the standard building drawings, see Section 01080.

2.2 Type of Building

- .1 The building proper shall consist of a skid mounted, pre-engineered and prefabricated, insulated, sectional, metal components of the type used in prefabricated refrigerated buildings, except that in this case, the interior may be heated occasionally to 15°C, while the exterior may be down to minus 46°C.
- .2 The building details and specifications included in this section are based on manufacturer's data from MakLoc Buildings Inc. of Nisku, Alberta. (Polyurethane insulated buildings manufactured by Coldstream Products of Canada Ltd., of Winnipeg, Canada or Bally Refrigeration of Canada Ltd. or other approved alternates, with equal or better insulation may be considered). The PPD Standard Detail Drawings are based on use of a Coldstream type building, should another building type be accepted, the Contractor shall, at his expense, provide shop drawings showing positions of all equipment to suit the requirements of the building specifics and any modifications for these Specifications.
- .3 In the design of the components, consideration shall be given to the climate in which it will be installed, the skid mounting setup, the requirements for anchoring the building, as well as anchoring the equipment to the floor panels, the number as well as size and location of pedestrian and loading doors and window, and the necessary wall openings for passage of piping, ventilation ducts and electrical conduits.
- .4 The building shall consist of self-framing members designed to withstand, within acceptable deflection limitations, transportation stresses, their own weight, acceptable snow loads, dead loads and live loads, and minimum design loads due to pressure and suction of wind as calculated in accordance with the National Building Code of Canada (NBC). For particular climatic design data, the Contractor and/or manufacturer shall refer to Section 01010.

2.3 Wall Panel Construction

The following minimum wall construction standards shall apply:

- .1 Panels shall consist of galvanized sheet steel fabricated from steel conforming to ASTM A446, Grade B, minimum 0.76mm (22 ga.) thick with a coating of zinc conforming to Class Z275.
 - .1a Alternatively, the panels may consist of interior and exterior 0.76mm zinc-coated, die-formed, steel sheets firmly bonded to foamed-in-place polyurethane insulation with a minimum 75mm thickness.
- .2 The walls shall be insulated with fiberglass friction fit batts, R20 minimum.
 - .2a Alternatively, polyurethane insulation having a minimum density of 35.2kg/m³ and a minimum R20 insulation value, after aging. The polyurethane panels shall be self extinguishing in a fire situation. The panels shall be manufactured with die-formed polyurethane tongue and groove edges, so designed as to provide a polyurethane to polyurethane fit, without air space between panels when they are joined.

- .3 The interior wall panel liner shall consist of galvanized sheet steel fabricated from steel conforming to ASTM A446, Grade B, minimum 0.70mm (24 ga.) thick with a coating of zinc conforming to Class Z275, and pre-painted white.
 - .3a All polyurethane insulated panels shall be equipped with a cam-locking or other clamp to draw and hold sections tightly together, operable from the interior of the building by the use of an 8mm hex key. Access to the locking device shall be through a 16mm diameter opening on the interior steel panel. After erection, this opening shall be sealed with snap-in type, chrome-plated button. Cams shall be provided on centres not exceeding 1,220mm.
- .4 The trim and flashing shall be the same materials and colour as that to which it is to be attached.
- .5 Fasteners shall be as specified by the manufacturer of the panel systems.

2.4 Roof (Ceiling) Panel Construction

- .1 The roof (ceiling) panel construction shall be as per construction described above for the wall panels. All roof panels shall be full length, without splices or laps.
 - .1a On the exterior of the polyurethane insulated roof panels, provide preformed, galvanized steel sheeting, 0.70mm (24 ga.) thick with interlocking joints to provide weather protection. The sheeting panels shall turn down 125mm minimum along the perimeter of the building to protect the wall-to-ceiling joint.

2.5 Joints, Reinforcements and Sealing (for Coldstream Buildings only)

- .1 For Coldstream Buildings, the following particular joint reinforcement and sealing is required for outdoor installation. Equivalent reinforcement and sealing may not be required for alternate building designs.
- .2 The cam-locking clamps shall draw and hold panels tightly together. Joints shall be sealed with high adhesion, non-hardening, non-skinning, moisture-resistant, Jet A-1 Aviation Fuel, and oil-resistant, odourless caulking compound. Walls exposed to the weather shall have an additional flush weatherproof caulking seal.
- .3 At the perimeter of the building, provide 50mm x 50mm x 1.897mm galvanized steel angles, riveted to wall and floor panels and to wall and roof (ceiling) panels.
- .4 The interior vertical wall joints between the wall panels shall be covered with a galvanized steel strapping, 76mm x 1.897mm thick.
- .5 All interior corners at bottom and at top shall further be reinforced with galvanized steel angles, 50mm x 50mm x 1.89 mm thick x 200mm long.
- .6 At the exterior perimeter of the building, provide a cover plate 125mm x 100mm x 0.76mm galvanized, riveted to wall and floor panels, so as to cover the floor-to-wall panel joint as shown on the standard building detail drawings. Vertical portion of plate to be notched at pedestrian door.

- .7 Fasteners shall be of the type, sizes and spacings shown on the standard building drawings.
- .8 In addition, once the building is installed at the permanent location in the field, the Contractor shall examine all joints and supply and apply an additional coat of sealant at all damaged portions of joints.

2.6 Skid Frame

The building shall be skid mounted, unless prior approval is obtained from the Petroleum Products Division, Manager, Operations (867) 920-3413, for an alternate foundation and floor option.

- .1 The steel for the skids shall conform to Section 05120.
- .2 The skid frame shall be of welded steel construction complete with floor-bearing plates and anchoring points, as detailed on the standard building detail drawings.
- .3 The building shall be attached to the skid frame by means of bolts, washers and nuts, as shown on the standard building drawings.
- .4 All fasteners going through the skid frame shall be fixed so that access under the skid shall not be required for fastening purposes.

2.7 Floor Panel Construction

- .1 Floor panels shall be constructed with 75mm nominal foamed-in-place polyurethane insulation with 1.897mm galvanized steel interior and exterior, or an approved equal.
- .2 Floor panels shall be anchored to the skid frame by means of galvanized steel bolts, nuts and washers, 16mm diameter, using a minimum of two bolts per panel and spaced as per details on the Standard building drawings.
- .3 Stationary floor loads shall be limited to a maximum of 15kN/m².

2.8 Pedestrian and Loading Doors

- .1 All doors shall be a minimum 45mm thick insulated hollow metal doors. Doors shall be constructed of 1.0 mm (20 ga.) zinc coated galvanized steel. The doors shall be insulated with polyurethane insulation. Double doors shall be equipped with a removable centre post, located between the two door swings.

The door opening shall be sufficient to allow pre-fabricated dispenser skid, complete with pumps, piping and meters, to be brought into the building without requiring the doorframe to be removed.

Fabrication of all doors shall comply with the Canadian Manufacturing Standards for steel doors and frames, published by the Canadian Steel Door and Frame Manufacturing Association.

- .1a The Coldstream building doors shall be freezer type, equipped with two chrome-plated, satin finish, heavy duty hinges operating on nylon bearings. The sizes and location of doors shall be as shown on the standard building

drawings, complete with polyurethane foamed-in-place insulation, zinc-coated, die-formed steel sheets 0.76mm all around.

The doors shall be internally reinforced at the periphery to prevent separation of the interior and exterior leaves. The pedestrian door shall **not** be equipped with a heating element.

A latch shall be provided at all doors: Coldstream Door #0055000028 safe guard latch K-5, chrome-plated with padlocking features for use with 10mm shank. Inside push rod shall be capable of opening pedestrian door when the door is closed.

- .2 Chains shall be provided on the exterior of the building to hold doors open. The chains shall be galvanized 3mm diameter, complete with one 'S' hook at one end, and inserted in an eye bolt at the other end.
- .3 All doors shall be equipped with a heavy duty storm door chain, complete with double spring installed at the top of the doors and adjusted to limit the door swing to 100°.
- .4 All doors shall be provided with weather stripping, all around, resistant to petroleum products and freezing.
- .5 In addition to the door latches as described above, all doors shall have a heavy duty steel hasp and catch suitable for padlocking, with the catch perpendicular to the door.
- .6 The pedestrian door shall be equipped with a 50mm diameter, two way air relief valve.
- .7 The pedestrian and loading doors shall be equipped with prefabricated, preformed rain hoods.
- .8 The pedestrian door shall have a 400mm x 560mm rectangular glass window equipped with Tru View double glass insulating unit. The fabrication shall be in accordance with the manufacturer's standard practice. The window shall be provided with a polycarbonate protective cover.

2.9 Flooring

- .1 The Contractor shall provide non-skid surfacing at areas where pedestrian traffic will occur and as shown on the standard building drawings.
- .2 The non-skid surfacing shall be 'Safety Tread' flooring sheet, aluminum, 3mm thick c/w button holes and attached to the floor by galvanized metal screws. Non-skid surfacing shall be as manufactured by I.S.G. Safety Grating Products Ltd., or approved equivalent.

2.10 Openings in Floor and Walls

- .1 Openings shall be made in walls and floor for passage of piping, ventilation ducts and other features. The openings shall be reinforced as called for on the standard building drawings. Sealant shall be applied to the interior and the exterior after the installation of pipes, ducts, etc. to provide weather tight joints. Sealants shall be used that are resistant to petroleum products.

2.11 Ventilation for Building

- .1 The ventilation system is designed to provide ventilation inside the building and render it safe for breathing and from explosive atmosphere due to vapours originating from the presence of Jet A-1 Aviation Fuel. The system shall monitor continuously mixtures of hydrocarbon vapour and air via a sensor and a remotely-located control module, which will activate the exhaust fan, a motorized damper at the fresh air intake duct, a pilot light located inside the building and a hazard warning light located outside the building, when the vapour/air mixture reaches a predetermined Lower Explosion Limit (LEL) point.
- .2 Ductwork and accessories:
 - .1 Fabrication and assembly of all ductwork and accessories shall conform to ASHRAE guidelines.
 - .2 Ducts shall be fabricated from galvanized steel sheets, commercial type ASTM A525, with thickness of sheets and duct sizes as shown on the standard building drawings.
 - .3 Duct walls with width dimensions larger than 200mm shall have diagonal breaks to prevent vibration. Longitudinal corner joints shall be of the 'Pittsburgh-Lock' type.
 - .4 Reinforcing steel shall be galvanized, bolted and/or riveted at 200mm maximum spacings. The joint between two galvanized steel angles shall be gasketed. The gasket shall be closed cell vinyl, 'Perma-Stick' type 136-M. Steel angles shall be bolted at 150mm maximum spacings.
 - .5 Elbows shall be as called for on the standard building drawings. Square elbows shall be provided with interior double wall vanes as manufactured by Duro-Dyne, or equivalent.
 - .6 Ducts shall be braced and fastened to the building as shown on the standard building drawings with galvanized bolts and stainless steel pop rivets.
- .3 An exhaust fan shall be provided on the exhaust duct outlet. The exhaust fan shall be direct drive, horizontal discharge, 1,725 RPM, aluminum propeller, capacity 680 L/s free air and 280L/s at 60Pa total static pressure, Leader Fan Industries Ltd. Cat AX12-4 fan or approved equivalent, complete with XBG-12 back guard and aluminum louvers to automatically open when the fan starts and close when the fan stops.
- .4 A motorized damper shall be provided on the fresh air intake duct complete with horizontal parallel blades, blade and jamb seals for tight fit and mounted in a

- galvanized steel frame. The damper shall be provided with an extended shaft equipped with nylon bearings for connection to an electric actuator to be mounted outside of the duct.
- .5 The damper actuator shall be two position, spring return, complete with damper linkage accessories, Barber-Coleman Model MA6-405, 120V, 60Hz, 2.0Nm minimum torque c/w AM-401 explosion-proof housing for Class 1, Group IIA hazardous location, or approved equivalent. The actuator shall be complete with all accessories and suitable for operation at ambient temperatures to minus 46 °C. The actuator shall be ULC listed and **CSA certified**.
 - .6 The grilles for ductwork shall be of extruded aluminum, double deflection, vertical front fins, Aero-Guide Ltd. Model 20DH or approved equivalent, size as shown on the Standard building drawings.
 - .7 Bird screens shall be provided in all ductwork openings outside of the building. The screens shall be of galvanized steel wire mesh, 12mm square, wire diameter 2mm, fastened to ducts with galvanized screws.
 - .8 Airflow control shall be provided in the fresh air intake via a two-way deflection grille. The Contractor shall make the necessary field adjustments on the two-way deflection grille in order to optimize air volume and sweep of the floor area.

2.12 Mechanical in Building

- .1 All work shall conform to Section 15010 and all other particulars outlined in this Section.
- .2 The system function is to meter and dispense Jet A-1 Aviation Fuel to aircraft, or to aircraft fueling trucks, as shown on the Project building drawings.
- .3 The assemblies shall conform to applicable API, NFC, ULC and CSA Codes and Standards.
- .4 The assemblies shall be fabricated to this Specification and shall conform and be tested to the Statutory Orders and Regulations of the Weights and Measures Act.
- .5 For welding of carbon steel pipes the Contractor shall refer to Section 15010. The procedure for welding of stainless steel pipes shall be the same as for carbon steel pipes except that welding electrodes shall be DC (E3XX-15) classification conforming to AWS A5.1 and suitable for the electric current characteristics, the position of welding, and other conditions of intended use. Selected electrodes shall be designated on shop and fabrication standard building drawings and in qualified welding procedures.
- .6 All material and equipment supplied under this section shall be acceptable to the Electrical/Mechanical Safety Section, Department of Public Works and Services, Government of the Northwest Territories with respect to their application.
- .7 Unless otherwise specified below, the Contractor shall refer to Section 15010 for specifications on pipes, valves, fittings, flanges, gaskets, bolts, nuts and jointing of threaded fittings. Socket weld and butt weld fittings and flanged connections shall be used whenever possible with a minimum number of threaded fittings.

- .8 Stainless steel pipe and fittings shall conform to the following:
 - .1 Stainless steel pipe shall be seamless, stainless steel type 304 to ASTM A-312
 - .1 50mm diameter and larger shall be Schedule 40 pipe;
 - .2 30mm diameter and smaller shall be Schedule 80 pipe.
 - .2 Stainless steel butt weld fittings shall be seamless, stainless steel type 304 to ASTM A-403. Butt weld fittings 50mm and larger shall be Schedule 40 and pipe and fittings 38mm and smaller shall be Schedule 80.
 - .3 Stainless steel socket weld fittings shall be stainless steel type 304 to ASTM A-182, Schedule 80, Class 3000.
 - .4 Stainless steel threaded fittings shall be stainless steel type 304 to ASTM A-182, Class 150.
- .9 Stainless steel flanges shall be 1034kPa, stainless steel type 304, F&D, to ASTM A-182.
- .10 The Jet A-1 Aviation Fuel pump shall be long-coupled, self-priming, centrifugal, electric motor driven Gorman-Rupp Model O3B31-B, size 75mm x 75mm c/w 3 H.P. motor, explosion-proof, Class 1, Group IIA, 115/230V, single phase, 60Hz, 3450 RPM; all mounted on a common steel base and properly aligned. Pump to have a stainless steel impeller, self-lubricated mechanical seal, coupling and coupling guard. Pump capacity to be 7.6L/s at 22.8m head; product specific gravity 0.82. Pump to be provided with 75mm threaded companion flanges and compatible gaskets at suction and discharge.
- .11 Pressure gauge, compound pressure/vacuum gauge and gauge valves:
 - .1 A compound pressure gauge and gauge valve shall be installed on the piping at the suction of the Jet A-1 Aviation Fuel pump.
 - .2 The pressure gauge and gauge valve shall be installed on the piping at the discharge of the Jet A-1 Aviation Fuel pump.
 - .3 The dials on the gauges shall indicate the pressure in metric (kPa) and Imperial units (psig).
 - .4 The pressure gauges shall be Ametek Model 540, 100mm dial, 12mm NPT male pipe connection, all stainless steel, dry, range 0-700kPa, or approved equivalent.
 - .5 The compound pressure/vacuum gauges shall be the same as the pressure gauges above with range -100/0/700kPa.
 - .6 The gauge valves shall be 12mm NPT, one male end and one female end, stainless steel to AISI type 316, Teflon seal, metal seat series, General Screw Products Co. or approved equivalent.

- .12 The filter/separator shall comprise the following:
- .1 The filtration apparatus shall comply with *API 1581 bulletin, latest edition, for Group 2, Class "B"*. One 3-L Model WAL-1622-100-1 filter/separator unit, of horizontal configuration, API approved, fabricated from aluminum or stainless steel, c/w integral water sump and inlet and outlet nozzles and other openings as shown on the standard building drawings. The back cover of the filter/separator shall be hinged and shall be equipped with low temperature Buna-N O-ring gasket. The filter/separator shall have a maximum pressure build-up of 104kPa at 6.28L/s loaded.
 - .2 The Contractor shall provide a steel support for the filter/separator unit as shown on the standard building drawings. The dimensions for the steel support as shown on the standard building drawings are only given as a guideline; they shall be verified with the filter/separator manufacturer's shop standard building drawings for compliance prior to fabrication.
 - .3 The filter/separator shall be three stage type, with coalescer stage, separator stage and "Go-No-Go" stage, to seal against water carry-over. The filter shall remove water contamination to 3ppm and solids contamination to 2 microns.
 - .4 The inlet and outlet connections shall be flanged, aluminum/or stainless steel, 75mm diameter, 1,034kPa, raised face. The length of nozzles shall be as shown on the standard building drawings.
 - .5 The filter/separator shall be provided with one 19mm NPT female outlet for drainage at the bottom of the water sump, one 38mm NPT female plugged side outlet on the side of the water sump, one 100 mm diameter nozzle with rectangular welding flange at the top of the vessel for mounting an air eliminator as per Clause 2.12.13 below and two 12mm NPT female outlets in each of the inlet and outlet nozzles for connection to the differential pressure gauge piping and sampling points.
 - .6 The Contractor shall supply complete sets of "Flushing elements" as necessary to perform the testing, start-up and trial operations. In addition, the Contractor shall supply five complete sets of filters adequately packaged for the filter unit (coalescer separator and "Go-No-Go"). The separator element is a permanent type and could be washed on site. Therefore, one set shall be enough.
 - .7 At the time of the Substantial Completion Inspection, the Contractor shall install one complete clean set of filters in the unit. The Contractor shall store the four remaining sets inside the building for use as spares for replacement when needed.
 - .8 The filter separator unit shall be provided with a pressure relief valve, Hydroseal Model #15D3MOV30, or equal set at the 760kPa. The vent piping shall be piped to the Sample Barrel.
- .13 The air eliminators shall be of aluminum fabrication, Liquid Control Corp. Model A-8110, maximum pressure 1034kPa.
- .14 The relaxation chamber shall also be of aluminum or stainless steel construction

and to the configuration and dimensions shown on the standard building drawings. It shall be constructed to ASME and CSA Codes for a maximum working pressure of 1,034 Pa. The relaxation chamber shall be complete with supports and openings as shown on the standard building drawings. The relaxation chamber shall be provided with a pressure relief valve, Hydroseal Model #15D3MOV30, or equal set at the 1034kPa. The vent piping shall be piped to the Sample Barrel.

- .15 The metering assembly shall comprise the following:
 - .1 **For Aviation Fuel Truck loading:** One Neptune Compact Meter Type 4, size 75mm, with heat treated aluminum main casing and aluminum measuring chamber piston suitable for Jet A-1 Aviation Fuel application, and including an auto-stop valve at the outlet, a threaded companion flange at the inlet, a strainer assembly with air eliminator, metric model with metal gears, configuration as shown on the standard building drawings. **No substitute accepted.**
 - .1a **For aircraft refueling:** One Neptune Compact Meter Type 4, size 75mm, with heat treated aluminum main casing and aluminum measuring chamber piston suitable for Jet A-1 Aviation Fuel application, with **metal gears**, including a strainer/air eliminator assembly, configuration as shown on the standard building drawings. **No substitute accepted.**
 - .1b The aircraft refueling meter shall be complete with a **Midwest Computer Corporation - Mid:Com Series 8000** (complete with RAM Card) electronic temperature compensating register and ticket printer system, complete with all wiring and brackets. The counter and register must be explosion proof, Class 1, Group IIA, hazardous location, and the computer and ticket printer module shall be remotely mounted in a heated insulated cabinet located at least 6,000 mm from the dispenser building, or in the Operators Shelter Building.
 - .2 The strainer shall be equipped with a 20 mesh stainless steel screen.
 - .3 Flow rate maximum 9.5L/s, minimum 1.9L/s.

Specification Note: Designer to modify as required.

- .4 For truck loading, the meter is a transfer meter and does not require temperature compensation, thus the meter shall be mounted with a Neptune Model 844-L55 Register comprising a direct reading reset counter with zero start, a print-o-meter, a metric totalizer and preset quantity controls.
 - .5 Where automatic temperature compensation metering systems are specified **(for sales to the public)** delete the register and counter and provide the components specified in Section 13420.
- .16 The hose and reel assembly for Jet A-1 Aviation Fuel dispensing to aircraft shall comprise the following:

- .1 One double reduction electric drive rewind hose reel, Hannay Model No. EP9346-33-34 or approved equivalent, with position of motor, crank, inlet and outlet, as shown on the standard building drawings. For airport installation, the reel shall have a minimum hose capacity of 42.67m of 50mm I.D. hose. The drum shall be 508mm diameter x 813mm wide with rolled edge drum heads. Drum heads shall not exceed 813mm in diameter.

Specification Note: Set up of dispensing building differs if it is at the airport for dispensing to planes or at the fuel facility (with only a section of hose) for dispensing to a tank truck. Designer must edit these sections to suit.

- .1a For bulk fuel storage facility installation the hose reel will be eliminated and a 3,050mm length of 75mm I.D. hose will be provided for direct coupling to the meter (see Jet A-1/LSDL Fuel standard building drawings). A length of 200mm diameter polyethylene pipe, with one closed cap and one threaded cap, shall be mounted beside the relaxation chamber on the exterior of the building for storage of the hose.
- .2 The hose reel assembly shall include one stainless steel sweeping gooseneck, 75mm female threaded outlet end.
- .3 One Stainless Steel 75mm female threaded 90° ball bearing swivel joint at the inlet. The swivel joint shall be provided with Fluoro-Silicone seals or manufacturer's equivalent suitable for aviation fuel application and elastic memory to -46°C.
- .4 The hose reel shall be fitted with a CSA approved ½ H.P., 115V, single phase, explosion-proof, Class 1, Group IIA electric motor, a combination clutch brake and auxiliary crank with rewind sprocket, and a sprocket type ball bearing clutch and double reduction unit c/w accessories, sprocket ratio is 11/36.
- .5 The reel shall be mounted on a heavy, solid, metal frame. The hose reel frame shall not exceed 978mm in width, 787mm in depth, and 864mm overall height.
- .6 Hose assembly shall comply with API 1529 & NFPA 407. The hose shall be a 50mm I.D. x 36.60m long Continental Hose for Aircraft Fueling, complete with static electricity conductivity wire, and male and male Scovill fittings at each end. One end of the hose shall be terminated with a 65mm female half dry-break disconnect via a 65mm x 50mm reducing bushing. The other end shall be connected to the sweeping gooseneck via a 75mm x 50mm reducing bushing. The hose shall be rated for a minimum working pressure of 690kPa and shall retain complete flexibility down to minus 50°C. The hose shall be totally resistant to Jet A-1 Aviation Fuel, abrasion and weather. Pressure test certificates shall be provided for each hose and fittings arrangement. Upon installation and before being used for refueling aircrafts, the hose arrangements shall be properly flushed.
- .7 Two utility rollers shall be installed at the support for the Jet A-1 Aviation Fuel meter and hose coupler rest, to guide the hose as shown on the

Standard building drawings. The rollers shall be stainless steel with cast alloy brackets as per Hannay Assembly 'A' and to the dimensions shown on the Standard building drawings.

- .17 The underwing aircraft refueling nozzle shall be Carter Model 60427CDEF3GX7H, comprising the following:
 - .1 underwing refueling nozzle c/w dust cap;
 - .2 100 mesh screen;
 - .3 bonding cable;
 - .4 vacuum breaker;
 - .5 241kPa hose end regulator;
 - .6 380mm long handles;
 - .7 safety clip to dry-break disconnect;
 - .8 dry-break disconnect Carter Model 61154, comprising a male and female adapter halves with 65mm NPT female inlet.
- .18 The overwing aircraft refueling nozzle shall be OPW Model No. 295SA, cast aluminum body, size 38mm x 38mm and shall be fitted with the following:
 - .1 one aluminum spout, OPW Model No. C3263, size 38mm x 38mm;
 - .2 one strainer, 100 mesh, stainless steel, OPW Model No. 153-0910;
 - .3 one protective cap, aluminum, OPW Model No. 296-CA, size 41mm;
 - .4 stainless steel ground wire cable, 1 830mm long with ground clamp, stainless steel ground plug and attaching eyelet, OPW Model No. 190 WM;
 - .5 one male half adapter Carter Part No. 44698, to provide 38mm NPT male thread to mate overwing nozzle.
- .19 The Contractor shall store the underwing and overwing nozzles inside the building or as directed by the Engineer.
- .20 The differential pressure gauge shall be as follows:
 - .1 Gammon piston type gauge set with a 3 way valve arrangement for periodic testing as specified in API bulletin 1581.
 - .2 The gauge shall provide a direct reading of the pressure differential between inlet and outlet nozzles of the filter/separator when both valves are open on the lines to the gauge.
 - .3 The support for the gauge **shall not be welded** to the shell of the filter/separator as the vessel is an aluminum or stainless steel pressure

vessel and can be damaged by heat.

- .21 Millipore test outlets and sampling probe assemblies:
 - .1 The Contractor shall provide sampling point outlets at the inlet and outlet nozzles of the filter/separator as called for on the standard building drawings.
 - .2 The millipore test outlets and sampling probe assemblies at the filter/separator shall be stainless steel and comprise the following:
 - .1 sampling probe with male adapter;
 - .2 ball valve;
 - .3 quick disconnect coupler and aluminum dust cap;
 - .4 standard of acceptance : Gammon Technical Products Aircraft Fuel Sampling Kit #7.
- .22 The Contractor shall provide one sample barrel, fabricated from steel and of construction as shown on the Standard building drawings. The sample barrel shall include the following:
 - .1 One threaded opening at the bottom, 19mm diameter, for a drain valve.
 - .2 One threaded outlet 25mm for pump-out.
 - .3 One opening 200mm diameter on top of barrel c/w 200mm diameter flanged gauge hatch Shand & Jurs Model No. 95020-XX-00, without clamp option and tabs ground to allow hatch to fully open. Gauge hatch shall be fastened to top plate of sample barrel with machine bolts and gasket.
 - .4 Two threaded openings on top, 19mm diameter for drain line from air eliminators and one threaded 19mm diameter opening for vent piping to the outside of the building.
- .23 The strainer shall be 75mm, steel, flanged, 1034kPa (150 lb.) ANSI-RF flanges, A.O. Smith Model 34-E3, complete with a 20 mesh stainless steel inner screen basket and expanded S.S. outer basket for Jet A-1 Aviation Fuel service.
- .24 The flexible connector shall be 75mm diameter x 450mm long, annular stainless steel corrugated flexible metal hose, single braided, Flextech Industries Ltd. # FT351 or U.S. Hose Corporation, Style UFBX1, stainless steel flanges, 1034kPa, raised face (RF) or approved equivalent.
- .25 The Contractor shall install pressure relief valves, on the valves, or where shown on the standard building drawings to relieve thermal pressure towards the storage tanks. Pressure relief valves shall be 12mm diameter stainless steel, male NPT ends, NUPRO Catalogue No. SS-8CPA2-3 set to relieve pressure at 103kPa. The pressure relief valves shall be engraved with an arrow showing the direction in which the pressure is relieved, and figures showing the relief pressure.
NOTE: The pressure relief valves shall not be painted.

- .26 Low temperature lubricant, Esso Low Torque Grease Beacon 325 suitable to -75°C or manufacturer's equivalent shall be used for all pumps and motors described above. Manufacturer to confirm adequacy of specified lubricant.

.27 Valves:

- .1 Gate valve, forged stainless steel, threaded to be conventional port opening, bolted bonnet, O.S.&Y., flanged to ANSI Class 150 (1034kPa), raised face (RF), face to face dimensions to ANSI B16.10, flanges to ANSI B16.5, and shall have the following:

- | | | |
|----|-------------------------|---|
| .1 | Body material: | Type 316 stainless steel |
| .2 | Trim material: | Type 316 stainless steel |
| .3 | Standard of Acceptance: | Crane #110 or equivalent, Velan, Kitz or Newman-Hattersly |

Note: Where specified on the standard building drawings, provide 12mm NPT tapplings into the valve body on both the inlet and the outlet and install a 12mm diameter stainless steel, male NPT ends, NUPRO Catalogue No. SS-8CPA2-3 thermal pressure relief valve (PRV), set to relieve pressure at 172kPa. The pressure relief valves shall be engraved with an arrow showing the direction in which the pressure is relieved, and figures showing the relief pressure. The upstream side of the PRV shall be connected to the inlet side of the valve (to relieve back to the tank) and piped with stainless steel pipe back to the valve outlet.

- .2 Check valve, cast stainless steel, flanged to be ANSI Class 150 (1,034kPa), raised face, swing check, bolted cover, face to face dimensions to ANSI B16.10, flanges to ANSI B16.5, and shall have the following:

- | | | |
|----|-------------------------|---|
| .1 | Body material: | Stainless steel to ASTM A351-CF8M |
| .2 | Trim material: | Disc - stainless steel CF8M, HF/ST6
Seat - stainless steel 316, HF/ST6 |
| .3 | Standard of Acceptance: | Crane-Aloyco #377 or equivalent, Velan, Kitz or Newman-Hattersly |

- .3 Ball valve, flanged stainless steel to be full bore, split body, stainless steel CF8M, ANSI Class 150 (1034 kPa), raised face c/w handle, face to face dimensions to ANSI B16.10, flanges to ANSI B16.5, fire safe to API 607, and shall have the following:

- | | | |
|----|-------------------------|--|
| .1 | Body material: | Stainless steel CF8M |
| .2 | Ball: | Stainless steel 316 |
| .3 | Stem: | Stainless steel 316 |
| .4 | Stem seal: | Graphoil |
| .5 | Body gasket: | Stainless steel 326 and graphoil |
| .6 | Standard of Acceptance: | Crane #KF 951 or equivalent, Velan, Kitz or Newman-Hattersly |

- .4 Ball valve, stainless steel, threaded ends to be bar stock, one piece body, stainless steel type 316 c/w lockable handle.
 - .1 Standard of Acceptance: Crane No. 9502 or equivalent Velan, Kitz or Newman-Hattersly
- .28 The Contractor shall provide pipe, equipment supports and hangers, to adequately support the piping and equipment as shown on the standard building drawings. Additional supports shall be provided if actual conditions so dictate. Base plates and supports shall be all welded construction, drilled for anchor bolts. Hangers shall be of stock or production parts as manufactured by ITT Grinnell, or approved equivalent. Pipe hangers shall be capable of supporting the pipe under all conditions of operation. They shall allow free expansion and contraction of the piping and prevent excessive stress to be induced in the pipe or transmitted to the equipment.
- .29 All floor mounted equipment shall be replaceable without the need for access to the underside of the building. Bolts or nuts shall be tack welded as required.

2.13 Electrical and Grounding

- .1 General
 - .1 All Work shall conform with Section 16010 and with the Canadian Electrical Code (CEC) Part 1, latest edition, with particular reference to Sections 10, 18 and 20 and all other particulars outlined in this section.
 - .2 The entire building shall be considered as Class 1, Group IIA and all fixtures, motors, heater, switches, starters and related accessories and electrical equipment shall be suitable for Class 1, Group IIA, hazardous location installation.
 - .3 The Contractor is advised to verify with the Electrical/Mechanical Safety Section, Asset Management Division, Department of Public Works and Services (PW&S) of the Government of the Northwest Territories (GNWT) for local by-laws or other particular special requirements that may be applicable to the Work and to obtain Electrical Certification of the dispenser building when completed on site.
- .2 Voltage Ratings:
 - .1 Operating voltages shall be within those defined in CSA Standard C235, latest edition.
 - .2 All motors, electrical heating, control and distribution devices and equipment shall operate satisfactorily at 60Hz within normal operating limits established by the above standard. Equipment must be able to operate in extreme operating conditions established in the above standard without damage to equipment down to minus 46°C, although the building will normally be heated to minus 10°C.
 - .3 The phase, voltage and amperage ratings of all equipment installed shall meet the ratings indicated on the standard building drawings or in the Specifications.

- .3 All electric motors shall be explosion-proof, Class 1, Group IIA, as called for on the standard building drawings and shall be supplied with the equipment.
- .4 All motors shall be lubricated for operation at temperatures to minus 46°C.
- .5 Motor Starters:
 - .1 The manual starter switches for the hose reel and the exhaust fan motors shall be explosion-proof, EEMAC Type 7D and 9EFG, enclosure Class 1, Group IIA, single phase, 1 H.P. rating at 115/230V, 2 pole toggle lever type c/w one type 'P' overload heater element sized for the motor amperage. Allen-Bradley Cat. No. 600-TEX5-12, or approved equivalent.
 - .2 The full voltage magnetic starters for the Jet A-1 Aviation Fuel pump motor shall be remotely installed as indicated on the Standard building drawings but shall be provided with this building. The starters shall be as indicated on Drawing E-AVA-02.
 - .3 An emergency shutdown button shall be installed on the exterior of the building beside the door.
- .6 Lighting Fixtures:
 - .1 The lighting fixtures for interior Type 'A' and exterior Type 'B' of the building shall be explosion-proof and weather resistant, Class 1, Group IIA, incandescent type. Lamps shall be 150 watt incandescent, A-23, medium base, 120V, extended service, clear.
 - .2 The Type 'A' interior fixtures shall be ceiling mounted type, factory sealed, hub size 13mm, complete with cast aluminum guard and lamp. Appleton Code-Master 'C' Cat. No. AEC-1550-CG, or approved equivalent.
 - .3 The Type 'B' exterior fixture shall be wall mounted, long bracket type, factory sealed, hub size 19mm, complete with cast aluminum guard and lamp. Appleton Code-Master 'C' Cat. No. AELB-1575-CG complete with polycarbonate covers, or approved equivalent.
 - .4 The interior hazard warning red pilot light shall be Allen-Bradley Cat. No. 800H-HVX7 base, c/w Cat. No. 800H-NP-30 cover, and Cat. No. 800H-PP16R red pilot light, transformer type, c/w colour cap and lamp. The pilot light shall automatically be turned "ON" when an unsafe vapour concentration is reached inside the building. The pilot light shall be explosion-proof, Type 7CD approved for Class 1, Group IIA, hazardous locations.
 - .5 The exterior hazard warning lighting fixture shall be a one lamp unit, Appleton Cat. No. TVA 1170, with one red polycarbonate globe and guard, complete with Type A-21 Clear Traffic Signal incandescent lamp, 125V, 69 watts, CSA approved. The hazard warning light located above the roof shall automatically be turned "ON" when an unsafe vapour concentration is reached inside the building.

- .6 The obstruction light fixture shall be a two lamp unit, Appleton Cat. No. TVA 2490 approved for use by Transport Canada, with red globe Fresnel glass lenses, c/w Type A-21 Clear Traffic Signal incandescent lamps, 125V, 69 W.
- .7 Heater:
 - .1 The heater shall be two Chromalox Type CEP-15-C, 120V, single phase, 1,500 watt, c/w terminal box at one end with 19mm hub, with wall mounting brackets, protective cover and located as shown on the Standard building drawings.
 - .2 The heater shall be heavy duty finned steel pipe body, specially coated for rust protection. Heating elements shall be low watt density and completely sealed in accordance with CSA Code requirements. The heater shall be thermostatically controlled by two thermostats, as outlined below.
- .8 Thermostats:
 - .1 The two thermostats shall be explosion-proof, CSA approved, Class 1, Group IIA, non-adjustable from exterior, capillary bulb type, range -18°C to 38°C, single phase, D.P.S.T. contacts, rating 25A max. at 277V max., Chromalox Cat. No. AR-0464-EP-2. The location of thermostats and temperature settings shall be as shown on the Standard building drawings. Thermostats shall be installed on plywood backing and capillary wire and bulb inserted into the conduit as shown on the Standard building drawings.
 - .2 One thermostat set at the lower temperature (minus 10°C), controls the room temperature at all times when the power switch is turned "ON". The second thermostat set at the higher temperature (plus 10°C), overrides the first thermostat and will operate the heater when the start/stop push button is activated. A timer will automatically cut-out the second thermostat after a predetermined period of time (60 minutes). The second thermostat can also be cut-out by depressing the stop push button. A pilot light will indicate that the timer is "ON". A switch located in the building will cut-out the heating entirely.
- .9 The automatic reset timer shall turn off the heater from the high setting to the lower setting after one hour of operation, or as otherwise specified by the Engineer. The timer shall be as shown on Drawing E-AVA-03, and shall be installed in the remote metal cabinet.
- .10 The push button stations shall be heavy duty, explosion-proof, Type 7CD and 9EFG approved for Class 1, Group IIA, hazardous locations. The push buttons are to be as indicated on the Standard building drawings, or approved equivalents.
- .11 Switches:
 - .1 The switches for building lighting and heater circuits shall be Crouse-Hinds EFS series, with tumbler switch, front operated, single or two gang, single pole, 20A rating at 120V, shallow enclosure, or approved equivalent as shown on the Standard building drawings.

- .1 Single gang: Cat. No. EFSC 2129 , feed through
 - .2 Two gang: Cat. No. EFS 1229 , dead end
- .2 The selector switches for the ventilation system, obstruction lights, and pump motor shall be as indicated on the Standard building drawings.
- .12 The control relay for the heater shall be as described on the Standard building drawings and shall be installed in the remote metal cabinet.
- .13 The contactors for the heating and ventilation system shall be as described on the Standard building drawings and shall be installed in the remote metal cabinet.
- .14 The terminal block shall be as described on the Standard building drawings. All wiring shall be identified at the terminal block and referenced to the shop drawing of the terminal block. A diagram showing the equipment connected, and the wire number shall be placed in the junction box at the time of shipping.
- .15 Polygas Surveillance and Detection System:
 - .1 The Contractor shall supply all equipment required for the Polygas Surveillance and Detection System and install same in the remote metal cabinet. The Polygas Surveillance and Detection System shall be Vulcaine Alarm Inc. Model No. VA-201C Controller comprising the following:
 - .1 Two sensors VA-301-D2 for Jet A-1 aviation fuel c/w Killark Cat.No. HKGL 0703 type mounting box, or approved equivalent.
 - .2 One power transformer, 120/12VAC.
 - .3 One control module.
 - .4 Connection blocks and relay.
 - .5 One dustproof cabinet.
 - .2 The system shall continuously detect and analyze the concentration of hydrocarbon vapours in the air of the building and automatically control the ventilation system in the building, as well as the hazard pilot light inside the building and the hazard warning light outside above the building roof.
 - .3 The Contractor shall install the sensor for the detection of hydrocarbon vapours in the building as shown on the Standard building drawings and as per the manufacturer's recommendations. All other equipment, i.e., the cabinet enclosing the control module(s), the connection blocks and relays, together with power transformer and contactor(s), shall be installed in the Operators Shelter Building or in a separate insulated heated cabinet located 6,000 mm from the dispenser building, or other, by the Contractor, where shown on the Standard building drawings.
 - .4 The Contractor must ascertain that the ventilation system will go "ON" as soon as the concentration of vapours in the room reaches an unsafe level for breathing, as recommended in the API 2015 Publication, or as the vapour concentration reaches a maximum of 10% of the lowest flammable limit of products under consideration.
 - .5 The Polygas Surveillance and Detection System shall be verified, calibrated and tested both at the shop, and on site, and a one year Security Certificate

shall be provided, issued to the Engineer in the name of the Government of the Northwest Territories.

- .16 The photoelectric controller for the obstruction lights shall be 120V, 60Hz, Tork Model No. 2003 with time delay preset for "On" at 3 foot candles c/w conduit mounting receptacle Tork Model No. 2421.
- .17 Spring rewind reel and deadman switch:
 - .1 The spring rewind reel for the deadman switch shall be Hannay Technical Products Inc. Model N0. SCR-10-17-19 without handle, c/w 30.5 metres of 2-#14 stranded type SO cable and ball stop, base with pre-drilled holes for permanent installation and 4 way rollers guide for cable.
 - .2 The ON-OFF deadman switch shall be Aljac deadman control handle for electric operation, Gammon Technical Products Inc., Model No. GTP-937-4.
- .18 Fittings, conduits, seals and wiring shall be as per Section 16010. Two hole clamps shall be used for anchoring conduit.
- .19 The Contractor shall refer to the Standard building drawings for details on static electricity grounding of the building, the pipes, and for ground cable and clamps for grounding of the tank trucks.
- .20 Electrical System Grounding:
 - .1 The continuity of ground throughout the non-current carrying parts of the electrical system shall be established by the Contractor according to Section 10 of the Canadian Electrical Code and to the satisfaction of the Inspecting Authority and the Engineer.
 - .2 The ground wires shall be brought to the ground lugs at the point of the power supply.
- .21 Markings:
 - .1 All switches, contactors, timer, etc. shall be identified with permanent labels, stainless steel type, attached to covers of enclosure boxes. Refer to Section 16010.
 - .2 Identify all wiring and colour code and number at the terminal blocks and at the junction box at the point of entry into the building. Same numbers shall be applied to wires in the remote metal cabinets.
- .22 Testing:
 - .1 All electrical equipment, switches, heater, etc. shall be tested and checked for satisfactory operation at the shop prior to shipping, and in the field after installation. See Section 16010.
 - .2 All tests shall be carried out in the presence of the Engineer and shall be deemed satisfactory.

2.14 Fire Protection Equipment

- .1 Supply and install one portable fire extinguisher where shown on the Standard building drawings. The portable dry chemical fire extinguisher shall be Type ABC, Multipurpose Foray Powder, fitted with external nitrogen operated cartridge, 9 kilogram capacity. The fire extinguisher shall be ANSUL Model LT-A20E, ULC rating 10-A-80-BC, complete with wall hanger and mounted at floor level.

PART 3 – EXECUTION

3.1 Finishes - Building Panels and Components

- .1 The interior and exterior faces of the building wall panels, doors, and the rainhoods, shall be finished in smooth baked white acrylic enamel on zinc-coated steel as per manufacturer's standard practice.
- .2 The building roof (ceiling) panels shall be finished galvanized on the exterior and smooth baked white acrylic enamel on the interior as per manufacturer's standard practice.
- .3 The building floor panels shall be finished galvanized both sides as per manufacturer's standard practice.
- .4 The reinforcing angles and plates shall be finished to match the panels.
- .5 The turn down of roof galvanized steel sheeting shall be finished galvanized.
- .6 The exterior edge of the floor panels shall be finished in smooth baked black acrylic enamel as per manufacturer's standard practice.

3.2 Surface Preparation for Painting

- .1 Surface preparation for painting skid frame, base plates, supports, steel reinforcing rings, drip pan, anchor bolts, nuts and washers shall be as per Section 09900.

3.3 Painting

- .1 The skid frame, base plates, supports, steel reinforcing rings, drip pan, anchor bolts and washers shall receive:
 - .1 one shop applied primer coat as per CGSB 1-GP-140 M;
 - .2 followed by one intermediate and one final coat, shop applied, of aluminum paint as per CGSB 1-GP-69.
- .2 The piping, valves, fittings, equipment framing and housings (e.g. hose reel framing, pump housing, meter housings, filter/separator, relaxation chamber, etc.) shall be colour painted and identified as follows:
 - .1 for all, one shop applied primer coat as per CGSB 1-GP 140M;
 - .2 followed by two coats CGSB 1-GP-12C-505-101 Yellow, Federal Standard 595B 38907 Yellow or Devoe DC8600 Medium Yellow.

- .3 The galvanized steel ducts for ventilation intake and exhaust, the galvanized steel panels, the electrical conduits and fixtures shall **not** be painted.
- .4 Name plates, markers and tags, relief valves in particular, shall **not** be painted over, and masking tape shall be removed once painting is completed.

3.4 Shop Testing, Inspection and Calibration

- .1 The Contractor shall notify the Engineer in advance of the date when shop testing of the building equipment will take place.
- .2 Pressure testing shall be in conformity with *API bulletins 2610 (Design, Construction, Operation, Maintenance and Inspection of Terminal & Tank Facilities)*, *API Recommended Practice 1110 (Pressure Testing of Liquid Petroleum Pipelines)*. The Contractor shall perform air pressure tests at 690kPa on the system and maintain the pressure for a minimum of two (2) hours. The time, pressure, and air temperature, shall be noted at the beginning and the end of the test. While the system is under pressure, all joints verified with soapy water or oil. Any leaks found, shall be repaired immediately and piping re-tested until all joints hold tight.
- .3 Once the air testing is satisfactorily complete, the Contractor shall test the system as described below with appropriate product. The product to be used for the test shall be Jet A-1 Aviation Fuel.
 - .1 All air must first be removed from the system prior to making the test.
 - .2 The Contractor shall circulate product through the system to verify the performance of the pump and meter.
 - .3 Pressure readings shall be recorded at the suction and discharge of the pump at the following flow conditions:
 - .1 zero flow;
 - .2 at approximately one-half full flow;
 - .3 at full flow condition.
 - .4 Motor amperage draw and voltage of motor shall be recorded at all three conditions for each pump as per the Test Sheet for Electrical Installations form provided at the end of this section.
 - .5 While performing product testing, the Contractor shall inspect piping and equipment for possible leaks. Any leaks discovered shall be repaired immediately and the testing undertaken until no leaks are found.
 - .6 The meters and automatic temperature compensating system shall be calibrated properly, tested, and certified to the *Department of Consumer and Corporate Affairs Canada, Volumetric Legal Metrology, Weights and Measures Canada* procedures.
 - .7 The size of the proving tank to be used shall not be less than 500 litres. Meter counter should run a minimum of one minute at full flow.
 - .8 After adjusting the meter for calibration, a minimum of three consecutive runs shall be carried out, and volumes recorded for each run shall match within allowable limits. This procedure shall be repeated until proper

calibration of the meter is obtained.

- .9 The meter shall be sealed after calibration and testing, and the calibration certificate shall be presented to the Engineer.
- .4 All building equipment, lighting fixtures, heater, etc. shall be tested at the shop prior to shipping.
- .5 The Polygas Surveillance and Detection System shall be calibrated and tested at the shop as per manufacturer's specifications and verified at site.
- .6 The ventilation system shall be tested in conjunction with the Polygas Surveillance and Detection System.
- .7 The entire building shall be inspected and any deficiencies corrected immediately.
- .8 The Contractor shall record all test data from the tests and submit to the Engineer for acceptance.
- .9 The hoses are to be flushed with an initial 2000 liters, allowed to soak for at least 2 hours, then flushed with another 2000 liters before being used for refueling aircraft.
- .10 The system has to be tested with Millipore color and gravimetric methods at critical points before being approved for aircraft servicing

3.5 Flushing and Sealing for Shipment

- .1 Following testing, the Contractor shall thoroughly flush and drain the system, clean the strainers, removing any sediment. Piping portions protruding outside the building shall be dismantled, as required, and placed inside of the building for field installation on the site. Open ends of piping shall be capped or plugged.

3.6 Packaging

- .1 All items shall be suitably packaged for transportation and delivery to the site.

3.7 Final Hookups on Site

- .1 Set in place and make final piping, grounding and electrical hookups at site of building complete as required and as described in Section 01010.

END OF SECTION 13230

**TEST SHEET FOR ELECTRICAL INSTALLATIONS
(USE SEPARATE SHEET FOR EACH MOTOR)**

SITE: _____ PROJECT NO.: _____

CONTRACTOR: _____

DATE: _____ MOTOR H.P.: _____ PHASE: _____

TEST: Installation resistance to ground _____ megohms.

Voltage at panel mains section:

(1) Between phases: A - B _____ B - C _____ A - C _____

Line to neutral: A - N _____ B - N _____ C - N _____

(Note for 120/240 V read A - B only and A - N and B - N only)

(2) Running amperes
of motor: A _____ B _____ C _____

(Note for 120/240V read A and B only)

Motor Serial No.: _____ Model No.: _____

Manufacturer: _____

Pump Duty (Product pumped or other use): _____

SIGNATURE: _____

(Print name after signature)

DIVISION 13 - SECTION 13420

AUTOMATIC TEMPERATURE COMPENSATING METERING SYSTEMS

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PART 1 – GENERAL

1.1 Description

- .1 “ATC” as referred to in this Section and throughout this document is an abbreviation for Automatic Temperature Compensating systems for petroleum products volumetric flow meters.
- .2 This Section specifies requirements for supply and installation of Automatic Temperature Compensating systems (register heads, computer modules, and ticket printers) complete with all required accessories on customer sales meters in Fuel Distribution Facilities / Remote Dispensers.
- .3 The system function is to provide Automatic Temperature Compensation (density correction) on fuel being dispensed to the customer from bulk fuel storage facilities, fuel delivery trucks, in-town gas stations, airport dispensers, and remote dispensers.
ATC is required at all final points of sale to the public, unless otherwise specified.

1.2 Related Work

- | | | |
|----|---|---------------|
| .1 | Gasoline and Low Sulphur Diesel Light (LSDL)
Fuel Dispensing Buildings | Section 13227 |
| .2 | Operators Shelter Building | Section 13229 |
| .3 | Jet A-1 Aviation Fuel Dispenser Building | Section 13230 |
| .4 | In-Town Gas Stations and
Gasoline & LSDL Fuel “Remote Dispensers” | Section 15010 |
| .5 | General Mechanical Provisions | Section 15010 |

1.3 Reference Standards

- .1 Canadian Electrical Code (CEC)
- .2 Weights and Measures Canada Regulations (WM-C)
- .3 National Fire Code of Canada (NFC)
- .4 Canadian Standards Association (CSA)
- .5 American Petroleum Institute (API)

1.4 Governing Parameters

- .1 The Fuel Dispenser Buildings (Gasoline/LSDL Fuel and Jet A-1) shall be considered as Class 1, Zone 1, and all fixtures, ATC register heads, related accessories and all electrical equipment shall be suitable for Class 1, Group IIA, Hazardous Location Installation.
- .2 Equipment must be able to operate in extreme operating conditions (down to -46°C) established in this Specification without damage to equipment, unless an insulated and heated enclosure is provided for the equipment.
- .3 The Contractor is advised to verify with the Department of Public Works and Services of the Government of the Northwest Territories, for local by-laws or other requirements that may be applicable to the work and to obtain Electrical Certification of the Dispenser Building when completed on site.

- .4 The ATC systems (register heads in particular) must be 100% compatible with the standard meters specified in these Specifications (Neptune Compact Meter Type 4).
- .5 The computer modules and ticket printers require an insulated heated non-explosive environment such as an Operators Shelter Building. Obtain recommended operating temperatures from Manufacturer and submit to the Engineer.
- .6 All ATC systems as specified in this Section can be installed in either a mobile (fuel truck) or in a stationary (fuel dispenser building / remote dispenser) application (except for typical commercial gas pumps). All units will require a 12VDC power supply with a current capacity as confirmed with the Manufacturer for conformance with the selected ATC.
- .7 The ATC system will register and operate in metric units as required by Weights and Measures Canada (WMC).

1.5 Contractor's Duties

- .1 All material and equipment supplied under this Section shall be acceptable to WMC and to the Department of Safety, Department of Public Works and Services of the Government of the Northwest Territories with respect to their application.
- .2 The Contractor shall be responsible for the complete design to accommodate the installation of the ATC equipment and components.
- .3 The Contractor shall provide and pay for all other facilities and services necessary for proper execution and completion of the work, including all testing and calibration. The assemblies shall be fabricated to this Specification and shall conform and be tested to the Statutory Orders and Regulations of the Canadian Weights and Measures Act.

1.6 Submissions

- .1 The Contractor shall submit originals of all Manufacturers' operation and maintenance literature, data and recommend a spare parts list to the Engineer as per Section 01300 and Section 01340.
- .2 Submit original test certificates for the material supplied and installed as requested by the Engineer.
- .3 Where the phrase "or approved equivalent alternative" occurs in the Contract Documents, do not assume that Material, Product, or methods will be accepted as equal by the Engineer, unless the item has been specifically accepted for work by the Engineer in writing.
- .4 The Contractor will provide proof of Weights and Measures-Canada conformance and certification of the ATC unit for automatic temperature correction for fuel product densities on the specified meter in which it is intended to register. This in no way exempts the Contractor from having a Weights and Measures-Canada official inspect the installation, on site if required, and approve it for product sale to the public.

1.7 Quality Control

- .1 Refer to and adhere to Section 01400
- .2 Quality control methods, as required by the Manufacturer, shall also apply to the Contractor during the supply, installation, testing and operation of the ATC systems.

PART 2 – PRODUCTS

2.1 Automatic Temperature Compensation (ATC) Systems

The Automatic Temperature Compensation systems currently approved by PPD are as follows:

- .1 Fuel Dispensing Systems utilizing Neptune mechanical volumetric flow meters:

Midwest Computer Corporation - Mid:Com Series 8000 (complete with RAM Card) equipped with Automatic Temperature Compensation.

Supply and install all parts and equipment necessary to enable the system to function as intended in the Contract Documents in a stationary position. Ensure components to be installed conform to the requirements for operation in Class 1, Group IIA areas and submit original confirmation documentation from Manufacturer to Engineer.
- .2 Commercial “Gas Stations” using retail pumps:

Kraus Industries Ltd, Micon 500 Electronic Register equipped with Automatic Temperature Compensation.

Supply and install all parts and equipment necessary to enable the system to function as intended in the Contract Documents in a stationary position.
- .3 Specifications on equivalent ATC systems may be submitted by Contractor/Manufacturer for review by the Engineer and Owner for compliance and acceptance.

PART 3 – EXECUTION

3.1 Inspection

- .1 The Contractor shall ensure that the ATC system conforms, is tested and inspected, to all WMC requirements including the Statutory Orders and Regulations of the Canadian Weights and Measures Act. A copy of the inspection reports shall be submitted to the Engineer.

END OF SECTION 13420

DIVISION 15 - SECTION 15010

GENERAL MECHANICAL PROVISIONS

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PART 1 – GENERAL

1.1 Related Work

.1	Substantial Completion Inspection Requirements	Section 01650
.2	Painting	Section 09900
.3	Gasoline and LSDL Fuel Dispenser Buildings	Section 13227
.4	Jet A-1 Aviation Fuel Dispenser Building	Section 13230
.5	Automatic Temperature Compensating Metering Systems	Section 13420
.6	Tankage	Section 15060

PART 2 – PRODUCTS

2.1 General

- .1 The materials supplied under this Section shall be new, except as otherwise specified, of uniform pattern and quality throughout the work, suitable for use with petroleum products, and acceptable to the Mechanical/Electrical Safety and Asset Management Divisions of the Department of Public Works and Services (PW&S) of the Government of the Northwest Territories (GNWT) with respect to their use.
- .2 The Contractor is responsible to inspect any materials provided by the Owner for incorporation into his work. The Contractor shall, within seven (7) days of their arrival on site, bring to the Engineer's attention, any item that he considers to be unsatisfactory. Use of Owner supplied material in no way relieves the Contractor of his responsibilities under this contract.

2.2 Pipe and Fittings

- .1 Pipe and pipe nipples, unless otherwise specified, shall be carbon steel pipe, black, to ASTM A53, Grade B specifications conforming to the following:
 - .1 Pipe 100mm dia. and larger to be Electric Resistance Welded (ERW).
 - .2 Pipe 75mm dia. and smaller to be seamless.
 - .3 Pipe 50mm dia. and larger to be Schedule 40.
 - .4 Pipe 38mm dia. and smaller to be Schedule 80.
- .2 Galvanized pipe and pipe nipples shall conform to the specifications for black carbon steel pipe above, with the addition of galvanizing to conform to *ASTM A-153* specification.
- .3 Fittings shall be carbon steel, butt weld type, seamless, black, conforming to *ASTM A234 Grade B*, unless otherwise specified. Fittings 50mm and larger shall be Schedule 40 and butt weld fittings 38mm and smaller, shall be Schedule 80.
- .4 Socket weld and threaded type fittings shall be forged steel, black, conforming to *ASTM A-350, Grade LF2, 20 680kPa (Class 3,000)*, unless otherwise specified, with dimensions to *ANSI B16.11* and threads to *ANSI B1.20.1*.

- .5 Malleable iron fittings, where called for, shall be black, 1,034kPa (Class 150), conforming to *ASTM A-197*, unless otherwise specified, and dimensions to *ANSI B16.3* and threading to *ANSI B1.20.1*.
- .6 Galvanized malleable iron fittings, where called for, shall be same as for malleable iron fittings above with the addition of galvanizing conforming to *ASTM A-153* specification.

2.3 Flanges, Gaskets, Nuts and Bolts

- .1 Flanges shall be 1 034kPa (Class 150), *ANSI B16.5*, raised face, *ASTM A-350, Grade LF2*, faced and drilled, forged steel, welding neck, slip-on or threaded as called for, unless otherwise specified. **Flat faced flanges shall only be used to mate with equipment with flat faced flanges, and shall be Class 150 flanges with the raised face machined flat. Cast or malleable iron flanges shall not be used on fuel piping systems.**
- .2 Gaskets shall be ring type for raised face flanges, and full-face type for flat-faced flanges. Gaskets shall be John Crane Style 2160 or Durlon 8500, non-asbestos, or approved equal, 1.6mm thick suitable for use with petroleum products. Do not apply a surface treatment of any kind to the gasket. **Gaskets used on fuel systems shall be fire safe, not a synthetic elastomer material.**
- .3 Flange bolting shall be alloy steel stud bolts, threaded full length, to *ASTM Spec. A-320, Grade L7*, sizes and lengths to suit. Nuts for stud bolts shall be alloy steel, semi-finished, hexagonal head nuts of standard heavy-duty series per *ASTM Spec. A-194, Grade 4* Stud Bolts, threaded in accordance with *ANSI B1.1*, coarse thread series, *Class 2A* fit. Nuts tapped in accordance with *ANSI B1.1*, coarse thread series, and *Class 2B* fit.

2.4 Flexible Connectors

- .1 Flexible connectors 50mm diameter and larger, shall be annular stainless steel, corrugated flexible metal hose, single braided, with 1,034kPa (Class 150), *ANSI B16.5* raised face, forged steel flange ends, Flextech Industries Ltd. # FT 351 or U.S. Hose Corporation (Senior Flexonics Inc.) Flexon A-6, 316L stainless steel, or approved equivalent. Flexible connector lengths shall be as follows:

Pipe Size (mm)	Minimum Length of Flexible Connector (mm)
50	305
75	450
100	610
150	610

- .2 Flexible connectors 38 and smaller shall be as indicated on the project drawings.

2.5 Valves

- .1 Cast steel flanged gate valves shall be full bore, low temperature cast carbon steel, flexible gate, O.S.&Y, flanges *ANSI 1 034kPa (Class 150)*, raised face, face to face dimensions to *ANSI B16.10*, flanges to *ANSI B16.5*, and as follows:

- | | | |
|----|-------------------------|--|
| .1 | Body material: | Low temperature carbon steel to <i>ASTM A352, Grade LCB or LCC</i> . |
| .2 | Trim material: | Wedge - Type 316 SS
Seat - Stellite
Stem - Type 316 SS |
| .3 | Standard of Acceptance: | <ul style="list-style-type: none"> - Crane No. 47 LU-F, A-352, Grade LCB or LCC. - Velan A-352, Grade LCB or LCC with equivalent trim. - Kitz A-352, Grade LCB or LCC with equivalent trim. - Newman-Hattersly A-352, Grade LCB or LCC with equivalent trim - Bonney Forge A-352, Grade LCB or LCC with equivalent trim. - or equal. |
- .2 Forged Steel flanged gate valves shall be conventional port opening, bolted bonnet, O.S.&Y., ANSI 1,034kPa (Class 150), raised face, face to face dimensions to *ANSI B16.10*, flanges to *ANSI B16.5*, and as follows:
- | | | |
|----|-------------------------|---|
| .1 | Body material: | Carbon steel to <i>ASTM A105N</i> . |
| .2 | Trim material: | Wedge - stainless steel 316 stellited.
Seat - stainless steel 316 stellited.
Stem - stainless steel 316B. |
| .3 | Standard of Acceptance: | Crane #B-3510 XU-F or equivalent, Velan, Kitz, Newman-Hattersly or Bonney Forge. |
- .3 Forged steel threaded gate valves shall have conventional port opening, bolted bonnet, O.S.&Y., ANSI 4137 kPa (Class 600) and as follows:
- | | | |
|----|-------------------------|--|
| .1 | Body material: | Carbon steel to <i>ASTM A105N</i> . |
| .2 | Trim material: | Wedge - stainless steel 316 stellited.
Seat - stainless steel 316 stellited.
Stem - stainless steel 316 B. |
| .3 | Standard of Acceptance: | Crane #B-3604 LU-T or equivalent, Velan, Kitz, Newman-Hattersly or Bonney Forge. |
- .4 Cast steel flanged check valves shall be low temperature cast carbon steel, flanges ANSI 1,034kPa (Class 150), raised face, face to face dimensions to *ANSI B16.10*, flanges to *ANSI B16.5*, and as follows:
- | | | |
|----|----------------|---|
| .1 | Body material: | Low temperature carbon steel to <i>ASTM A-352, Grade LCB or LCC</i> . |
| .2 | Trim material: | Disc - stainless steel, 13% Cr.
Seat - stainless steel, 13% Cr. |

- .3 Standard of Acceptance: Crane No. 147 LU, A-352 *Grade LCB or LCC*, or equivalent, Velan, Kitz, Newman-Hattersly or Bonnet Forge.
- .5 Forged steel flanged check valves shall be 1,034kPa (Class 150), regular port, raised face, face-to-face dimensions to *ANSI B16.10*, flanged to *ANSI B16.5* and as follows:
 - .1 Body material: Forged steel to *ASTM A105N*.
 - .2 Trim material: Disc - stainless steel 420.
Seat - stainless steel ST6.
 - .3 Standard of Acceptance: Crane #B-3665 LU-F or equivalent, Velan, Kitz, Newman-Hattersly or Bonney Forge.
- .6 Cast steel flanged ball valves shall be 1,034kPa (Class 150), full bore, low temperature cast carbon steel, raised face, face to face dimensions to *ANSI B16.10*, flanges to *ANSI B16.5*, and as follows:
 - .1 Body material: Low temperature carbon steel to *ASTM A-352, Grade LCB or LCC*.
 - .2 Standard of Acceptance: Crane Tork Seal Ball Valve or equivalent, Velan, Kitz, Newman-Hattersly or Bonney Forge.
- .7 Carbon steel threaded ball valves shall be one piece bar stock type, minimum rating 6,895kPa (Class 1 000) WOG at 38°C, complete with handle incorporating padlocking feature. Valves to be fire safe to *API 607* and as follows:
 - .1 Body material: Carbon steel *ASTM A-105 or A-108*.
 - .2 Trim material: Ball - stainless steel 316.
Seat - RTFE.
 - .3 Standard of Acceptance: Crane #9401-LC or Velan HB-1000 memory stop, or equivalent, Kitz, Newman-Hattersly or Bonney Forge.
- .8 Water drain valves at both vertical tanks and horizontal tanks shall be Shand & Jurs Model 96181, 50mm diameter, threaded mounting connection, complete with internal syphon extension and padlocking feature.
- .9 Solenoid Valves: Solenoid valves to be Snap-Tite Green Top Model Z6214SSTE-120/60 for 50mm (2") Ø, or Z6214SSGEA for 75mm (3") Ø (no substitutes).
- .10 For other valves the Contractor shall refer to the project drawings.

2.6 Thermal Pressure Relief Valves

- .1 Thermal pressure relief by-pass valves shall be RitePro F979-195, or Nupro Cat. # SS-8CPA2-3 TRPV, or equal, male NPT threaded ends with stainless steel spring,

poppet, lock screw and adjusting screw. O-ring to be low temperature Buna-N.

.2 Pressure settings at pressure relief valves shall be as follows:

- .1 At tank valve by-pass lines the pressure setting shall be 525kPa (75psi).
- .2 At other valve bypasses in the piping, where indicated on the project drawings, the pressure relief valves shall be set at 172kPa (25psi).

2.7 Dike Drain Pump Assembly

- .1 The portable pump assembly shall be as shown on Drawing NT-P01, NT-P01A or NT-P01B. In addition to the pipe and fittings indicated, the assemblies shall comprise the following equipment:
 - .1 Suction strainer 50 Ø, brass construction with screen, female, threaded, RNG Equipment Inc.
 - .2 Gorman Rupp Model 4790-97, Protek diaphragm pump Model 900, HAN-D Pumper, or equal, 50 Ø x 50 Ø, cast aluminum, male suction, female discharge, non-clogging, capacity 2.52L/s minimum, self priming, suction lift 4,570mm water c/w steel tubing handle and pump carrying board.
 - .3 If provision is made for a 230V receptacle, **outside of the diked containment area**, an electric primer pump, Jabsco Model 6050-0013, with cable and matching explosion proof plug may be specified. **The pump assembly must be located on top of, or outside the dike, as shown on NT-P01B.**
 - .4 Suction hose assembly 50 Ø I.D. consisting of blue Arctic Flexwing hose, one OPW Kamlok No. 633-C shank coupler 50 Ø, bronze, fastened to one end of the hose and one OPW No. 710-HS hose shank adapter fastened with stainless steel punch lock bands.
 - .5 OPW Kamlok No. 633-F adapter 50 Ø, bronze, male NPT c/w dust cap, two 'S' hooks and 300 long chain.
 - .6 Discharge hose assembly 50 Ø I.D. consisting of blue Arctic Flexwing hose, one OPW Kamlok No. 633-C shank coupler 50 Ø, bronze, fastened to one end of the hose with stainless steel punch-lock band.
 - .7 Ball valve 50 Ø, bronze B62 body, brass trim, end entry memory seal, threaded, RTFE seats Velan No. EE 500, or approved equivalent, c/w handle and PVC handle cover.
- .2 If provision is made for an explosion proof receptacle **outside of the diked containment area**, an explosion proof submersible sump pump, with cable and matching explosion proof plug may be specified. The portable pump assembly shall be a Flygt Sump Pump, Model CF-3067, Submersible Pump, complete with 2 hp explosion proof motor, or equal, with hose and fittings as per Clause 2.7.1 above.

2.8 Wrapping of Pipes

- .1 Portions of pipes running through the earth dike walls shall be double wrapped with Polyken #927 Primer and Polyken Tape #900 black, as manufactured by Kendall Company of Canada Ltd., or approved equal. Application as per Clause 3.4.4.

2.9 Remote Dispenser

- .1 If a dispenser island is included in the project, the remote mechanical dispensers at the island shall be Gilbarco Model EAO-AEX single product, single hose dispenser without pump, illuminated, 115 Volt, 60Hz, instant start low temperature ballasts, no front glass but with polycarbonate covers instead of glass, metric meter read to one tenth of a litre, 4 wheels, price indicator, purchase amount indicator in dollars and cents, electric power reset, 19mm Ø x 4,570mm long hose, low temperature Arctic Fueling hose, with OPW #33 swivel at each end of hose and as follows:

- .1 The pump shall be located in the Gasoline/LSDL Fuel Dispenser Building.
- .2 The gasoline dispenser shall be identified “**UNLEADED GASOLINE**” and equipped with one OPW #11-AP nozzle for unleaded gasoline c/w internal check valve OPW #6R, splash guard, OPW 5-BP spout 21mm OD and red hand insulator.

NOTE: Gasoline dispensers shall be provided with a sticker stating that plastic containers not be filled while on a vehicle, but shall be placed on the ground when filling.

- .3 The LSDL fuel dispenser shall be identified “**LSDL Fuel**” and equipped with one OPW #11-A nozzle for LSDL fuel c/w internal check valve OPW #6R, splash guard, OPW 5-B spout 24mm OD and green hand insulator.
- .4 The Seals shall be low temperature Buna-N.
- .5 The meter in the dispenser building shall be a Neptune Red Seal, Type 4, meter with a MID:COM 8000 series Automatically Temperature Compensating system, complete with Low Temperature Card, and Weights and Measures Canada approved, certified and sealed.
- .6 A canvas cover shall be supplied with each dispenser as per manufacturer's standard and shall be able to cover the entire dispenser c/w nozzle and hose and be provided with means for strapping same to dispenser housing.

2.10 Automatic Tank Level Gauge for Vertical Tanks

- .1 The automatic tank level gauge on vertical storage tanks shall be Shand & Jurs Model No. 92021, cast aluminum body, housing and cover, stainless steel constant power spring, 316 stainless steel tape, metric tape with graduations in millimetres and comprising all accessories as indicated on Standard Drawing NT-P11. Length of tape to suit height of tank. **The level gauge shall be calibrated to an actual dip reading, with the Contract Operator and the Engineer, prior to acceptance.**

2.11 Gauge Hatches at Tanks

- .1 Roof gauge hatch at vertical tanks shall be a flanged, 150 Ø aluminum Shand & Jurs Model 95010, with padlocking feature, flange drilled to match ANSI 1,034kPa (Class 150), flat face flange, relief setting to be maximum of 2,585Pa, and including gasket, stud bolts, and nuts as per 2.3 above.
- .2 Roof gauge hatch at horizontal tanks shall be a flanged, 150 Ø aluminum Shand & Jurs Model 95010, with padlocking feature, flange drilled to match ANSI 1,034kPa (Class 150), flat face flange, relief setting to be maximum of 2,585Pa, and including gasket, stud bolts, and nuts as per 2.3 above.

2.12 Pressure/Vacuum Vents at Tanks

- .1 Pressure/vacuum vent at vertical tanks shall be flanged, 150 Ø, Shand & Jurs Model 94020, venting to atmosphere, low temperature service, flange drilled to match ANSI 1,034kPa (Class 150), flat face flange, relief setting to be 2,585Pa, and including gasket, stud bolts, and nuts as per 2.3 above.
- .2 Pressure/vacuum vent at horizontal tanks shall be flanged, size as indicated on the Drawings, Shand & Jurs Model 94020, venting to atmosphere, low temperature service, flange drilled to match ANSI 1,034kPa (Class 150), flat face flange, relief setting to be 2,585Pa, and including gasket, stud bolts, and nuts as per 2.3 above.

PART 3 – EXECUTION

3.1 Welding

- .1 Welding of steel pipes shall conform to *API Standard 1104 - Standard for Welding Pipelines and Related Facilities* or *CSA-Z662, Oil and Gas Pipeline Systems*.
- .2 The welding work shall be carried out by fully qualified tradesmen, in accordance with appropriate CSA and API Standards, using good trade practices.
- .3 Welder qualification for work on pressure piping and fuel tanks shall be as per *Section XI of the ASME Code - Boiler and Pressure Vessel Code: Welding Qualifications*. All welders, to be accepted, must be registered in the Northwest Territories prior to starting work and possess a valid 'B' Pressure Welding certification.
- .4 Welding electrodes and their exposure and utilization shall be as specified in Clause 3.1.8 of Section 15060.
- .5 Prior to commencing work, qualified welding procedures shall be submitted to the Engineer in accordance with Section 01400. Welders shall be qualified to the procedures in accordance with the latest *CSA-Z662 - Oil and Gas Pipeline Systems*, *ASME Code Section IX* and /or *CSA W47.1 or W55.2 Specifications*.
- .6 Each welder shall be registered and qualified to work in the Northwest Territories as certified by the Electrical/Mechanical Safety Division of the Department of Public Works and Services, Government of the Northwest Territories, phone (867) 920-8801. A copy of each welder's qualifications shall be provided to the Engineer before the welder starts work.

3.2 Jointing of Threaded Fittings

- .1 Jointing of threaded fittings shall be with the use of Gasoil Thread Lubricating Compound suitable for gasoline and petroleum products use. The compound shall be applied to the male threads only at the connection point.
- .2 Teflon tape is not allowed.

3.3 Layout and Installation

- .1 All pipe, fittings, appurtenances and equipment, shall be laid out and installed in accordance with the lines, elevations, and grades indicated on the Drawings.
- .2 Equipment shall be set in place and final alignments completed before connections are made. Flexible connectors shall be installed straight, in a relaxed condition, as their inclusion into systems is intended to offset minor future misalignments that may occur due to natural conditions.
- .3 Pipes shall be joined and supported so that no undue stress or strain is created in the lines or in connected equipment. Supports for piping shall be spaced as indicated in Section 05500. Flanges shall be installed with holes straddled about the vertical axis and tightened evenly in balanced fashion. Flanges shall not be used to force parts into position.
- .4 The Contractor shall install pipelines with gradual uniform slopes as specified on the Drawings, with no low areas that will trap water.
- .5 The direction of welding for steel pipe shall be the Uphill Method in all cases.

3.4 Pipelines and Piping

- .1 Piping shall be installed above ground, unless otherwise specified.
- .2 Buried pipelines shall be installed on a compacted sand bed as per Section 02224.
- .3 All piping shall be installed with uniform slopes to permit drainage of lines. Along the pipelines, lockable drain plugs shall be provided at low points as shown on the Drawings. Expansion loops shall be provided as detailed on the Drawings.
- .4 Where protective tape coating is to be used as mentioned in Clause 2.8 above, the pipe shall be prepared for tape application as follows:
 - .1 The pipe surface shall be cleaned of all grease, oil, mill scale, loose rust, welding residue, dirt or other foreign matter, down to the parent material by wire brushing, filing, ball peening or other suitable method and as recommended by the manufacturer.
 - .2 Once the pipe is cleaned, primer shall be applied and Polyken Protective Tape coating spirally wrapped around the pipe as per manufacturer's specifications. Tape widths, roll lengths, and lap dimensions, shall be in accordance with material specifications. Care shall be taken that no wrinkles, voids or breaks are left in the coating.

- .3 Simultaneously with the tape application, an overwrap as defined in the material specifications shall be applied.

3.5 Dike Drain Pump Assembly

- .1 One submersible explosion proof sump pump and power supply, or dike drain pump assembly shall be supplied with each site as per details on Drawing NT-P01.
- .2 The lengths of suction and discharge hoses shall be as indicated in Section 01010.
- .3 The assemblies shall be adjusted to suit, tested and, if performing satisfactorily shall be stored in the dispenser building or as directed by the Engineer.

3.6 Pressure Relief Bypasses

- .1 Thermal pressure relief by-pass lines shall be installed at valves on the piping systems where and as indicated on the Drawings.
- .2 Pressure relief valves in pressure relief bypasses shall be installed so that thermal pressure build-up in the piping system is relieved in the direction of the tanks. Pressure relief bypass shall be pipe to pipe, not pipe to tank. The accumulated pressure build-up, in a series of pressure relief bypasses, shall be checked to ensure that the pressure does not exceed the design pressure of the piping system.
- .3 External pressure relief valves shall be engraved or impression stamped to permanently indicate relief direction and pressure setting.

3.7 Inspection, Testing and Pigging of Pipelines and Product Piping

- .1 Welding of joints on pipelines shall be complete fusion and complete penetration. Fifteen percent (15%) of all welded joints shall be radiographically inspected for 100% of their circumferences. In addition, **all** welds under traffic areas shall be radiographically inspected before burial. Welds with defects shall be repaired and inspected by the same means previously used.
- .2 Welding, repairs and radiographic inspections shall be in accordance with CSA-Z662, *Oil Pipeline Systems*, and latest publication.
- .3 The Owner reserves the right to engage, at his expense, the services of an independent firm to carry out radiographic inspections of any or all welded joints. Any faulty joints shall be repaired at the Contractor's expense and retested radiographically, at the Contractor's expense, until such are found satisfactory. In addition, two additional joints shall be radiographed for each failed joint.
- .4 Sections of the pipelines shall be tested hydrostatically at 1,380kPa (200psi) at the lowest point. The piping shall be isolated from the tanks, dispensers, valves, flexible connectors and other equipment that may leak or be damaged during the test. The pressure shall be maintained for 24 hours minimum and all joints shall be inspected. The pressure and temperature shall be recorded every hour during the test. Any leak shall be repaired immediately and testing redone.

NOTE: Any meters in the system shall be bypassed and isolated during testing and flushing.

- .5 Once the testing of the pipelines is completed, the pipelines shall be drained and pigged with a T.D. Williamson Inc. FJR Pig, or equivalent, to remove debris and all water from the lines.
- .6 The pig shall be moved with air pressure not exceeding 1,034kPa. A minimum of three passes of the pig in each line shall be made to assure cleanliness and that the pipelines are free of water.
- .7 For buried piping, once the hydrostatic testing is completed, the holiday testing of the coating is completed, and inspections are completed and accepted by the Engineer, the Contractor shall proceed with the backfill operation as per Section 02224.
- .8 Testing of the piping, other than to the island dispensers, shall be tested hydrostatically at 1,380kPa (200psi) at the lowest point. The pressure shall be maintained for 24 hours minimum and all joints shall be inspected. The pressure and temperature shall be recorded every hour during the test. Any leak shall be repaired immediately and testing redone.

NOTE: The piping shall be isolated from the tanks, dispensers, valves, flexible connectors and other equipment that may leak or be damaged during the test. Any meters in the system shall be bypassed and isolated during testing and flushing.

- .9 Testing of the piping in the dispenser buildings and from the dispenser buildings to the island dispensers may be air (soap bubble) tested at 415kPa (60psi). The pressure shall be maintained for two (2) hours, while each joint is tested with a soapy solution. Any leak shall be repaired immediately.
- .10 Once the hydrostatic and/or air testing are completed and accepted, by the Engineer, the Contractor shall proceed to the start-up and trial operation.

3.8 Startup and Trial Operation

- .1 The Contractor shall flush each system with a minimum of 4,500 litres of product at full flow capacities and with the strainer baskets in place.
- .2 At the island dispensers, the Contractor shall flush the system with a minimum of 500 litres of product at full flow capacity and with the strainer baskets in place.
- .3 The strainer baskets and/or filters, as well as the strainers at the pumps and meters, shall then be removed, cleaned and reinstalled and the flushing repeated as often as required until no further deposits are retained.
- .4 Following the above, the Contractor shall verify the performance of the equipment and make calibration tests for the meters. Before and after meter readings shall be recorded in the site Engineer's logbook.
- .5 Any product movement in the systems for the above tests shall be done with the authorization of the Engineer and the Regional Petroleum Products Officer. All quantities shall be recorded, verified and delivered back into the system.
- .6 Upon completion of the start-up and trial operation, all strainers shall be verified for

cleanliness.

- .7 Prior to acceptance of the Works by the Engineer at the Substantial Completion Inspection, the Contractor shall operate the systems, as detailed in Section 01650, on a trial basis in the presence of the Engineer or a designated Representative, and any faults or defects found shall be remedied immediately. This trial operation must be continued until each system is fully operational to the satisfaction of the Engineer.
- .8 Under no consideration shall the existing or approved temporary dispensing facilities be shutdown and removed from service until the new dispensing facilities have been fully tested and approved at the Substantial Completion Inspection.
- .9 For other particulars, the Contractor shall refer to Section 01650.

3.9 Dismantling of Existing Piping and Other Structures and Equipment

- .1 To 'dismantle' shall mean to cut and/or to take apart and lay flat any welded, bolted or riveted tanks, pipes or other structure or surplus pipe etc., that is present on site, which will not be reused and is to be discarded.
- .2 Before dismantling work begins on any tank, the Contractor shall empty, clean and gas free such as per Section 15060.
- .3 When called for by the Works, the dismantling of tanks that have been used to store leaded gasoline, and the disposal of steel or other material removed from those tanks, shall be done in accordance with *API Publication 2202 - Guidelines for Protecting against Lead Hazard when Dismantling and Disposing of Steel from Tanks that have contained Leaded Gasoline*.
- .4 Hot work shall be done on a tank only after the tank has been gas freed and tested for hydrocarbon vapours immediately prior to undertaking the work. Confined Space procedures are in effect when working inside a fuel storage tank. Continuous monitoring of the tank atmosphere, in the tank, shall be required while workers are working inside a tank.
- .5 The dismantled pieces of tank steel plates shall not be larger than three metres square. The disassembled pieces of structural shapes shall be cut to maximum lengths of six metres or as specified by the Engineer.
- .6 All valves, flexible connectors and usable equipment shall be removed from the piping and turned over to the Regional Petroleum Products Officer for future use or disposal. The disassembled piping shall be cut to maximum lengths of six metres or as directed by the Engineer.
- .7 All dismantled material and equipment shall remain the property of the Government of the Northwest Territories. It shall be removed from site and transported by the Contractor to the disposal site or elsewhere as directed by the Engineer.

END OF SECTION 15010

DIVISION 15 - SECTION 15051

PIPE WELDING

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PART 1 – GENERAL

1.1 References

- .1 ANSI/ASME B31.1-1989, Power Piping.
- .2 ANSI/ASME Boiler and Pressure Vessel Code-1992:
 - .1 Section 1: Power Boilers.
 - .2 Section V: Nondestructive Examination.
 - .3 Section IX: Welding and Brazing Qualifications.
- .3 CSA W48 series-M1980, Electrodes.
- .4 CSA B51-M1991, Boiler, Pressure Vessel and Pressure Piping Code.
- .5 CAN/CSA-W117.2-M87, Safety in Welding, Cutting and Allied Processes.
- .6 CSA W178.1-1990, Certification of Welding Inspection Organizations.
- .7 CSA W178.2-1990, Certification of Welding Inspectors.
- .8 CAN/CGSB-48.2-92, Spot Radiography of Welded Butt Joints in Ferrous Materials.
- .9 AWS B3.0-1980, Welding Procedures and Performance Qualifications.
- .10 AWS C1.1-66, Recommended Practices for Resistance Welding.
- .11 AWS W1-1980, Welding Inspection.

1.2 Welders Qualifications

- .1 Welding qualifications to be in accordance with CSA B51. All welders to be registered in the Northwest Territories.
- .2 Use qualified and licensed welders possessing certificate for each procedure to be performed from authority having jurisdiction.
- .3 Furnish welder's qualifications to ENGINEER prior to work commencing on project.
- .4 Each welder to possess identification stamp issued by authority having jurisdiction.

1.3 Inspectors Qualifications

- .1 Inspectors to be qualified to CSA W178.2.

1.4 Welding Procedures

- .1 Registration of welding procedures in accordance with CSA B51.
- .2 Copy of welding procedures to be available for inspection at all times.
- .3 Safety in welding, cutting and allied processes to be in accordance with CAN/CSA-W117.2.

PART 2 – PRODUCTS

2.1 Electrodes

- .1 Electrodes: in accordance with CSA W48 Series.

PART 3 – EXECUTION

3.1 Workmanship

- .1 Welding to be in accordance with ANSI/ASME B31.1/3/4, ANSI/ASME Boiler and Pressure Vessel Code, Sections I and IX and ANSI/AWWA C206, using procedures conforming to AWS B3.0, AWS C1.1, API 1104 and all applicable requirements of Authority having jurisdiction.

3.2 Installation Requirements

- .1 Identify each weld with welder's identification stamp.
- .2 Backing rings:
 - .1 Where used, fit to minimize gaps between ring and pipe bore.
- .3 Prior to commencing any welding work provide in written form the following for review by the Engineer:
 - .1 All welder qualifications.
 - .2 Description of welding procedures including the diameter, thickness and grades of all piping and fittings used in the work.
- .4 Pipe may not be moved while the welds are incomplete.
- .5 Steel die stencils shall not be used at the welders work.
- .6 Pipe shall not be welded to structural steel.
- .7 Welding shall not be permitted when in the ENGINEER'S opinion weather is not suitable.
- .8 Provide for preheating where required by applicable codes. Prior to commencing work provide written description of preheating methods for review by ENGINEER.

- .9 Striking of arc except at welding groove is not acceptable.
- .10 All welds to be completed on the same working day the weld is commenced.

3.3 Inspection and Tests – General Requirements

- .1 Review all weld quality requirements and defect limits of applicable codes and standards with Engineer before any work is started.
- .2 Formulate "Inspection and Test Plan" in co-operation with ENGINEER.
- .3 Do not conceal welds until they have been inspected, tested and approved by ENGINEER.
- .4 Provide for inspector to visually inspect all welds during early stages of welding procedures in accordance with AWS W1. Repair or replace all defects as required by codes and as specified herein.

3.4 Specialist Examinations and Tests

- .1 General:
 - .1 Perform examinations and tests by specialist qualified in accordance with CSA W178.1 and CSA W178.2 and approved by ENGINEER.
 - .2 To ANSI/ASME Boiler and Pressure Vessels Code, Section V, CSA B51 and requirements of authority having jurisdiction.
 - .3 Inspect and test 15% of all welds in by non-destructive visual examination and full gamma ray radiographic (hereinafter referred to as "radiography") tests.
- .2 Hydrostatically test all welds to requirements of ANSI/ASME B31.1.
- .3 Visual examinations: include entire circumference of weld externally and wherever possible internally.
- .4 Failure of visual examinations:
 - .1 Upon failure of any weld by visual examination perform additional testing as directed by Engineer of a total of up to 10% of all welds, selected at random by ENGINEER by radiographic tests.
- .5 Radiographic tests as follows:
 - .1 Full radiography to CAN/CGSB-48.2:
 - .1 Conduct radiographic tests on 15% of all welds, selected at random by ENGINEER from all welds.

- .2 Radiographic film:
 - .1 Identify each radiographic film with date, location, name of welder, and submit to Engineer. Replace film if rejected because of poor quality.
- .3 Interpretation of radiographic films:
 - .1 To be by qualified radiographer.
- .4 Failure of radiographic tests:
 - .1 If any weld test fails, tests will be extended to all welds made by welder responsible.

3.5 Defects Causing Rejection

- .1 As described in ANSI/ASME B31.1 and ANSI/ASME Boiler and Pressure Vessels Code.

3.6 Repairs of Welds Which Failed Tests

- .1 Re-inspect and re-test repaired or re-worked welds at no additional cost to the project.
- .2 Repairs will not be permitted if the defect is a crack or the defective segment has been previously repaired.
- .3 All repairs and defect removal shall be in accordance with the provisions of ASME Section IX or API 1104.

END OF SECTION 15051

DIVISION 15 - SECTION 15060

TANKAGE

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PART 1 – GENERAL

1.1 Description

- .1 This Section specifies requirements for the design, supply and field erection of new vertical fuel storage tanks and the fabrication of horizontal fuel storage tanks, including appurtenances, testing, calibration and inspection. It also includes the modification works to existing vertical and horizontal tanks and appurtenances, the moving of existing tanks, the procedures for product transfer and the procedures for emptying, cleaning and gas freeing of tanks.

1.2 Related Work

- | | | |
|----|--|---------------|
| .1 | Summary of the Work | Section 01010 |
| .2 | Shop Drawings | Section 01340 |
| .3 | Substantial Completion Inspection Requirements | Section 01650 |
| .4 | Site Work | Section 02224 |
| .5 | Geotextile | Section 02270 |
| .6 | HDPE Liner Membrane | Section 02592 |
| .7 | Structural Steel | Section 05120 |
| .8 | Painting | Section 09900 |
| .9 | General Mechanical Provisions | Section 15010 |

1.3 Specifications and Codes

- .1 Design and field erected vertical fuel storage tanks shall conform to the latest edition of *API Std. 650 - Welded Steel Tanks for Oil Storage* and applicable Appendices, and in accordance with the details in the Drawings and the particulars of this Section.
- .2 The shop fabricated above ground horizontal fuel storage tanks shall conform to the latest edition of *CAN4-S601-M, Standard for Shop Fabricated Steel Above Ground Horizontal Tanks for Flammable and Combustible Liquids* and shall be in accordance with the details in the Drawings and particulars of this Section.

PART 2 – PRODUCTS

2.1 General

- .1 The following requirements shall be taken into account in the fabrication and erection of tankage:
 - .1 Maximum specific gravity of stored liquid is to be 0.85.
 - .2 Design temperature range, wind, and snow loads, shall be in accordance with the *National Building Code (NBC) and Supplement No. 1*. The Contractor shall also communicate with the Department of Transport and Environment Canada and refer to Section 01010 for particular data on the locality where the Work is to be carried out.
 - .3 Live loads on stairways to be in accordance with the NBC.

2.2 Vertical Tanks

- .1 Plates for vertical tanks, i.e., floor, roof, and shell, shall conform to steels listed in API Std. 650 for Group IIIA materials, i.e., for design metal temperature below minus 40°C, and as per the following:

ASTM	CSA	National Standard
A131M Gr. CS A573M Gr. 400 A516M Gr. 380 A516M Gr. 415 A516 Gr. 55	G 40.21M - 260 W	Grade 41

- .2 All plates thicker than 5mm shall be normalized, killed, and made to fine grain practice.
- .3 Each plate, as rolled, shall be impact tested in accordance with API Std. 650 at a metal temperature of minus 40°C, or lower, to show a minimum Charpy V-Notch longitudinal impact strength of 20 J (15ft-lbf) on the full size specimen.
- .4 The Contractor shall provide the Engineer with copies of mill certificates and obtain approval of such prior to shipping of steel plates.
- .5 The roof structure shall be a *supported cone roof*, as per *API 650, Section 3.10*, with a maximum slope of 19 to 305, and a maximum shell to roof well size of 5mm, so that the roof to shell joint is frangible. A continuous roof handrail cannot be used or the roof to shell joint will not be frangible, and emergency venting devices in accordance with *API Standard 2000* will be required.
- .6 All structural shapes used in the fabrication of tankage shall conform to *CSA G40.21-300W*.
- .7 The material for all connections and nozzles, 100mm Ø and smaller, provided for each opening called for on the Drawings shall conform to the latest edition *API Standard 650*, or to *CSA Z145.12, NP20 (ANSI Class 150)* steel slip-on flanges welded to lengths of *Schedule 80 ASTM A-333 Standard for Seamless and Welded Steel Pipe for Low Temperature Services, Grades 1 and 6*. Forgings shall conform to *ASTM A-350, Grade LF2 Standard*.
- .8 The material for nozzles and manhole necks, over 100 mm Ø, provided for each opening called for on the Drawings, shall be fabricated from similar plate material as used for the tank shell, conforming to the requirements of *API Std. 650*.
- .9 The flanges shall conform to *ASTM A-350, Grade LF2* forged carbon and low-alloy steel forgings and to *ANSI B16.5 Specifications*.
- .10 Bolting shall be with alloy steel heavy hexagonal head bolts conforming to *ASTM A-320, Grade L7*, sizes and lengths to suit. Nuts shall be alloy steel, semi-finished, hexagonal, standard heavy series conforming to *ASTM A-194, Grade 4 Specifications*. Bolts to be threaded in accordance with *ANSI B1.1, coarse thread series, Class 2A fit*. Nuts to be tapped in accordance with *ANSI B1.1, coarse thread series, Class 2B fit*.

- .11 The welding electrodes shall be low hydrogen series E70XX classification conforming to the latest edition of *AWS A5.1* and suitable for the current characteristics, the position of welding and other conditions of intended use. Selected electrodes shall be designated on shop and erection drawings and in qualified welding procedures.
- .12 The connections shall conform to *API Std. 650*, except as amended or extended by the Drawings or this section. Gasket material for connections shall be non-asbestos, 1.6mm, **suitable for use with petroleum products**. Gasket material shall be John Crane Style 2160, Durlon 8500, or approved equivalent. Gaskets shall be 3.2mm thick at the shell manhole(s) and 1.6mm thick at the roof manhole(s). **No elastomer gaskets shall be used (the gaskets must be fire-safe).**
- .13 Appurtenances shall conform to *API Std. 650*, except as amended or extended by the Drawings or this section. Appurtenances to be included are as shown on the Drawings.
- .14 All manholes and manhole covers shall be shop fabricated to *API Std. 650* and as per the Drawings.

2.3 Horizontal Tanks

- .1 Plates for fabricating horizontal tanks shall be good welding quality, carbon, or low alloy steel, in accordance with *CAN4/ULC-S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids, the latest edition*, with a minimum yield strength of 200MPa as applicable to one of the following Specifications:
 - 1. *ASTM A283, Grade C (for plate),*
 - 2. *ASTM A1011 (for sheet),*
 - 3. *ASTM A635 (for coils),*
 - 4. *CSA G40.20/G40.21M (230W), or*
 - 5. *Stainless steel type 304 or 316.*
- .2 The nominal plate thickness shall be as per thickness specified in the *CAN4/ULC-S601 Standard* for the given diameter of the tank.
- .3 The structural steel stiffening members shall be fabricated from steel conforming to *CSA G40.21M (230W)* Specifications, or equivalent.
- .4 Tank connections shall be provided for each opening called for on the Drawings by welding to the tank at each opening:
 - .1 Forged steel threaded tank flanges, or
 - .2 Steel pipe couplings conforming to the latest edition of *CAN4/ULC-S601 Standard*, or
 - .3 ANSI Standard 1,034kPa (Class 150) steel slip-on flanges, welded to lengths of steel pipe (welds shall be full fillet type) with pipe thickness not less than the thickness of the tank shell and:

- .1 For diameters over 100mm, a minimum of Schedule 40 pipe shall be used.
- .2 For diameters of 100mm and under, a minimum of Schedule 80 pipe shall be used.
- .5 Welding shall conform to latest editions of *CSA W59, W47.1 and W55.2* and *ASME Code Section IX* as applicable. E70XX series low hydrogen electrodes shall be used.
- .6 Structural shapes for skids and saddles shall conform to *CSA G40.21M, Grade 300W*.
- .7 Gaskets for flanged connections shall be non-asbestos, 1.6mm, suitable for use with petroleum products. Gasket material shall be John Crane Style 2160, Durlon 8500 or approved equivalent. Gaskets shall be 3.2mm thick at all manholes. **Elastomer gaskets shall not be used (the gaskets must be fire-safe).**
- .8 Appurtenances shall conform to CAN4-S601-M, except as amended by the Drawings or by this Section. The appurtenances to be included are as shown on the Drawings.
- .9 All manholes and manhole covers shall be shop fabricated to *CAN4/ULC-S601 Standard* and as per the Drawings.

PART 3 – EXECUTION

3.1 General

- .1 Fabrication, erection, inspection, welding and labeling of vertical and horizontal tanks shall be to the latest edition of *API Standard 650* and *CAN4/ULC-S601 Standard* respectively, except as amended or extended by the Drawings or by this section.
- .2 No welding shall be permitted during fuel resupply.
- .3 Erection drawings for new tankage, as well as other shop or erection drawings shall be submitted by the Contractor to the Engineer for approval prior to fabrication.
- .4 Shell plates shall be shaped to suit the curvature of the tanks.
- .5 Prior to commencing work, qualified welding procedures shall be submitted to the Engineer in accordance with these specifications. Welders shall be qualified to the procedures in accordance with the latest *API Standard 650, API Standard 1104, ASME Code Section IX* and/or appropriate *CSA W47.1 or W55.2 Specifications* as applicable.
- .6 Each welder working on pressure piping and tank erection shall be registered and qualified to work in the Northwest Territories, and possess a valid NWT A or B Pressure Ticket, as certified by the *Chief Boiler Inspector, Electrical/Mechanical Section, Asset Management Division of the Department of Public Works and Services of the Government of the Northwest Territories, phone (867) 920-3257.*

- .7 Appropriate standard API or ULC Monogrammed nameplates shall be affixed to tankage. The Contractor shall fill out completely all information required on the standard name plates, i.e. nominal diameter, height, capacity, etc. and all information shall be stated in metric units.
- .8 Welding electrodes are affected by humidity and therefore, to retain their quality, special precautions must be followed when same are not maintained in dry environments or when containers are opened. Prior to utilization, electrodes in open containers shall be maintained heated in proper sized ovens as per manufacturer's recommendations at all times.
- .9 In all cases where existing tanks are emptied and gas freed as per Clause 3.5 below, the Contractor and Engineer shall make a visual inspection of the interior of the tanks to determine if any defects, metal pitting, rust or corrosion are present at the bottom and shell plates, etc. The Contractor shall await further instructions from the Engineer before closing the tanks.

3.2 Welding, Testing and Inspection of New Vertical Tanks

- .1 Welding shall be performed as per *API Std. 650, Sections 5.2 and 7.0*.
- .2 Radiographic inspections shall be carried out on butt weld shell joints of vertical tanks in accordance with *API Std. 650 Section 6.1*. The shell to bottom weld shall be inspected by Magnetic Particle or Dye Penetrant inspection. A qualified independent inspection firm shall be provided by the Contractor for this work. The selection of the firm will be subject to approval by the Engineer.
- .3 Radiographic and other inspection reports, certifying the welding, shall be submitted to the Engineer along with a drawing of the developed shell lengths clearly showing the location where the radiographs were taken.
- .4 Inspection and testing of new tank bottom and roof welds shall be by vacuum method in accordance with *API Std. 650 Section 5.3*, using soap suds, linseed oil or other non-toxic product and shall be performed by a qualified independent inspection firm as mentioned above.
- .5 Upon completion of the tank erection and confirmation by the Engineer tank is acceptable; the tank shall be hydrostatically tested per Clause 3.8, below.

3.3 Testing and Inspection of Existing Vertical Tanks

- .1 Once emptied, cleaned and gas freed, and set in their final position (if relocated), the interior of existing vertical tanks shall be visually inspected by a Certified API 653 Tank Inspector and the Engineer.
- .2 The entire floor shall be power wire brushed and vacuumed (swept) clean to check for pitting and weld defects. An API 653, Out of Service Inspection Report, on the condition of the tank bottoms and the structural integrity of the tanks shall be submitted to the Engineer, with recommended repairs (if required).
- .3 Once all repair work is completed and upon confirmation by the Engineer that the condition of the bottom plates and the tank are acceptable, the Contractor shall complete the necessary testing as requested by the Inspector, including vacuum

test all the floor welds, Magnetic Particle inspection of the floor to shell weld, and hydrotesting, in accordance with *API Std. 653*. If no repairs are required, the testing may not be required, as determined by the API 653 inspector.

3.4 Testing and Inspection of Existing Horizontal and Vertical ULC Tanks

- .1 Once emptied and gas freed, the existing horizontal or vertical ULC listed tanks shall be cleaned and plates visually inspected in the presence of the Contractor and the Engineer. The tank bottom and 600mm up the sides shall be power wire brushed and vacuumed (swept) clean to check for pitting and weld defects. A report on the condition of the bottom of tanks and the structural integrity of the tanks shall be submitted to the Engineer for further instructions. If no modifications or repairs are required, the tank can be returned to service, as is. A letter report shall be maintained on file.
- .2 Relocated tanks which bear a ULC Aboveground Label and have not been modified, refurbished or repaired in any way, may, upon relocation, be externally inspected in compliance with, *Technical Supplements CAN4-S601(A) and CAN4-S630(A), paragraph 11*, internally inspected to determine that the tank interior is free of significant pitting or other corrosion, and is leak tested in accordance with the requirements of, *Technical Supplements CAN4-S601(A) and CAN4-S630(A)* or by another equivalent method. A letter report referencing the original label number will be issued and no other labels will be affixed to the tank. The tank can be returned to service, as is. A copy of the letter report shall be maintained on file.
- .3 Refurbished or repaired aboveground tanks, {refurbished by a ULC Listee or by special permission, by an approved A or B pressure welder registered with the *GNWT Boilers Branch*, and in accordance with *Technical Supplement CAN4-S601(A)*}, ULC Labeled in accordance with *CAN4-S601 or CAN4-S630*, shall be inspected and recertified by a *ULC Inspector (416) 757-3611*, in accordance with *Technical Supplement CAN4-S601(A), Shop Refurbishing of Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids, and Certification Bulletin No. 91-21* to be acceptable for continued service. Upon successful testing, ULC will issue a new ULC Label, to be affixed to the tank, showing that the tank has been refurbished.
- .4 Non-standard tanks and tanks without a ULC Nameplate shall be inspected, examined and tested by a *ULC Inspector (416) 757-3611*, in accordance with *CAN4-S601, Standard for Shop Fabricated Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids*, and if acceptable, a Special Acceptance – Tank Label will be issued to be affixed to the tank. All defects shall have been repaired in accordance with *Technical Supplement CAN4-S601(A), Shop Refurbishing of Steel Aboveground Horizontal Tanks for Flammable and Combustible Liquids, and Certification Bulletin No. 91-21*, prior to the inspection.

3.5 Product Transfer

- .1 All methods and procedures to be used by the Contractor for effecting product transfer shall be previously approved by the Engineer and the Regional Petroleum Products Officer.
- .2 The Engineer shall be notified in writing by the Contractor, a minimum of five (5) working days in advance of any proposed transfer of product, so that the

Government of the Northwest Territories Regional Petroleum Products Officer and the Engineer can be on-site during the transfer operation.

- .3 All details of the proposed product transfer shall be provided by the Contractor to the Engineer.
- .4 The Engineer's representative at site shall be responsible for notifying the Regional Petroleum Products Officer and the Engineer of the proposed product transfer.
- .5 The product transfer shall only proceed while the Regional Petroleum Products Officer or his authorized representative is on site. The Contractor shall be held responsible and pay for any variance in product quantities for failing to ensure that the Regional Petroleum Products Officer, or his representative, is on-site during the product transfer.
- .6 During transfer of product the Contractor shall adhere to the following procedures:
 - .1 Accurate strapping charts must be available on-site prior to the product transfer.
 - .2 The Contractor shall supply portable explosion-proof pumping equipment, with sufficient capacity, and all necessary hoses and adaptors to transfer the product.
 - .3 The Petroleum Products Officer and the Contractor shall establish the quantity of product to be transferred and arrange for an accounting of the product quantities before and after the transfer operation.
 - .4 During the transfer operation, all piping, fittings, valves and equipment shall be thoroughly checked for leaks and deficiencies.
 - .5 Tank dips shall be taken and recorded before and after the product transfer, (including the product temperature, level of any water in the bottom of the tanks) and recorded in the Engineer's daily logbook with copies to the Regional Petroleum Products Officer.
 - .6 For each transfer of product, for meter proving or other reasons, meter readings shall be taken and recorded before and after the product transfer and recorded in the Engineer's logbook with copies to the Regional Petroleum Products Officer.
- .7 Once the fuel transfer is complete, the amount of sludge and/or contaminated product remaining in the tank shall be confirmed by the Petroleum Products Officer, shall be recorded by the Contractor, and this quantity shall be verified by the Engineer. Disposal of any contaminated product and disposal of any empty drums shall be as directed by the Engineer.
- .8 The Contractor shall be responsible for any fuel spills resulting from his fuel transfer operations. The Contractor shall pay for all clean-up costs and for any fuel spilled.

3.6 Emptying, Cleaning and Gas Freeing Tanks

- .1 When tanks are to be emptied, the Contractor shall give due notice to the Engineer

- the product transfer, as per Product Transfer Procedures outlined in Clause 3.5 above.
- .2 The Contractor shall observe all safety precautions and confined space entry procedures at all times as required by the *Prevention Services Department of the Workers' Compensation Board (867) 669-4407* and the *Chief Safety Officer at (867) 669-4403*.
 - .3 When emptying, cleaning or gas freeing a tank, the Contractor shall follow the procedures and precautions necessary for the safety and health of personnel, as described in *API Publication 2015 entitled "Cleaning Petroleum Storage Tanks,"* as well as *API Publication 2015A entitled "Guide for Controlling Lead Hazard Associated with Tank Entry and Cleaning"* whenever a tank is known to have contained leaded gasoline.
 - .4 Any contaminated product and/or sludge removed from a tank shall be placed in metal containers and disposed of as directed by the Engineer.
 - .5 After a tank has been emptied of all product and sludge, it shall be dried and ventilated or steamed until the tank is free of hydrocarbon vapours. The tank shall be tested with a gas/oxygen meter to ascertain that it is gas free and safe to enter.
 - .6 In all cases where existing tanks are emptied and gas freed, the tank shall be inspected by an API 653 Tank Inspector. The Contractor and the Engineer shall also make a visual inspection of the interior of the tanks to determine if any defects, metal pitting, rust or corrosion are present. Chipping and power wire brushing will be required for the removal of hard rust blisters and scale from the bottom to measure pitting. A report shall be prepared by the API Tank Inspector on the findings and it shall be presented to the Engineer and Contractor outlining what repairs are required. All repairs shall be made in accordance with API Standard 653 and shall be tested and inspected to the satisfaction of the API Inspector.
 - .7 When existing tanks are to be relocated and re-used, final cleaning of the tanks shall be done when the tanks are in place in their final position. The interior of the tanks which contained leaded gasoline shall be swept and washed down with a water hose stream, emptied of water, scale and other debris and wiped dry.
 - .8 After all tank repairs, modifications, installation of equipment and tank cleaning are completed, the Contractor shall advise the Engineer to that effect and obtain his authorization before closing the tank.

3.7 Moving of Tanks

- .1 In cases where the tanks are to be moved, the Contractor shall submit for the Engineer's consideration and approval all necessary details of the method of moving the tanks, including any bracing of the tank, prior to proceeding with the move. All tanks shall be emptied and gas freed prior to moving. The Engineer's approval shall not relieve the Contractor from his responsibility for the Work or method selected and any damage that occurs to the tankage due to use of improper equipment or moving methods. Damages shall be repaired by the Contractor at no extra cost to the Owner.
- .2 Suitable steps shall be taken to protect the liner and top layer of compacted gravel

from damage due to the relocation of tanks and equipment used in this procedure. This method of protection shall be reviewed and approved by the Engineer.

3.8 Hydrostatic Testing and Repairs

- .1 After completion, the shell of new, relocated or extended tankage, shall be tested hydrostatically with water for a minimum of 24 hours. Seawater may be used, provided that it is discharged by pipe or hose to the sea after use, and that the tanks are thoroughly drained and flushed with fresh water immediately after test completion.
- .2 Any dirt or excessive rust accumulation on the interior surface of the tanks shall be wire brushed and cleaned to the satisfaction of the Engineer. The Contractor shall provide adequate temporary lighting inside the tank during inspection of tanks by the Engineer.
- .3 During the filling operation, the tanks and granular bases shall be inspected frequently for leaks or excessive settlement. Level readings shall be taken at a minimum of four (4) locations 90° apart (or no more than 10 m apart, whichever is the lesser), starting at the inlet nozzle of the tank, on the bottom flange along the perimeter of the tank. A set of readings shall be taken before, during, and after testing and shall be submitted to the Engineer as part of the tank testing record.
- .4 For vertical tanks with tight roof, **the filling height shall be 50mm above the top leg of the top angle**, to prove the structural integrity of the tank.
- .5 All defects found in welds, or leaks discovered, shall be repaired immediately by the Contractor at no extra cost. Any excessive settlement of the tank during the filling operation shall be reported immediately to the Engineer for instructions, and the filling operation halted until corrective action, as specified by the Engineer, has been taken.
- .6 After the horizontal tanks are set in place on their granular pads, they shall be hydrostatically tested with water for a minimum of 24 hours. Level readings shall be taken on both tank skids at each end, before, during, and after testing and shall be submitted to the Engineer as part of the tank testing record. Any leaks found shall be repaired as per *CAN4-S601(A) Specification* and the tank re-tested at no additional cost.
- .7 Existing vertical and/or horizontal tanks that have been relocated, modified or reinstalled, shall, in all cases, be hydrostatically tested once in place as noted above.
- .8 All above mentioned tests shall be made in the presence of the Engineer to be officially recognized. The Contractor shall first satisfy himself that facilities are ready for testing, and then give the Engineer sufficient advance notice of his intent to carry out the test, so that the Engineer may arrange to witness the test.

3.9 Protective Coating

- .1 The exterior surface of the bottom, shell, and roof plates for new vertical steel tanks shall be shop blasted and primed with inorganic zinc primer prior to shipping, as per Section 09900.

- .2 Where practical, the exterior of all horizontal tanks shall be grit blasted, shop primed with inorganic zinc primer and finish coated prior to shipping, as per Section 09900.
- .3 All aviation fuel tanks at airport fuel facilities shall be lined internally with an epoxy coating. The tank interior shall be cleaned by a white metal blast and internally lined with an epoxy urethane coating, under *CGSB-1-GP-146E* or *CGSG-1-GP-193*, in accordance with *Nav Canada Standard AK-66-05-900*.

3.10 Strapping and Calibration of Tanks

- .1 All new and relocated tanks shall be calibrated as part of the Contract. The Contractor shall engage the services of an independent firm, approved by the Engineer, who is experienced in tank strapping and calibration to carry out the fieldwork and the preparation of the tank charts.
- .2 The Contractor shall confirm with the Engineer that the strapping firm is acceptable to the Government of the Northwest Territories (GNWT).
- .3 The strapping and calibration shall be carried out in accordance with *API Std. 2550, latest edition*, and *MPMS Chapter 2, Section 2A*, for vertical tanks, and *API Std. 2551, latest edition*, for horizontal tanks.
- .4 Strapping and calibration of tanks shall be done after the tanks have been hydrostatically tested. Strapping and Calibration can be done at any fill condition, but preferably at the time of emptying, when the tank is two-thirds full of water.
- .5 Tank charts shall be produced to indicate volumes in litres at each 10mm interval, with a key scale to show calculation volumes for 1mm intervals.
- .6 Five (5) copies of the charts and field data shall be provided to the Engineer. Two (2) copies of the charts and field data shall be made available to the Engineer two (2) weeks prior to the Substantial Completion Inspection and also prior to any fuel transfers taking place.
- .7 Rough field data shall be provided to the Engineer within five (5) days of completion of strapping in the field. Data to be faxed to the Regional Petroleum Products Officer within 24 hours of completion of strapping.

END OF SECTION 15060

DIVISION 16 - SECTION 16010

GENERAL ELECTRICAL PROVISIONS

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PART 1 – GENERAL

1.1 Related Work

.1	Substantial Completion Inspection Requirements	Section 01650
.2	Gasoline and LSDL Fuel Dispenser Building	Section 13227
.3	Operators Shelter Building	Section 13229
.4	Jet A-1 Aviation Fuel Dispenser Building	Section 13230
.5	Automatic Temperature Compensating Metering Systems	Section 13420

1.2 General

- .1 These specifications shall be read together with the Drawings and all other sections of the contract documents.
- .2 The complete Work under this trade shall be governed by the dictates of good practice in all details of materials and methods even if not minutely specified. The Work shall be properly co-ordinated with the requirements of other units of work specified in other sections.
- .3 The Contractor shall, upon being awarded a contract, submit five (5) complete sets of electrical drawings to the *Electrical/Mechanical Safety Section {Phone: (867) 920-8801}, Asset Management Division, Department of Public Works and Services (PW&S) of the Government of the Northwest Territories* for approval. When the Drawings are approved, submit one copy of approved drawings both to the Engineer and to the Owner for their records.
- .4 The Contractor shall obtain all necessary electrical permits from the local authorities having jurisdiction before the start of the project and the costs of these permits shall be borne by the Contractor. The Contractor shall obtain and pay for all other permits, inspections, etc., required by the Department of Public Works and Services of the Government of the Northwest Territories.
- .5 The Contractor shall co-ordinate Work with the Northwest Territories Power Corporation (NTPC), or in some communities, Northland Utilities Ltd., or other local providers, for connection of electrical services, if required.
- .6 The Contractor shall submit shop drawings, product data, and samples in accordance with *Section 01340*. Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material. Where applicable, include wiring, single line, and schematic diagrams.
- .7 The Contractor shall provide Operation and Maintenance data for incorporation into the Operation and Maintenance Manual, as specified in *Section 01340*.
- .8 When all work has been completed, the Contractor shall obtain a Final Certificate of Approval (without reservations) from the Electrical Inspector having jurisdiction certifying that the installation is in accordance with the requirements of the contract drawings, specifications and all governing codes and regulations.
- .9 The relative distances required to be observed for the installation of electrical equipment in hazardous areas are shown on Standard Detail Drawings: NT-E32 and NT-E33.

- .10 Upon completion of the project, the Contractor shall provide the Owner with a complete set of record drawings, with changes indicated in red.

1.3 Specifications and Codes

- .1 All work shall be in compliance with the *Canadian Electrical Code (CEC) Part 1, C22.1*, latest edition, with particular reference to Sections 10, 18 and 20.
- .2 The Contractor is advised to verify with the *Electrical/Mechanical Safety Section [Phone: (867) 920-8801], Asset Management Division, Department of Public Works and Services (PW&S) of the Government of the Northwest Territories*, for local applicable bylaws and for any particular special requirements that might be applicable to the installation.
- .3 Motors, electric heating, control and distribution devices and equipment shall operate satisfactorily at 60Hz within normal operating limits established by *CSA Standard CAN3-C235, latest edition*.

PART 2 – PRODUCTS

2.1 General

- .1 All materials and equipment shall be new and of a uniform pattern throughout the Work. All electrical components shall be CSA approved and comply with the requirements of the *Electrical/Mechanical Safety Section [Phone: (867) 920-8801], Asset Management Division, Department of Public Works and Services (PW&S) of the Government of the Northwest Territories* with respect to their application.
- .2 Any item or equipment described or identified for use by manufacturer's type, model or catalogue number shall be provided with additional features or modifications as specified herein or as shown on the Drawings or required for the installation.
- .3 All outdoor electrical equipment shall be finished with *ANSI 62 Grey Finish*. Clean and touch up factory-painted equipment, which was scratched or marred during shipment or installation, to match original paint. Clean, prime, and paint exposed hangars, racks, and fastenings to prevent rusting.

2.2 Fittings, Boxes and Seals

- .1 Fittings, seals, flexible couplings and boxes used in hazardous locations, as defined in *CEC Section 18*, shall be explosion-proof and rated for use in Class I, Zone 0, 1 or 2 locations, as applicable, and as shown on the Drawings, and shall be rated for use in Group IIA vapour atmospheres.
- .2 Boxes shall be copper- free aluminum and/or malleable iron, cadmium or zinc finish, Crouse-Hinds or approved equal. All fittings shall have sufficient room for insulated joints, wires and bushings.
- .3 Seals shall be provided as per code requirements and as indicated on the Drawings and as follows:
 - .1 Conduits shall be sealed with Crouse-Hinds EYS type seals.

- .2 Teck type cables shall be sealed with a barrier gland and outer seal, Phillips Cables Ltd. design No. 424-CA, size to suit actual cable dimensions.
- .4 The seals and sealing connectors shall be filled with sealing compound on site after all components are finally positioned to avoid cracking. Crouse-Hinds Chico 'A' sealing compound and Chico Fiber shall be placed in seals as per manufacturer's recommendations.
- .5 Crouse-Hinds HTL High Temperature Thread Lubricant shall be used at all threaded locations.
- .6 Malleable iron clamps shall be used for anchoring conduits.

2.3 Conduits

- .1 All conduits shall be sized in accordance with the *Canadian Electrical Code* unless a larger size is specifically called for on the Drawings.
- .2 All conduits shall be rigid, heavy wall, mild steel tube, electro-galvanized or hot-dipped galvanized.

2.4 Conductors

- .1 All conductors shall be copper, with minimum 600 Volt RW90-XLPE (minus 40°C) insulation.
- .2 Unless otherwise specified, wire sizes shall not be less than No. 12 AWG. Conductors of size No. 10 AWG and larger shall be stranded.
- .3 Teck cables shall be used as indicated on the Drawings. Cables shall be hazardous location type HL Teck 90 (minus 40°C). Multiple conductor cables shall have one grounding uninsulated copper conductor.
- .4 Ground wires in conduits shall be copper, 600 Volt, green-coloured insulation and sized per code, or as indicated on the Drawings.

2.5 Service Masts

- .1 Service masts shall be of rigid galvanized steel (RGS), minimum 63mm Ø trade size, and shall comply with *Section 6 of the Canadian Electrical Code, in particular, Rules 6-112, 6-114 and 6-116.*

2.6 Floodlight Poles

- .1 Straight square steel poles shall be 6.1m high, 100mm square c/w steel base plate and two piece base cover, one reinforced handhole with cover at 300mm above base, ground lug and mounting arrangement for one side-mount Magnu-Series luminaire. Pole to be Hubbell Cat. No. SSC-4206-A2 complete with four 19mm Ø x 760mm long c/w 75 hook 'L' shaped black, unplated anchor bolts, Hubbell Cat. No. TAB-30 and one 250mm long mounting arm for flat surfaces, Hubbell Cat. No. MAA-10.

- .2 Hinged, square tapered steel poles shall be 7.315m high, shaft size, base plate and anchor bolts to be designed and fabricated to withstand 180km/h wind force on an equivalent projected area (EPA) of 1.0 m², and a total weight of fixture and cross arms at the top of pole of 100 kg. Poles to be as manufactured by Dynapole Inc., Toronto, or approved equivalent. Poles to be provided with the following accessories:
 - .1 Tenon 65mm Ø x 75mm long, top end threaded to NPT standard.
 - .2 Ground lug at handle (maximum wire size No. 4 AWG).
 - .3 Reinforced handhole with cover plate.
 - .4 Lowering device consisting of a winch, an arm, a rotating drum with a 2-way ratchet lock and 10m of standard flexible aircraft cable and snap hook. Drum to have gear ratio of 4.1 to 1; combination arm, gear and lever to provide a 30 to 1 mechanical advantage.
- .3 Wood floodlight poles combined with service mast shall be as shown on Drawing NT-E01 and as called for on Drawings.

2.7 Floodlight Fixtures and Lamps

- .1 High pressure sodium floodlight fixture **Type 'A'** shall be outdoor type c/w integral low temperature ballast, 250W, 120V, trunnion mounting Twist-lock photo control receptacle, 120V, Hubbell Magnuliter Cat. No. MVM-0250S-268-PCR and shall include the following:
 - .1 Protective polycarbonate shield Hubbell Cat. No. MVMS-2.
 - .2 Photo control Twist-lock cell Hubbell Cat. No. PTL-1, 120 V, lamp.
 - .3 Pole mount bracket Hubbell Cat. No. 4040 and steel fitting Hubbell Cat. No. 4010.
 - .4 Lamp 250W, high pressure sodium, E-18 Mogul base, 120V, base down, CGE Lucalox LU-250 BD, or approved equivalent.
- .2 High pressure sodium floodlight fixture **Type 'B'** shall be outdoor type c/w integral low temperature ballast, 400W, 120V, knuckle-type slipfitter mounting, Hubbell Magnuliter Cat. No. MVM-0400S-268 and shall include the following:
 - .1 Protective polycarbonate shield Hubbell Cat. No. MVMS-2 and lamp.
 - .2 Lamp 400W, high pressure sodium, E-18 Mogul base, 120V, base down, CGE Lucalox LU-400 BD or approved equivalent.
- .3 **Type 'C'** lighting fixture shall be explosion proof and weather resistant, factory sealed, Class 1, Group IIA, high pressure sodium lighting fixture c/w integral low temperature ballast, 150W, 120V, ceiling mounting type, 19mm Ø hub, Appleton Code-Master 'C', Cat. No. AESC 1575 with cast aluminum guard and shall include the following:

- .1 Protective polycarbonate cover.
- .2 Lamp 150W, high pressure sodium, E-18 Mogul base, 120V, base up, CGE Lucalox LU-150 BU or approved equivalent.
- .4 **Type 'D'** lighting fixture shall be explosion proof and weather resistant, factory sealed, Class 1, Group IIA, high pressure sodium lighting fixture c/w integral low temperature ballast, 150W, 120V, 25° stanchion mounting type, 38mm Ø hub, Appleton Code-Master 'C', Cat. No. AESS 15150 with cast aluminum guard and shall include the following:
 - .1 Protective polycarbonate cover.
 - .2 Lamp 150W, high pressure sodium, E-18 Mogul base, 120V, base up, CGE Lucalox LU-150 BU or approved equivalent.
- .5 High pressure sodium lighting fixture **Type 'E'** shall be rectangular housing, gasketed for all weather operation c/w integral low temperature ballast, 400W, 120V, Mogul base socket, Hubbell Magnuform II Series Cat. No. RCM-0400S-2W8, luminaire to be drilled for fastening to mounting arm for pole side installation and shall include the following:
 - .1 Protective polycarbonate shield Hubbell Cat. No. RCM-SPC and lamp.
 - .2 Lamp 400W, high pressure sodium, E-18 Mogul base, 120V, base down, CGE Lucalox LU-400 BD or approved equivalent.

2.8 Grounding Wire and Connectors

- .1 Materials for grounding systems shall be in accordance with *Section 10 of the Canadian Electrical Code*, except that the ground wire sizes shall be no less than the sizes indicated on the Drawings and shall be copper stranded copper.
- .2 The ground wire for anti-static grounding shall be minimum No. 4 AWG stranded copper.

2.9 Markings

- .1 All switches, starters, contactors, timers and conduits in panelboards shall be identified with permanent labels, stainless steel type, with embossed identification, attached to covers of enclosure boxes. Within operator's shelter only, identification labels may be lamacoid type, black background with white engraved lettering.
- .2 Identify wiring with permanent indelible, numbered, identifying markings, on both ends of phase conductors of feeders and branch circuit wiring and on all control wiring.
- .3 Panel directories are to be typewritten, clear plastic laminated, and provided with each panel.

- .4 Nameplate sizes:
 - Type A 9.5mm Letter height
 - Type B 6.0mm Letter height
 - Type C 3.0mm Letter height
- .5 Wording on nameplates to be approved by Engineer prior to manufacturer. Submit type written list.
- .6 Identification language to be English.
- .7 Nameplate for main distribution centre: Type A, indicate name of facility, year installed, electrical ratings and names of electrical engineer and electrical contractor.
- .8 Nameplate for Panelboards: Type B, indicate panel designation and voltage.
- .9 Nameplate for disconnect switches: Type B, indicate equipment controlled and voltage.
- .10 Nameplate for terminal cabinets: Type B, indicate equipment controlled and voltage.
- .11 Nameplate for starters and contactors: Type B, indicate equipment controlled and voltage.
- .12 Nameplate for motor control centres: Type B, indicate equipment controlled and voltage.
- .13 Nameplate for transformers: Type B, indicate circuit and panel designation.
- .14 Nameplate for ON/OFF switches where use is not immediately obvious: Type B, indicate area or device served.
- .15 Nameplate for generator: Type B, indicate voltage, phase, and capacity.
- .16 Nameplate for receptacles: Type C, indicate panel designation and circuit number.

2.10 Remote Island Dispensers

- .1 The remote island dispensers shall be as called for in Section 15010. The remote dispensers at island shall be equipped with lighted front, power reset and solenoid valve.

PART 3 – EXECUTION

3.1 General

- .1 Electrical layout shall be in accordance with the intent expressed by the Drawings and Specifications and/or as required by site conditions.

3.2 Conduits

- .1 Conduits shall be free from kinks and foreign matter and all cut or threaded ends shall be reamed. Field cut threads shall be painted with Crouse-Hinds STL lubricant.

- .2 All conduits shall enter properly and be secured to all fittings, outlet boxes, panel tubs, etc. by means of locknuts and bushings. All unused openings shall be sealed with a threaded plug. Running threads shall **not** be used.
- .3 Approved seals shall be provided on all conduits running into or through a hazardous location as defined in *CEC Sections 18 & 20*. Sealing compound shall be inserted into seals upon completion of work in accordance with manufacturer's specifications.
- .4 Install conduits and fittings neatly and square to building and tank structure lines.

3.3 Electrical Grounding

- .1 Grounding of electrical service entrance equipment and other equipment shall comply with *Section 10 of the Canadian Electrical Code*, except that minimum size #2 AWG conductor shall be used as the common service grounding conductor.
- .2 All grounding connections and methods shall be approved for the purpose.

3.4 Static Electricity Grounding

- .1 Pipelines, piping, tanks, Operators Shelter Building, Garages, dispenser buildings, fences and gates shall be bonded and grounded, as shown on the Project Drawings.
- .2 Bonding jumpers shall be installed across valves, expansion joints and flanged joints to ensure continuity. Maintain the continuity of the grounding systems throughout the installation by ensuring proper ground wire connections and joins at all terminations.
- .3 Ground tests shall be conducted by the Contractor for each pipeline.
- .4 Grounding devices must not be allowed to penetrate the liner membrane. If any damage to the liner membrane occurs, it shall be repaired by the Contractor to the Engineer's satisfaction at no extra cost to the Owner, and as per Section 02592.
- .5 A ground cable complete with sturdy clamp for grounding of tank trucks shall be provided at all truck loading or unloading points and as shown on the Project Drawings and as shown on Standard Detail Drawings NT-E25 or NT-E26.

3.5 Testing

- .1 The Polygas Surveillance and Detection System operation shall be verified, calibrated and tested on site by the manufacturer, or as delegated, as per Section 01650, and applicable Sections 13227 and Section 13230.
- .2 The ventilation system for each dispenser building shall be tested on site per Section 01650, and applicable Sections 13227 and Section 13230.
- .3 Motors shall be tested on site as follows:
 - .1 Check that the motor starter is sized properly and that motor overload settings are sized properly.
 - .2 Check the voltage and rotation.

- .3 Check motor amperage at full load condition, to ensure the current is within the nameplate rating.
- .4 Record test data for each motor on the test sheet at the back of this Section.
- .5 Confirm motor is properly rated for its hazard location.
- .4 Anti-static ground continuity tests shall be conducted for each tank by the Contractor.
- .5 Test each circuit originating from branch distribution panels for continuity, short circuit and ground. Ensure phase-to-ground resistance of open circuit is not less than fifty (50) megohms. Megger circuits, feeders and equipment rated up to 350V with a 500V instrument. Ensure circuits are open during Megger testing. Check resistance to ground before energizing. Do not Megger test instrumentation or computer circuits.
- .6 Test all lighting and their controls.
- .7 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project. Pay all costs for testing as required.
- .8 Submit test results to Engineer for review.

END OF SECTION 16010

**TEST SHEET FOR ELECTRICAL INSTALLATIONS
(USE SEPARATE SHEET FOR EACH MOTOR)**

SITE: _____ PROJECT NO.: _____

CONTRACTOR: _____

DATE: _____ MOTOR H.P.: _____ PHASE: _____

TEST: Installation resistance to ground _____ megohms.

Voltage at panel mains section:

(1) Between phases: A - B _____ B - C _____ A - C _____

Line to neutral: A - N _____ B - N _____ C - N _____

(Note for 120/240 V read A - B only and A - N and B - N only)

(2) Running amperes
of motor: A _____ B _____ C _____

(3) Overload Settings: A _____ B _____ C _____

(Note for 120/240V read A and B only)

Motor Serial No.: _____ Model No.: _____

Manufacturer: _____

Pump Duty (Product pumped or other use): _____

SIGNATURE: _____

(Print name after signature)