EQUIPMENT INSTALLATION

CERTIFICATE OF EQUIPMENT INSTALLATION
FORM 101

I have familiarized the Contractor of the specific installation requirements related to the equipment listed below and am satisfied that he understands the required procedures.

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

_____ _____
(Authorized Signing Representative of the Supplier) Date

I certify that I have received satisfactory installation instructions from the equipment Supplier.

_____ _____
(Authorized Signing Representative of the Contractor) Date

EQUIPMENT INSTALLATION

CERTIFICATE OF SATISFACTORY EQUIPMENT INSTALLATION
FORM 102

I have completed my check and inspection of the installation listed below and confirm that it is satisfactory and that defects have been remedied to my satisfaction except any as noted below:

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

OUTSTANDING DEFECTS: _____

_____ _____
(Authorized Signing Representative of the Supplier) Date

_____ _____
(Authorized Signing Representative of the Contractor) Date

EQUIPMENT INSTALLATION

CERTIFICATE OF SATISFACTORY EQUIPMENT PERFORMANCE FORM 103

We certify that the equipment listed below has been continuously operated for at least fourteen (14) consecutive days and that the equipment operates satisfactorily and meets its specified operating criteria. No defects in the equipment were found. The equipment is therefore classed as "conforming".

PROJECT: _____

ITEM OF EQUIPMENT: _____

_____

TAG NO: _____

REFERENCE SPECIFICATION: _____

_____ _____
(Authorized Signing Representative of the Supplier) Date

_____ _____
(Authorized Signing Representative of the Contractor) Date

_____ _____
(Authorized Signing Representative of the Engineer) Date

_____ _____
(Authorized Signing Representative of the Owner) Date

END OF SECTION

SYSTEMS DEMONSTRATIONS

1. GENERAL

.1 Operate the facility and demonstrate operation and maintenance of equipment and systems to Owner's personnel for two weeks prior to date of Interim Completion.

.2 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

.3 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

2. SUBMITTALS

.1 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Owner's approval.

.2 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.3 Give time and date of each demonstration, with a list of persons present.

3. CONDITIONS FOR DEMONSTRATIONS

.1 Equipment has been inspected and put into operation.

.2 Testing, adjust, and balance has been performed and equipment and systems are fully operational.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

4. EXECUTION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated personnel are present.

.3 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.

.4 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.5 Review contents of manual in detail to explain all aspects of operation and maintenance.

.6 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions

END OF SECTION

CONTRACT CLOSEOUT

1. RELATED REQUIREMENTS

.1 Submission of Record Drawings: Section 01720

.2 Operating/Maintenance Manuals: Section 01730

.3 Commissioning: Section 01735

.4 General Conditions of the Contract: fiscal provisions, legal submittals and other administrative requirements.

2. FINAL CLEANING

.1 When the Work is at Interim Completion, remove surplus products, tools, construction machinery and equipment not required for the performance of the remaining Work.

.2 Remove waste products and debris and leave the Work clean and suitable for occupancy by Owner.

.3 When the Work is at Final Completion, remove surplus products, tools, construction machinery, equipment, waste products and debris.

.4 Leave the Work broom clean before the final inspection process commences.

.5 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.

.7 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.9 Broom clean and wash exterior walks, steps and surfaces.

.10 Remove dirt and other disfigurations from exterior surfaces.

.11 Clean and sweep roofs, gutters, downspouts, areaways and sunken wells.

.12 Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.

3. SYSTEMS DEMONSTRATION

.1 See Section 01670.

4. DOCUMENTS

.1 Collect reviewed submittals (Section 01300) and assemble documents executed by Subcontractors, suppliers and Manufacturers.

.2 Submit material prior to final application for Interim Inspection. For items of Work delayed materially beyond date of Interim Completion provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

.3 Provide warranties and bonds fully executed and notarized.

.4 Execute transition of Performance and Labour and Materials Payment Bond to warranty period requirements.

.5 Submit a final statement of accounting giving total adjusted Contract Sum, previous payments and monies remaining due.

.6 Engineer will issue a final change order reflecting approved adjustments to Contract Sum not previously made.

5. REMOVAL OF TEMPORARY FACILITIES

.1 Prior to application for Interim Completion, remove all temporary offices and furniture, hoardings, fencing, tree and plant protection, and all other items used to aid the performance of the Work. Make good surfaces.

6. PROJECT COMMISSIONING

.1 Expedite and complete deficiencies and defects identified by the Engineer at no cost to owner.

.2 Review maintenance manual contents (operating, maintenance instructions, record "as-built" drawings, spare parts, materials) for completeness.

.3 Review cash allowances in relation to Contract Price, change orders, retainage, hold-backs and other Contract Price adjustments.

.4 Submit required documentation such as statutory declarations, Workers' Compensation Certificates, warranties, certificates of approval or acceptance from regulating bodies.

.5 Attend "end-of-work" testing and break-in or start-up demonstrations.

.6 Review inspection and testing reports to verify conformance to the intent of the documents and that changes, repairs or replacements have been completed.

.7 Review condition of equipment, which have been used in the course of the work to ensure turning over at completion is in "as new condition" with warrantees dated and certified from time of Interim Completion of the Work.

.8 Arrange and coordinate instruction of Owner's staff in care, maintenance and operation of building systems and finishes by Suppliers or Subcontractors.

.9 Provide on-going review, inspection and attendance to building call-back, maintenance and repair problems during the Warranty periods.

7. INSPECTION/TAKEOVER PROCEDURES

.1 Prior to application for Interim Completion, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete and/or corrected and the building is clean and in condition for occupancy. Notify the Engineer in writing, of satisfactory completion of the Work and request a final inspection.

.2 During the final inspection, a list of deficiencies and defects will be tabulated. Correct same.

.3 When the Engineer considers deficiencies and defects have been corrected and it appears all requirements of the Contract have been performed, make application for final completion.

END OF SECTION

PROJECT RECORD DOCUMENTS

1. REQUIREMENTS INCLUDED

.1 Record documents, samples, specifications

.2 Equipment and systems.

.3 Product data, materials and finishes, and related information.

.4 Operation and maintenance data.

.5 Warranties and bonds.

2. RELATED REQUIREMENTS

.1 Section 01050 – Field Engineering: Site survey after construction.

.2 Section 01300 – Submittals: Shop drawings, samples, manufacturer's instructions, photographs.

.3 Section 01310 – Schedules, Progress Reports: Total project schedule.

.4 Section 01400 – Quality Control: Test and inspect reports.

.5 Section 01730 – Operation and Maintenance Manuals.

.6 Individual Specifications Sections: Specific requirements for operation and maintenance data.

3. RECORD DOCUMENTS AND SAMPLES

.1 Maintain at the site for Engineer one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store Record Documents and Samples in Field Office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label and file in accordance with Section number listings in Table of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain Record Documents in a clean, dry and legible condition. Do not use Record Documents for construction purposes.

.5 Keep Record Documents and samples available for inspection by Engineer.

4. RECORDING AS-BUILT CONDITIONS

.1 Record information on a set of blue line opaque drawings, provided by Engineer.

.2 Provide felt tip marking pens, maintaining separate colors for each major system, for recording information.

.3 Record information concurrently with construction progress. Do not conceal work until required information is recorded.

.4 Contract Drawings and shop drawings: Legibly mark each item to record actual construction, including:

.1 Measure depths of elements of foundation in relation to finish first floor datum

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: Legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalog number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: Maintain manufacturer's certifications, inspection certifications, field test records, and other documents required by individual specifications sections.

PROJECT RECORD DOCUMENTS

5. EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: Include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications.

.3 Include installed color-coded wiring diagrams.

.4 Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: Include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed color-coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01400.

.15 Additional Requirements: As specified in individual specification sections.

6. MATERIALS AND FINISHES.

.1 Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and Weather-exposed Products: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommend schedule for cleaning and maintenance.

.4 Additional Requirements: As specified in individual specifications sections.

END OF SECTION

OPERATION AND MAINTENANCE MANUALS

1. GENERAL

1.1 Operations and Maintenance Manuals

.1 Operation and maintenance manuals for the project will be produced in part by the Contractor, for completion by the Engineer.

.2 Manuals are to cover all installed items requiring or likely to require operating, maintenance or repairs.

.3 The Contractor's work includes:

.1 Provision of manufacturers and suppliers information and warranties.

.2 Supply of binders and dividers.

.4 All work described in this section is Contractor's work, except where specifically indicated otherwise.

.5 The final number of copies required are six (6).

.6 Deliver two (2) draft manuals to the Engineer before Interim Completion Inspection. These are in addition to the six (6) final copies. Deliver any outstanding information prior to requesting final inspection.

.7 One (1) draft manual will remain at the plant after commissioning and the remaining copy will be utilized to finalize the Final copies.

.8 The Engineer will add his portion to the draft copies for future reproduction by the Contractor.

1.2 Reference Standards

.1 The manual is to conform to the current edition of "Specifications for Operations and Maintenance Manuals:, Department of Public Works and Services, Government of Nunavut.

2. FORMAT

2.1 Organization

.1 The completed manual will contain ten (10) chapters. The responsibility for production of each chapter is indicated below:

.1 Introduction (by the Engineer)

.2 Index (by the Engineer)

.3 Background, Design Data (by the Engineer)

.4 Schematic, Functional Data (by the Engineer)

.5 Components Details (by the Engineer)

.6 Operating Procedures (by the Engineer)

.7 Maintenance Procedures (by the Engineer)

.8 Testing and Certification Data (part by the Contractor)

.9 Manufacturer Data and Service Information (by the Contractor)

.10 Appendices (by the Engineer, except as directed otherwise in this section)

.2 Group information within chapters logically by system, to the greatest possible extent. Organize the information on each system in the most logical fashion, for example, from supply point through to point of use.

2.2 Language

.1 English

2.3 Testing

.1 Include all data sheets recording concrete test results, data tests for leakage, drain operation and like information.

.2 List all items that require periodic inspection by independent inspectors. List the frequency of inspection, the inspection agency to contact, including address and current phone number.

.3 Include a photocopy 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 certificates is filed and where it is to remain displayed.

2.4 Manufacturer's Warranties (Chapter 8)

.1 Include the originals of manufacturer's warranties in Copy 1 of the manual.

.2 Include photocopies in copies 2 through 5.

.3 Group warranties together to form a section in Chapter 8.

2.5 Manufacturer's Information (Chapter 9)

.1 Include information needed for operation, maintenance and repair of every component of mechanical and electrical systems, and any other system requiring or likely to require operation or routine maintenance.

.2 Preface this section with an index. List in order, each item by the manufacturer's name, the pieces of equipment to which it refers, and the tab number of the item. Include supplier's name, address, phone number and fax number.

.3 Include:

.1 Maintenance instructions for finished surfaces and materials.

.2 Copy of hardware and paint schedules.

.4 Include all service manuals, data sheets and other manufacturer's information for each component.

.5 Manufacturer's information is to be original in all six (6) copies of the manual. Photocopies are not acceptable.

.6 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.

.7 Remove pages from manufacturer's information that are irrelevant to the equipment provided to this project.

.8 Where tables and curves are given for the full range of sizes, underline in red in 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 positive identification. Draw a thick diagonal black line across all data not applicable to equipment provided.

.9 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.

.10 Service manuals must be the operating and maintenance type, which give part lists, preferably including an exposed or sectioned drawing for guidance in assembling,

installation details, lubrication and operating details. Sales types of brochures which give only a very general description and few details are not acceptable.

.11 Include all shop drawings that contain essential equipment or system details not available elsewhere. No drawings larger than 11 x 17 should be inserted in the manual: if drawings are larger, reduce them.

.12 Shop drawings are often made for use with a range of alternate materials and layouts. It is essential that those dimensions layouts, materials, outlet locations, flange sizes, etc. which apply to the equipment installed, shall be underlined or circled in red in all copies. Any features shown but not actually provided, should be crossed out. Place the shop drawing with the applicable service manual and index them as one unit.

.13 Mount any items that are smaller than 216 mm x 279 mm, on a full page for inclusion in the manual.

.14 Include heavy-duty plastic folder pages to hold booklets and pamphlets smaller than 216 mm x 279 mm. Supply one (1) holder for each such booklet.

.15 Include all wiring diagrams complete with wire coding.

2.6 Binders

.1 Supply six (6) binders to the Engineer for incorporation of the Operation and Maintenance manuals.

.2 Expandable hard covered three post binders, of extra heavy weight capable of standing several decades of reasonable use.

.3 Binders must take standard 216 mm x 279 mm size inserts prepared by a standard three hole punch.

.4 The expansion slide should be proportional to the binder size, e.g., a 50 mm slide for a 75 mm binder. The purpose of the expansion slide is to allow the pages to lie flat for reading. It must not be used to stuff the binder with more than 75 mm of material. Use more than one binder where necessary.

.5 Full identification titles must appear on the outer spine and front of binders to permit easy identification. These titles are to be in a permanent form. Plastic lettered tape, gummed labels and similar methods that can become detached are not to be used.

.6 Covers in a set should be a matching colour. The choice of colour is open.

2.7 Separate Volumes

.1 If thickness, including inserts by others exceeds 75 mm, break the manual into two or more volumes.

.2 Identification on outer spine and front shall include Volume __ of __ .

.3 Organize material so that each volume contains separate sub systems.

2.8 Dividers

.1 Provide plastic tabbed medium weight dividers for each chapter outlined in 2.1 Plastic tabs to have chapter name, not number, printed on each face.

.2 Provide numbered, plastic tabbed medium weight dividers between major sections of equipment manufacturer's material.

END OF SECTION

COMMISSIONING

1. GENERAL

1.1 Intent

.1 Commission the various process, mechanical and electrical systems.

1.2 Related Work

.1	Process Equipment	Division 11
.2	Mechanical	Division 15
.3	Electrical	Division 16
.4	Controls and Instrumentation	Division 17

1.3 Submissions

.1 The Contractor shall furnish his detailed methodology and schedule for the commissioning of each system at least twenty (20) working days prior to planned start of commissioning for the process. The plan shall include the following:

.1 detailed schedule of events

.2 detailed list of attendees

.3 methods for introducing flow

.4 disposing of any sludge and/or any other wastes generated during commissioning

.5 contingency plans in the event of a process malfunction

.6 drawings and sketches as required to illustrate the planned sequence of events

1.1 Coordination

.1 Coordinate with subcontractors to ensure their attendance as necessary to make any adjustments or to facilitate any minor repairs during commissioning.

.2 Coordinate with the Engineer and operators of water treatment plant.

2. PRODUCTS

2.1 Equipment

.1 All equipment shall be satisfactorily installed and tested as per the requirements of Section 01670 – Systems Demonstration prior to commissioning. The electrical and the controls systems and any related services pertaining to each piece of equipment shall be completed and shall be operational.

2.2 Manpower

.1 Supply all staff required during commissioning necessary to operate the plant processes.

.2 Once a process has been successfully commissioned, provide supervisory staff to train and supervise the Owner's staff for a period of two full weeks, while still being responsible for the operation of the plant until takeover.

.3 Be responsible for ensuring that maintenance staff are operating and maintaining systems in a proper manner and keeping schedules up-to-date.

2.3 Systems

In general, the systems which must be commissioned include, but are not limited to:

1. All wastewater treatment processes
2. Chemical preparation and metering
3. Plant service water system
4. Heating and ventilation system
5. Process and plant control system
6. Motor control centres
7. Monitors and alarms

3. EXECUTION

3.1 Preparation

.1 Each item of equipment included in the system to be commissioned shall be satisfactorily tested.

.2 Piping systems shall be finished and tested.

.3 Electrical connections shall be complete and inspected to the satisfaction of the governing authorities.

.4 Control systems shall be fully operational.

.5 The plant architectural finishes, painting, heating and ventilation, etc. shall be substantially complete.

.6 The attendance of equipment manufacturer's representatives, as required during commissioning, shall be arranged.

3.2 Sequence

.1 The process systems shall be commissioned from upstream to downstream.

3.3 Commissioning

.1 Raw water will be introduced in a manner which precludes the damage of any equipment or structures.

.2 Raw water may not be introduced into a section of pipe that will be , at any time afterwards, used for treated water distribution unless it is flushed and disinfected.

.3 For a period of 24 hours, twice during commissioning, each process system shall be subjected to flows and loads as close to design conditions as possible. Where necessary to achieve this, augment flows from other sources or operate a part of the system at any time to exaggerate the naturally occurring flows and loads.

.4 Operate all systems in automatic and manual-local modes as applicable.

.5 Ensure all bypasses and backup provisions function satisfactorily.

.6 Induce all minor and major alarm conditions. Ensure the controls react as designed, the application alarms are annunciated, and the plant dialing system functions.

3.4 Testing

.1 Acquire all samples as directed by the Engineer to provide a basis for process evaluation.

.2 Arrange and be responsible for the transportation to a qualified laboratory of all the samples to be tested at an outside facility.

.3 Cooperate with the Engineer in undertaking all analysis of samples to be tested at the plant.

3.5 Acceptance

.1 The commissioning of a continuously operating mechanical or electrical system shall be considered acceptable when the system has operated in a stable manner, satisfying the specified basic design criteria for a period of five (5) consecutive days.

.2 Where system operated intermittently, commissioning shall be considered acceptable when the system has been operated in a stable manner, satisfying the specified basic design criteria, as often as required during a period of fourteen (14) consecutive days but in no case less than four (4) times.

.3 When a system has been commissioned satisfactorily, **Form 103**, as shown in Section 01650, shall be endorsed by the Contractor, the Engineer, and the manufacturer's representatives for the items of equipment included in the system.

END OF SECTION

TAKE-OVER PROCEDURES

1. GENERAL

1.1 Section Includes

.1 Administrative procedures preceding preliminary and final inspections of the Work.

1.2 Related Sections

.1 Section 01670 – Systems Demonstrations.

.2 Section 01735 – Commissioning.

1.3 Inspection And Declaration Procedures

.1 Contractor's Inspection prior to commissioning the facility: Contractor and all Subcontractors shall conduct an inspection of the Work, identify deficiencies and defects; repair as required to conform to Contract Documents. Notify Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made. Provide fourteen (14) days advance notice when requesting an Interim Inspection.

.2 Interim Completion: submit a written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents,

.2 Defects have been corrected and deficiencies have been completed,

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational,

.4 Certificates required by Boiler Inspection Branch, Fire Commissioner, Utility companies etc. have been submitted,

.5 Operation of systems have been demonstrated to Owner's personnel, and

.6 Work is complete and ready for Interim Inspection.

.3 Interim Inspection: Engineer and Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

.4 Final Inspection: when deflects or deficiencies are completed, request a final inspection of the Work by Owner, Engineer and Contractor. If Work is deemed incomplete by the Owner and the Engineer, complete outstanding items and request a reinspection.

1.4 Reinspection

.1 Should status of the Work require reinspection by Consultant due to failure of Work to comply with Contractor's claims for inspection, Owner will deduct amount of Consultant's compensation for reinspection services from payment to Contractor. This applies to both Interim and/or Commissioning.

2. PRODUCTS (NOT APPLICABLE)

3. EXECUTION (NOT APPLICABLE)

END OF SECTION