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DIVISION 01

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SITE CONDITIONS

1. GENERAL

1.1 Site Conditions and Limits

.1 Examination of Site

- .1 Prior to commencing actual construction Work, inspect field conditions, obtain and confirm actual Site dimensions, examine surface conditions as required to ensure correct execution of the Work.
- .2 Maintain or arrange for the removal, relocation, and replacement as appropriate of any existing utilities, which may be affected by the Work.
- .3 Arrange for the removal, relocation, and replacement as appropriate, of process piping, equipment, electrical conduit, and concrete pads and supports.

1.2 Documents and Instructions

.1 Documents Provided

- .1 Upon award of the Contract, the Contractor will be provided with five (5) complete sets of the Bid Documents (including Drawings) and five (5) copies of any revised Drawings or Addenda to the Bid Documents, which may have been issued during the Bid Period. Should the Contractor require additional sets of Drawings or documents, these will be supplied to them at cost.

.2 Discrepancies and Omissions

- .1 Notify the Contract Administrator immediately upon discovery of discrepancies or omissions in the Contract Documents or of any doubt as to the meaning or intent of any part thereof.
- .2 To proceed with the Work when an error is suspected or when there is doubt as to the interpretation of the project requirements constitutes full acceptance of any cost associated with any remedial Work, which may be required.

.3 Documents On-Site

- .1 Maintain one (1) copy of all current Contract Documents and all Shop Drawings on-site, in good order and available to the Contract Administrator or their representatives.
- .2 This requirement does not include the executed Contract Documents.

.4 Changes to the Work

- .1 Refer to the Contract General Conditions regarding changes to the Work.

SITE CONDITIONS

- .2 Contemplated Change Notice: issued after award of Contract, does NOT constitute an order to perform the change but is a notice of a proposed change only. Submit to the Contract Administrator within seven (7) days after receipt of Contemplated Change Notice a statement of cost adjustments and effect upon construction schedule required by the proposed change. Itemize statement in accordance with all items separately listed.
- .3 Field Order: during Construction, the Contract Administrator may issue a Field Order to authorize a change or additional Work of an emergency nature. A firm total cost (extra or credit) or a method for determining this cost must be included (unit price, cost plus, or time basis).
- .4 Authorization for Contract Change: after receipt of the statement of cost adjustment and the City's approval, the Contract Administrator will issue an Authorization for Contract Change in the amount of the approved cost adjustment, which will authorize the Contractor to proceed with the change to the Work, or alternatively will notify the Contractor that the proposed change is cancelled.
- .5 Field Instructions: the Contract Administrator may issue during construction, a Field Instruction to supplement or clarify the Contract Documents. Neither the Contract Price nor the Contract Time is affected by a Field Instruction.

1.3 Subsurface Conditions

- .1 The Contractor shall take appropriate precautions to protect existing structures and any underground utilities that could be affected by the Work.

1.4 Site Preparation

- .1 Description
 - .1 This Specification shall cover Site preparation, including mobilization, field office facilities, equipment and fuel compounds, Site drainage, access roads, storage areas, and turnarounds, Site contamination and clean-up, demobilization and Site restoration, and other Contractor related tasks required, as a portion of the Works for this Contract.
 - .2 The Work to be done by the Contractor under this Specification shall include the furnishing of all superintendence, overhead, labour materials, all things necessary for and incidental to the satisfactory performance and completion of all Work, as hereinafter specified.

1.5 Construction Methods

- .1 Use of Public Roads and Rights-of-Way
 - .1 Maintenance

SITE CONDITIONS

- .1 It shall be the responsibility of the Contractor to keep public roads and rights-of-way used by their construction activities and traffic clean and maintained during the Construction Period.
 - .2 Earth, gravel, sand, or other construction materials spilled from hauling equipment onto public roads and rights-of-way shall be picked up promptly and continuously at the Contractor's expense.
 - .3 Any damage to public roads and rights-of-way caused by the Contractor's construction activities shall be repaired at the Contractor's expense as directed by the Contract Administrator or the authority having jurisdiction.
 - .4 Public roads and rights-of-way on the Site are used daily for delivery of septage and other materials. The Contractor shall ensure the roadways are kept unobstructed and not used for stockpiling or storage of materials, equipment, garbage, or Contractor's vehicles and parking.
- .2 Construction Traffic Crossing and Entering Public Roads
- .1 The Contractor shall limit their construction traffic crossing or entering public roads to as few locations as possible. Crossing and entrance locations shall be provided to the Contract Administrator for review and approval prior to construction starting.
 - .2 Where construction traffic crosses or enters onto public roads and rights-of-way the Contractor shall obtain the necessary approvals and provide signage and temporary traffic controls detailed in the Workzone Traffic Control Manual from the Manitoba Transportation and Government Services.
- .2 Site Drainage
- .1 Provision of adequate Site drainage during the Work shall be the Contractor's responsibility. No extra payments or time extensions will be granted as a result of difficulties associated with Site access resulting from poor Site drainage during any part of the Work.
 - .2 Any areas requiring clearing and grubbing to maintain adequate Site drainage shall be reviewed with the Contract Administrator prior to commencement of the Work.
 - .3 Maintain surface drainage in groundwater recharge areas.

SITE CONDITIONS

.3 Demobilization and Site Restoration

- .1 Further to GC:6.29, the Contractor shall demobilize, clean up, and remove all Work related surplus materials, tools, equipment, waste and debris, access roads, storage areas, turnarounds, approaches to public roads, ditch crossings, and temporary culverts and dispose off-site and backfill excavations by the day set for Substantial Performance.
- .2 The Contractor shall at their own expense, restore all surface areas damaged or disturbed by their activities at or adjacent to the Site to a condition equal to or better than was existing.

.4 Restricted Access Areas

- .1 Refer to the Site plan for any areas identified as restricted access. No admittance shall be permitted to these areas by the Contractor or Contractor's personnel without the Contract Administrator's permission.

1.6 Environmental Protection

- .1 The Contractor shall plan and implement the Work of this Contract strictly in accordance with the requirements of the environmental protection measures as herein specified.
- .2 The Contractor is advised that at least the following Acts, Regulations, and By-laws apply to the Work.
 - .1 Federal
 - .1 Canadian Environmental Protection Act c.16
 - .2 Transportation of Dangerous Goods Act and Regulations c.34
 - .2 Provincial
 - .1 The Dangerous Goods Handling and Transportation Act D12
 - .2 The Endangered Species Act E111
 - .3 The Environment Act c.E125
 - .4 The Fire Prevention Act F80
 - .5 The Manitoba Nuisance Act N120
 - .6 The Public Health Act c.P210
 - .7 The Workplace Safety and Health Act W120
 - .8 Other current associated regulations that may be applicable

SITE CONDITIONS

- .3 The Contractor is advised that the following environmental protection measures apply to the Work.
 - .1 Materials Handling and Storage
 - .1 The Contractor shall abide by the requirements of Manitoba Conservation for handling and storage of fuels.
 - .2 All fuel handling and storage facilities shall comply with the Dangerous Goods and Transportation Act, Storage and Handling of Petroleum Products Regulation and any local land use permits.
 - .2 Fuel Handling and Storage
 - .1 Fuels, lubricants, and other potentially hazardous materials as defined in The Dangerous Goods and Transportation Act shall be stored and handled within the approved storage areas.
 - .2 The Contractor shall ensure that all fuel storage containers are inspected daily for leaks and spillage. Damaged or leaking fuel storage containers shall be promptly removed from the Site.
 - .3 When servicing requires the drainage or pumping of fuels, lubricating oils or other fluids from equipment, a groundsheet of suitable material (such as HDPE) and size shall be spread on the ground to catch the fluid in the event of a leak or spill. This groundsheet may be supplemented with absorbent fabric material.
 - .4 Refuelling of mobile equipment and vehicles shall take place at least 100 m from a water reservoir shoreline.
 - .5 The areas around storage areas and fuel lines shall be distinctly marked and kept clear of snow and debris to allow for routine inspection and leak detection.
 - .6 A sufficient supply of materials, such as absorbent material and plastic oil booms, to clean up minor spills shall be stored nearby on-site. The Contractor shall ensure that additional material can be made available on short notice.
 - .3 Waste Handling and Disposal
 - .1 The construction area shall be kept clean and orderly at all times during and at completion of construction.
 - .2 At no time during construction shall personal or construction waste be permitted to accumulate for more than one day at any location on the construction Site, other than at a dedicated storage area as may be acceptable to the Contract Administrator.
 - .3 Indiscriminate dumping, littering, or abandonment shall not take place.

SITE CONDITIONS

- .4 No on-site burning of waste is permitted.
- .5 The Contractor shall provide waste collection bins within the laydown area acceptable to the Contract Administrator.
- .4 Dangerous Goods/Hazardous Waste Handling and Disposal
 - .1 Dangerous goods and hazardous waste are identified by, and shall be handled according to, the Dangerous Goods Handling and Transportation Act and Regulations.
 - .2 The Contractor shall be familiar with the Dangerous Goods Handling and Transportation Act and Regulations.
- .5 Emergency Spill Response
 - .1 The Contractor shall ensure that due care and caution is taken to prevent spills.
 - .2 The Contractor shall report all major spills of petroleum products or other hazardous substances with the potential for impacting the environment and threat to human health and safety to the Contract Administrator and Manitoba Conservation, immediately after occurrence of the environmental accident, by calling the 24-hour emergency telephone number (204) 944-4888.
 - .3 The Contractor shall designate a qualified supervisor as the on-site emergency response coordinator for the project. The emergency response coordinator shall have the authority to redirect manpower in order to respond in the event of a spill.
 - .4 The following actions shall be taken by the person in charge of the spilled materials or the person(s) arriving at the scene of a hazardous material accident or the on-site emergency response coordinator.
 - .5 Notify emergency response coordinator of the accident:
 - .1 Identify exact location and time of accident.
 - .2 Indicate injuries, if any.
 - .3 Request assistance as required by magnitude of accident (Manitoba Conservation 24-hour Spill Response Line (204) 944-4888, Police, Fire Department, Ambulance, company back-up).
 - .6 Assess situation and gather information on the status of the situation, noting:
 - .1 Personnel on-site
 - .2 Cause and effect of spill
 - .3 Estimated extent of damage

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- .4 Amount and type of material involved
- .5 Proximity to waterways and the reservoirs
- .7 If safe to do so, try to stop the dispersion or flow of spill material:
 - .1 Approach from upwind
 - .2 Stop or reduce leak if safe to do so
 - .3 Dike spill material with dry, inert absorbent material or dry clay soil or sand
 - .4 Prevent spill material from entering waterways and utilities by diking
 - .5 Prevent spill material from entering manholes and other openings by covering with rubber spill mats or diking
- .8 Resume any effective action to contain, clean up, or stop the flow of the spilled product.
- .9 The emergency response coordinator shall ensure that all environmental accidents involving contaminants shall be documented and reported to Manitoba Conservation according to the Dangerous Goods Handling and Transportation Act Environmental Accident Report Regulation 439/87.

2. PRODUCTS

- .1 Not used

3. EXECUTION

- .1 Not used

END OF SECTION

PROJECT MEETINGS

1. GENERAL

1.1 Preconstruction Meeting

- .1 Within 2 days after award of Contract, the Contract Administrator will request a meeting of parties in the Contract to discuss administrative procedures and responsibilities.
- .2 Representatives of the City, Contract Administrator, Contractor, and major sub-contractors shall attend.
- .3 Representatives of the Contractor and sub-contractors attending the preconstruction meeting shall be qualified and authorized to act on behalf of the party each represents.
- .4 The Contract Administrator will arrange meeting space and facilities, and notify all parties.
- .5 The Contract Administrator will chair and record discussions and decisions, and circulate the meeting notes to all parties concerned.
- .6 Agenda to include the following:
 - .1 Appointment and notification of official representatives of participants in the Work
 - .2 Schedule of the Work, progress scheduling
 - .3 Schedule of Shop Drawing and Sample submissions
 - .4 Schedule for the procurement and delivery of specified equipment
 - .5 Plant orientation program
 - .6 Requirements for temporary facilities, signs, offices, storage sheds, utilities, hoarding, access, and use
 - .7 Site security
 - .8 Health and safety
 - .9 Modification procedures, Contemplated Change Notices and Authorization for Contract Changes procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements as originated by the City or in the case of a savings, by the Contractor.
 - .10 Product and tool storage
 - .11 Weather protection
 - .12 As-Constructed Drawings
 - .13 Commissioning, acceptance, and handover
 - .14 Warranties
 - .15 Monthly progress claims, administrative procedures, photographs, holdbacks

PROJECT MEETINGS

- .16 Insurances and transcript of policies
- .17 Communication procedures
- .18 Access to the Site and Work areas; security
- .19 Survey
- .20 Progress meeting schedule
- .21 Photographs
- .22 Emergency telephone numbers
- .23 Other business

1.2 Progress Meetings

- .1 The Contract Administrator shall schedule and chair progress meetings once a week during construction and through the commissioning period.
- .2 Provide input to the Contract Administrator for the meeting agenda.
- .3 Representatives of the City, Contract Administrator, Contractor, and major sub-contractors must be in attendance. Arrange for other parties, such as trades and suppliers, to attend for specific agenda items if applicable.
- .4 Representatives of the Contractor, sub-contractors, and suppliers attending meetings must be qualified and authorized to act on behalf of the party each represents.
- .5 Agenda for construction progress meetings to include the following:
 - .1 Review and approval of minutes of previous meeting
 - .2 Field observations, problems, conflicts
 - .3 Review submittal schedules; expedite as required
 - .4 Review of off-site fabrication and delivery schedules
 - .5 Forecast progress and schedule for upcoming Work period
 - .6 Problems impeding construction schedule
 - .7 Corrective measures and procedures to regain projected schedule
 - .8 Revisions to construction schedule
 - .9 Site coordination review
 - .10 Maintenance of quality standards
 - .11 Review of Site cleanliness
 - .12 Review of Site safety and security

PROJECT MEETINGS

- .13 Review of temporary facilities
 - .14 Review requests for information
 - .15 Review Contemplated Change Notices, Field Orders, Authorization for Contract Change, and Field Instructions
 - .16 Review proposed changes for effect on construction schedule and on completion date
 - .17 Review of progress payments
 - .18 Outstanding action items
 - .19 Date and place of next meeting
 - .20 Other business
- .6 The Contract Administrator will record notes of the project meetings, including significant proceedings, decisions, parties responsible for all actions, dates for completion of duties, etc.
 - .7 The Contract Administrator reserves the right to cancel any progress meeting or call additional meetings whenever deemed necessary.

1.3 Special Meetings

- .1 Special meetings may be requested by the Contract Administrator or Contractor to discuss specific issues. Generally, three days' notice is required for special meetings. The agenda will be set to suit the meeting. Minutes will be recorded by the Contract Administrator.

2. PRODUCTS

- .1 Not used

3. EXECUTION

- .1 Not used

END OF SECTION

SUBMITTALS

1. GENERAL

1.1 Shop Drawings and Product Data

- .1 "Shop Drawings" mean custom drawings, product data, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work.
- .2 Arrange for the preparation of clearly identified shop drawings as specified or as the Contract Administrator may reasonably request. Shop drawings are to clearly indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of the Work. Where articles or equipment attach or connect to other articles or equipment, clearly indicate that all such attachments and connections have been properly coordinated, regardless of the trade under which the adjacent articles or equipment will be supplied and installed. Shop drawings are to indicate their relationship to design drawings and specifications. Notify the Contract Administrator in writing of any deviations in shop drawings from the requirements of the Contract Documents.
- .3 Shop drawings shall be submitted with a marked-up copy of the associated specification. For each specification clause, indicate compliance or deviation from specification. Provide full explanation for each deviation. Shop drawings submitted without the marked-up associated specification sections will be returned to the Contractor as "NOT REVIEWED".
- .4 Examine all shop drawings prior to submission to the Contract Administrator to verify that all requirements have been determined and verified and that each shop drawing has been checked and coordinated with the requirements of the Work and the Contract Documents. Examination of each shop drawing shall be indicated by stamp, date and signature of a responsible person of the Subcontractor for supplied items and of the General Contractor for fabricated items. Shop drawings not stamped, signed and dated will be returned without being reviewed and stamped "REVISE AND RESUBMIT".
- .5 Submit shop drawings promptly and in an orderly sequence so as to cause no delay in the Work. Failure to submit shop drawings in time is not to be considered reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed. Jointly prepare a schedule fixing the dates for submission and return of shop drawings.
- .6 The Contract Administrator will review and return shop drawings in accordance with the schedule agreed upon or otherwise with reasonable promptness so as to cause no delay in the Work.
- .7 Shop drawing review by the Contract Administrator is solely to ascertain conformance with the general design concept. Responsibility for approval of detail design inherent in shop drawings rests with the Contractor and review by the Contract Administrator shall not imply such approval.
- .8 Review by the Contract Administrator shall not relieve the Contractor of any responsibility for errors or omissions in shop drawings or for proper completion of the Work in accordance with the Contract Documents.

SUBMITTALS

- .9 Responsibility for verification and correlation of field dimensions, fabrication processes, techniques of construction, installation and coordination of all parts of the Work rests with the Contractor.
- .10 Shop drawings will be returned to the Contractor with one of the following notations.
 - .1 When stamped "REVIEWED – NO COMMENT", distribute additional copies as required for execution of the Work.
 - .2 When stamped "REVIEWED - AS NOTED", Contractor shall so modify all copies for use and distributed same as specified for "REVIEWED – NO COMMENT".
 - .3 When stamped "REVISE AND RESUBMIT", make the necessary revisions, as indicated, consistent with the Contract Documents and submit again for review.
 - .4 When stamped "REVIEW BY CONSULTANT NOT REQUIRED", no further revisions are required.
- .11 After submittals are stamped "REVIEWED – NO COMMENT" or "REVIEWED - AS NOTED", no further revisions are permitted unless re-submitted to the Contract Administrator for further review.
- .12 Any adjustments made on shop drawings by the Contract Administrator are not intended to change the Contract Price. If it is deemed that such adjustments affect the Contract Price, clearly state as such in writing prior to proceeding with fabrication and installation of work.
- .13 Make changes in shop drawings which the Contract Administrator may require consistent with Contract Documents. When re-submitting, notify the Contract Administrator in writing of any revisions other than those requested by the Contract Administrator.
- .14 Shop drawings indicating design requirements not included in the Contract Documents require the seal of a qualified Professional Engineer, registered in the province of the place of the Project. Consulting calculations shall be submitted for review, if requested, and sealed by a qualified Professional Engineer.
- .15 Only two (2) reviews of shop drawings will be made by the Contract Administrator at no cost. Each additional review will be charged to the Contractor at the Contract Administrator's scheduled rates. The Contract Administrator's charges for the additional work will be deducted from the Contractor's Progress Certificates.

2. RECORD DRAWINGS

- .1 After award of Contract, the Contract Administrator will provide a complete set of electronic drawing files in AutoCAD format for the purpose of maintaining Project record drawings. Accurately record all deviations from Contract Documents caused by site conditions and changes ordered by the Contract Administrator. Update daily.
- .2 Record locations of concealed elements of mechanical and electrical services.
- .3 Identify drawings as "Project Record Copy". Maintain in good condition and make available for inspection on site by Contract Administrator at all times.

SUBMITTALS

- .4 On completion of the Work, two (2) weeks prior to final inspection, submit record drawings to Contract Administrator for review.

3. PHOTOGRAPHS AND PUBLICITY

- .1 No photographs of the site or of any portion of the Work will be permitted without prior approval of the Contract Administrator.
- .2 No press or publicity releases will be permitted without prior approval of the Contract Administrator.

4. PROCEDURES

- .1 The Contractor shall, if required by the Contract Administrator, submit for the review of the Contract Administrator method statements which describe in detail, supplement with drawings where necessary, the methods to be adopted for executing any portion of Work.
- .2 These statements shall also include details of constructional plant and labour to be employed. Acceptance by the Contract Administrator shall not relieve the Contractor of any of their responsibilities, nor shall reasonable refusal to approve entitle the Contractor to extra payment or an extension of time.

END OF SECTION

TEMPORARY FACILITIES

1. GENERAL

1.1 Laydown and Storage

- .1 All construction materials shall be stored at designated laydown and storage areas. Stored combustible materials shall be separated by clear space to prevent fire spread and allow access for manual fire fighting equipment, including fire hoses, extinguishers, hydrants, etc.
- .2 Designated areas shall be used for storage of flammable and combustible liquids and gases, which shall be properly equipped for grounding and bonding when refueling vehicles and equipment. Spills shall be contained as required by Provincial Regulations.
- .3 Pressurized dry chemical fire extinguishers of suitable capacity or equally effective extinguishers as per NFPA 10 shall be provided where:
 - .1 Flammable liquids are stored or handled.
 - .2 Temporary oil or gas fire equipment is used.
 - .3 Welding or flame cutting is performed.

1.2 Temporary Construction Materials

- .1 Tarpaulins and plastic coverings shall be of fire-retardant materials, which are UL or FM listed or approved, or which have passed the Large Scale Test specified in NFPA-701.

1.3 Contractor's Trailers

- .1 The Contractor shall:
 - .1 Prevent hazardous accumulations of dust, fumes, mist, vapours, or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of Work process to assure removal of harmful elements.
- .2 Suitable fire control equipment shall be provided by the Contractor for protection of its facilities, the portion of the City's building under construction and materials and equipment

TEMPORARY FACILITIES

at all Work areas. All fire protection equipment and fuel storage shall meet the approval of the Contract Administrator. Storage of fuel will not be permitted in the vicinity of the Work.

- .3 Unless approved by the Contract Administrator, burning of any materials is **NOT** allowed at the Site of the Work.
- .4 The Contractor shall be responsible for any damage resulting from fires caused by the Contractor or its employees and shall be solely responsible for all costs, which may be incurred in extinguishing such fires.

1.4 Toilets and Washrooms

- .1 Washroom facilities are not available at the NEWPCC for the Contractor's use.
- .2 The Contractor shall supply and maintain all necessary toilets and washrooms for its employees engaged in the Work. These toilets and washrooms shall comply with the requirements of The Public Health Act, R.S.M. 1987, c. P210, including sewage holding facilities and water storage. Sewage connections are not available.

1.5 Disposal of Waste Materials

- .1 Spoiled and waste materials shall not be dumped in any locations other than those approved by the local authorities. Any cost for permits and fees for disposing of waste materials shall be borne by the Contractor.
- .2 Disposal of all excavated and waste materials shall be in accordance with the requirements of the appropriate provincial regulatory agencies.
- .3 When working anywhere within the Works, the Contractor shall at the end of each working day remove the rubbish and leave the Site in a clean and tidy state, to the satisfaction of the Contract Administrator. If this is not done, the City will clean the Site and charge the Contractor.

1.6 Parking

- .1 Parking shall be arranged and maintained to not disrupt access for the plant's operation and maintenance.

1.7 Contractor's Site Storage for Equipment and Materials

- .1 The Contractor shall provide and maintain in a clean and orderly condition an adequately sized storage facility on-site, which will provide weather protected storage for all the tools, equipment, and materials necessary for the undertaking and completion of the Work.
- .2 The storage facility shall be located where directed by the Contract Administrator.
- .3 The compound shall have a hard base suitable for the storage of heavy equipment. Adequate temporary drainage shall be provided around the facility.

TEMPORARY FACILITIES

- .4 The storage of equipment and materials shall be limited to the storage facility only.
- .5 The responsibility for the security of the Site storage and the condition of all the equipment and materials therein shall rest solely with the Contractor.
- .6 The Contractor will be responsible for removal of this facility prior to issuance of Total Performance.

1.8 Water Supply

- .1 The Contractor is responsible to provide water required for the construction Works and for the water required for watertightness testing.
- .2 The Contractor shall, at its own cost, supply, install, maintain, and move extensions to water services as required during the Construction Period, subject to the City's approval.

1.9 Power and Light

- .1 The Contractor shall provide temporary power and light for own use. Install in accordance with regulations of governing authorities.
- .2 Provide and pay for all temporary power required during Construction for temporary lighting and the operations.
- .3 Wiring for temporary lighting is to be entirely separate from temporary power installation except for a common supply connection at either an electrical service or distribution centre.

1.10 Use of Permanent Water Supply, Heat, Power Light, and Telephone

- .1 The Contractor shall not make use of permanent water supply, heat, power, lighting, or telephone inside the NEWPCC without permission from the Contract Administrator.

1.11 Fueled Welding Machines and Air Compressors

- .1 Fueled welding machines and air compressors required for performance of the Work are to be the responsibility of the respective users. Locate outside of buildings.

1.12 Guard Rails and Barricades

- .1 Provide guard railings and barricades, around all openings, open shafts, open stairwells. Construct as recommended by local governing authorities.

1.13 Site Security

- .1 The City does not normally provide security forces to the plant Site. The gate is normally open during the day and closed at night.

TEMPORARY FACILITIES

1.14 Scaffolding

- .1 Provide and maintain adequate scaffolding as required. Scaffolding shall be rigid, secure, and constructed to ensure adequate safety for workers. Erect without damage to buildings or finishes.

1.15 Ladders, Stairs

- .1 Provide and maintain adequate temporary ladders and stairs required for construction.
- .2 Secure to structure.
- .3 Ladders and stairs are to comply with all requirements of safety authority.
- .4 Provide temporary wood treads on steel pan stairs for use prior to placement of permanent treads.

1.16 Explosive Actuated Fastening Tools

- .1 Provide for the use of explosive-actuated fastening tools when required. When using, conform to the requirements of CSA Z166 - "Explosive Actuated Fastening Tools" and local governing authorities.

1.17 Access to Site

- .1 Provide and maintain access roads, sidewalk crossings, ramps, and construction runways as required for access to, from, and through the Site. Conform to requirements of local governing authorities when required and when necessary make arrangements with adjacent property owners. Locate these traffic facilities where they are least disruptive to normal street traffic and local Site traffic.

1.18 Temporary Vehicular and Pedestrian Access

- .1 Maintain existing vehicular and pedestrian accesses properly at all times during construction.
- .2 The Contractor shall confine their equipment, storage of materials, and operations of their workmen to minimize Site damage. The Contractor shall be responsible to restore all areas damaged or affected by construction to equal or better conditions, which existed prior to construction, unless designated otherwise.

1.19 Protection for Off-Site and Public Property

- .1 Protect adjacent private and public property from damage during the performance of the Work.
- .2 Be responsible for all damages incurred due to improper protection.

TEMPORARY FACILITIES

1.20 Fire Protection

- .1 Provide and maintain adequate temporary fire protection equipment during performance of the Work as required by insurance companies having jurisdiction.
- .2 Provide minimum one (1) fire extinguisher in each equipment and tool shed, temporary office, material storage shed workshop.
- .3 Where subjected to low temperatures, extinguishers shall be anti-freeze type. In proximity to gas, oil, grease, or paint storage locations extinguishers shall be No. 10 carbon dioxide type. Extinguishers for all other locations shall be soda-acid type. All extinguishers shall be minimum 10 L capacity and ULC labelled.
- .4 Handle gasoline and like combustible materials with good, safe practice.
- .5 Remove combustible debris from Site daily.

1.21 Protection of Building Finishes and Equipment

- .1 Provide adequate protection for finished and partially finished building finishes and existing equipment and services during the performance of the Work. Provide necessary screens, covers, hoardings, etc., as required. Be responsible for all damages incurred due to improper or lack of protection.
- .2 The Contractor shall use methods of construction on concrete Work that will not generate dust.
- .3 The Contractor shall protect existing mechanical and electrical equipment from damage.
- .4 Maintain and protect existing services in operation during the course of the Work. Repair services damaged at no cost to the City.
- .5 If service interruptions are necessary, such interruptions shall be made only at times approved by the City.
- .6 Advise the Contract Administrator of any necessary service relocations not identified by the Contract Documents.

1.22 Access to Site and Building

- .1 It will be the Contractor's responsibility to check that accesses are in suitable condition before any plant, equipment, or materials are delivered to Site.
- .2 Access on the Site may be restricted by existing buried and surface utilities and structures. The Contractor is to confirm location of all potential obstructions and to review routing of construction vehicles with the Contract Administrator.
- .3 The Contractor shall maintain access at all times for City personnel or the Contract Administrator.

TEMPORARY FACILITIES

1.23 Access to Work

- .1 Normal working hours for City staff working inside the NEWPCC shall be between 7:30 a.m. and 4:00 p.m., Monday to Friday, except holidays.
- .2 The Contract Administrator shall be informed at least 24 hours in advance where the Contractor intends to carry out Work outside normal working hours and no such Work shall be done without the Contract Administrator's approval except when the Work is unavoidable or absolutely necessary for:
 - .1 Preventing injury to any person or saving the life of any person; or
 - .2 Preventing damage to property where the circumstances placing the property in danger could not reasonably have been foreseen and where the immediate carrying out of such Work is necessary in order to prevent damage to that property; in which case the Contractor shall immediately advise the Contract Administrator in writing that such Work outside the normal working hours is necessary and of the reasons for this. They shall also state the nature and extent of Work to be carried out.
- .3 The Contractor shall coordinate activities with City personnel and any other contractors that may be working concurrently on the Site.
- .4 The Contractor shall notify SBR Operations staff on arrival at the Site, each and every day of Work. It is vital that the City is aware of all workers on site.

1.24 Temporary Use of Conveying Systems

- .1 Contractor may use existing cranes, hoists, monorails, and other access and lifting devices as required for the work; provide City minimum 24 hours' notice requesting such use.

1.25 Site Security Lighting

- .1 Provide and pay for temporary Site lighting as required for non-daylight times. Install lamps in suitable locations to obtain unobstructed light over all Work areas.
- .2 Perform daily inspection of Site lighting and replace burned out and missing lamps. Relocate promptly any lights that become obstructed by new Work.

1.26 Warnings and Traffic Signs

- .1 When Work is performed within public areas, provide and erect adequate warning signs as necessary to give proper warning. Place signs sufficiently in advance to enable public to respond to directions.
- .2 Warning and traffic signs shall be illuminating type, visible to public and traffic during day and night.
- .3 Provide and maintain signs and other devices required to indicate construction activities or other temporary or unusual conditions resulting from the Work.

TEMPORARY FACILITIES

2. PRODUCTS

.1 Not used

3. EXECUTION

.1 Not used

END OF SECTION

EQUIPMENT INSTALLATION

1. GENERAL

1.1 Intent

- .1 This Section describes general requirements for all equipment supplied under the Contract. The Contractor shall be responsible for the supply, installation, testing, operation, and performance verification of the specified equipment.

1.2 Definitions

- .1 **Manufacturer:** the Manufacturer is the person, partnership, or corporation responsible for the manufacture and fabrication of equipment provided to the Contractor for the completion of the Work.
- .2 **Manufacturer's Representative:** the manufacturer's Representative is a trained serviceman empowered by the Manufacturer to provide installation, testing, and commissioning assistance to the Contractor in their performance of these functions.

1.3 Expertise and Responsibility

- .1 The Contract Administrator recognizes the expertise of the Manufacturer.
- .2 Should the Contract Administrator issue a Field Order, Authorization for Contract Change, or Instruction to Change the Work, which would, in the opinion of the Contractor, compromise the success or safety of the Work, then it shall be incumbent on the Contractor to notify in writing the Contract Administrator to this effect within two (2) days.

2. PRODUCTS

- .1 Not used

3. EXECUTION

3.1 Equipment Delivery

- .1 The equipment shall be delivered to the City of Winnipeg North End Water Pollution Control Centre.
- .2 A duly executed "Certificate of Equipment Delivery" (Form 100) shall be completed. Any damage identified during the inspection shall be repaired as per the Manufacturer's recommendations by the Contractor at no cost to the City. Any severe damage will be grounds for rejection of the equipment. The severely damaged equipment will be replaced at no cost to the City.
- .3 The Contractor shall be responsible for receiving, off-loading, and placing into storage all equipment at the Site.

EQUIPMENT INSTALLATION

- .4 The Contractor shall ensure that they are fully informed of precautions to be taken in the unloading of equipment and its subsequent storage.

3.2 Installation Assistance

- .1 Before commencing installation of equipment, the Contractor shall arrange for the attendance of the Manufacturer's Representative to provide instructions in the methods, techniques, precautions, and any other information relevant to the successful installation of the equipment.
- .2 When the Manufacturer's Representative is satisfied that the Contractor is aware of all installation requirements, they shall so certify by completing Form 101 attached to this Specification.

3.3 Installation

- .1 The Contractor shall install all equipment. If necessary, or if so directed by the Contract Administrator during the course of installation, the Contractor shall contact the manufacturer to receive clarification of installation procedures, direction, or any other additional information necessary to continue or complete the installation in an appropriate manner.
- .2 If it is found necessary, or if so directed by the Contract Administrator, the Contractor shall arrange for the Manufacturer's Representative to visit the Site to provide assistance during installation, all at no cost to the City.
- .3 Prior to completing installation, the Contractor shall inform the Manufacturer and arrange for the attendance at the Site of the Manufacturer's Representative to verify successful installation.
- .4 The Manufacturer's Representative shall conduct a detailed inspection of the installation including alignment, electrical connections, belt tensions, rotation direction, running clearances, lubrication, workmanship, and all other items as required to ensure successful operation of the equipment.
- .5 The Manufacturer's Representative shall identify any outstanding deficiencies in the installation.
- .6 The deficiencies shall be rectified by the Contractor and the Manufacturer's Representative will be required to re-inspect the installation, at no cost to the City.
- .7 When the Manufacturer's Representative accepts the installation, they shall certify the installation by completing Form 102, attached to this Specification.

3.4 Operation and Performance Verification

- .1 Equipment will be subjected to a demonstration, running test, and performance tests after the installation has been verified and any identified deficiencies have been remedied.

EQUIPMENT INSTALLATION

- .2 The Manufacturer's Representative will conduct all necessary checks to equipment and if necessary, advise the Contractor of any further checking, flushing, cleaning, or other Work needed prior to confirming the equipment is ready to run.
- .3 The Contractor shall then operate the equipment for at least one (1) hour to demonstrate to them self the operation of the equipment and any required ancillary services. Any remedial measures required to ensure satisfactory operation shall be promptly undertaken.
- .4 The Contractor shall then notify the Contract Administrator of their readiness to demonstrate the operation of the equipment. The Contract Administrator shall attend, as expeditiously as possible.
- .5 With the assistance of the Manufacturer's Representative, the Contractor will demonstrate that the equipment is properly installed. Alignment, piping connections, electrical connections, etc., will be checked and if appropriate, code certifications provided.
- .6 The equipment shall then be run for one (1) hour, minimum. Local controls shall be satisfactorily verified by cycling the equipment through several start-stop operations, modulating its output, or some combination. Operating parameters such as temperature, pressure, voltage, vibration, etc., will be checked to ensure that they are within the specified or manufacturer's recommended limits, whichever is more stringent.
- .7 On satisfactory completion of the one-hour demonstration, the equipment will be stopped and critical parameters, such as alignment, will be rechecked.
- .8 The equipment will be restarted and run continuously for three (3) days minimum, unless otherwise stated by the manufacturer. During this period, as practicable, conditions will be simulated which represent maximum or most severe, average, and minimum or least severe conditions. These conditions will be mutually agreed by the Manufacturer's Representative, the Contractor, and Contract Administrator on the basis of the information contained in the Specifications, as well as the methods utilized to create the simulated conditions and the time periods allotted to each.
- .9 Performance tests will be conducted either concurrent with or subsequent to the running test, as practicable and agreed between the Contract Administrator, the Manufacturer's Representative, and the Contractor.
- .10 Performance tests shall be as dictated in the Specifications for each item of equipment or as reasonably required by the Contract Administrator to prove adherence to the requirements listed in the Specification.
- .11 The Contractor shall submit the results of the performance tests to the Contract Administrator, documented and summarized in a format acceptable to the Contract Administrator. The Contract Administrator reserves the right to request additional testing. No equipment shall be accepted and handed over to the City prior to the satisfactory completion of the performance tests and receipt of the test reports.
- .12 Should the initial demonstration, running test or performance tests reveal any defects, then those defects shall be promptly rectified and the demonstration, running tests, and/or

EQUIPMENT INSTALLATION

performance tests shall be repeated to the satisfaction of the Contract Administrator. Additional costs incurred by the Contractor, the Contract Administrator, or the City, due to repeat demonstration, running tests, and/or performance tests shall be the responsibility of the Contractor.

- .13 On successful completion of the demonstration, running test, and performance tests, Form 103 attached to this Specification will be signed by the Manufacturer's Representative, the Contractor, and the Contract Administrator.

EQUIPMENT INSTALLATION

**CERTIFICATE OF EQUIPMENT DELIVERY
FORM 100**

We certify that the equipment listed below has been delivered into the care of the Contractor. The equipment has been found to be in satisfactory condition. No defects in the equipment were found.

PROJECT: _____

ITEM OF EQUIPMENT: _____

TAG NO: _____

**REFERENCE
SPECIFICATION:** _____

(Authorized Signing Representative of the Supplier)

Date

(Authorized Signing Representative of the Contractor)

Date

EQUIPMENT INSTALLATION

**CERTIFICATE OF READINESS TO INSTALL
FORM 101**

I have familiarized the installer of the specific installation requirements related to the equipment listed below and am satisfied that they understand 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 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 EQUIPMENT SATISFACTORY PERFORMANCE
FORM 103**

We certify that the equipment listed below has been continuously operated for at least three (3) 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 Contract Administrator) _____ Date

(Authorized Signing Representative of the City) _____ Date

EQUIPMENT INSTALLATION

END OF SECTION

COMMISSIONING

1. GENERAL

1.1 General

- .1 The Contractor shall refer to all Divisions for details on the commissioning procedures not included in this Section.
- .2 The Contractor shall note that on materials and equipment installed in this Contract, warranty will not begin until issuance of Total Performance.

1.2 Intent

- .1 This Section describes the Contractor's responsibilities in the commissioning and handover of the process, electrical, and other systems to be installed as part of this Work.

1.3 Definitions

- .1 System: for the purpose of this Specification Section, a system shall be defined as the equipment, piping, controls, ancillary devices, electrical power, etc., which together perform a specific function at the facility.
- .2 Commissioning: for the purpose of this Specification Section, commissioning shall be defined as the successful operation of a system in accordance with its design requirements for a period of twenty one (21) days, the last seven (7) of which shall be consecutive, unless otherwise specified.
- .3 Acceptance: for the purpose of this Specification Section, acceptance shall be defined as the formal turnover of a system to the City for their operation and maintenance. This shall occur after the successful end of commissioning of each system through a formal agreement between the Contract Administrator, the City, and the Contractor. Success of the commissioning period is determined by the Contract Administrator.

1.4 Commissioning Team

- .1 The Work of commissioning will be conducted by the Contractor, the City, and the Contract Administrator.
- .2 The City's appointed staff shall represent process personnel and operating staff.
- .3 The Contractor shall provide personnel representing the appropriate trades, including instrumentation and control (I&C) personnel during the commissioning. These personnel shall be skilled workmen, able to expedite any minor repairs, adjustments, etc., as are required to complete commissioning with as few delays as possible.

COMMISSIONING

1.5 Commissioning Plan

- .1 Develop a detailed methodology for the commissioning of each system at least ninety (90) calendar days prior to planned start of commissioning. The plan shall be drafted by the Contractor and Contract Administrator and include the following:
 - .1 Detailed schedule of events.
 - .2 Planned attendance schedule for manufacturer's representatives.
 - .3 Contingency plans in the event of a process malfunction.

1.6 Equipment

- .1 All electrical, control, and miscellaneous equipment related to a system shall be successfully installed and tested. Form 103 shall be executed for each item.
- .2 Operating and Maintenance (O&M) Manuals will be submitted and reviewed by the Contract Administrator.
- .3 Staff training sessions shall be completed.

1.7 Manpower

- .1 Supply all staff required during commissioning as necessary to assist the City's staff in the operation of the plant.

2. PRODUCTS

- .1 Not used

3. EXECUTION

3.1 Preparation

- .1 Each item of equipment included in the system to be commissioned shall be satisfactorily tested and Form 103 completed.
- .2 Wiring, and other conduit systems shall be finished and tested.
- .3 Electrical connections shall be completed and inspected to the satisfaction of the governing authorities.
- .4 All other regulatory inspections shall be completed to the satisfaction of the governing authorities.

COMMISSIONING

3.2 Acceptance

- .1 The commissioning of a system shall be considered acceptable when the process has operated in a stable manner, satisfying the design criteria for a period of twenty one (21) days, the last seven (7) of which shall be continuous and consecutive, unless otherwise specified.
- .2 When a process system has been commissioned satisfactorily, the process system shall be formally accepted for operation and routine maintenance by the City's forces. On successful completion of Commissioning, Form 104 – Certificate of Satisfactory Process Performance attached to this Specification will be signed by the representative of the Manufacturer, Contractor, Contract Administrator, and the City.
- .3 An acceptance meeting must be held at the end of the twenty one (21) day test to confirm the status of each system.

COMMISSIONING

**CERTIFICATE OF SATISFACTORY PROCESS PERFORMANCE
FORM 104**

We certify that the equipment listed below has been operated and tested as per the Specifications and that the equipment meets its performance testing criteria. 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 Contract Administrator) _____ Date

(Authorized Signing Representative of the City) _____ Date

COMMISSIONING

END OF SECTION

CONTRACT CLOSEOUT

1. GENERAL

1.1 Final Cleaning

- .1 When the Work is Substantially Performed, remove surplus products, tools, construction machinery, and equipment not required for the performance of the remaining Work.
- .2 Remove waste and debris and leave the Work clean and suitable for occupancy by the City.
- .3 When the Work has reached Total Performance, remove surplus products, tools, construction machinery, equipment, waste, and debris.
- .4 Leave the Work areas broom clean before the final inspection.

1.2 Site Restoration

- .1 The Contractor shall remove the temporary Site office and storage facilities prior to Total Performance being issued.
- .2 The Contractor will be responsible for grounds restoration to original state, as determined necessary by the Contract Administrator.
- .3 The Contractor shall repair all damage caused by their forces on roadways or accesses.

2. PRODUCTS

- .1 Not used

3. EXECUTION

- .1 Not used

END OF SECTION

OPERATION AND MAINTENANCE MANUALS

1. GENERAL

1.1 Description

- .1 This Section supplements the requirements for the provision of Operation and Maintenance (O&M) Manuals.
- .2 Furnish complete operations manuals and maintenance information as specified in this Section for installation check-out, operation, maintenance and lubrication requirements for each unit of mechanical, electrical, and instrumentation equipment or system and each instrument.
- .3 In some instances, this requirement is reinforced by additional references within individual Specification Sections; however, the inclusion or exclusion of additional references within the Contract shall not supersede or otherwise limit the generality of the foregoing and these requirements shall govern.
- .4 Customize the operations manuals and maintenance information to describe the equipment actually furnished. Do not include extraneous data for models, options or sizes not furnished. When more than one model or size of equipment type is furnished, show the information pertaining to each model, option or size.

1.2 Submittals

- .1 The submission and acceptance of the "Equipment Operating and Maintenance Instruction" manual is a condition precedent to the certification of Substantial Performance.
- .2 Submit operation manuals and maintenance information in accordance with Section 01300. Submittals may be checked for general compliance with the requirements of this Section.
- .3 Submit complete operations manuals and maintenance information as soon as possible after review of project submittals but no later than thirty (30) days before the date of Substantial Performance.
- .4 Submit O&M data in electronic format.
- .5 Submit seven (7) printed and bound copies.

1.3 General Requirements

- .1 Provide materials of equal clarity and quality as the originals.
- .2 Provide drawings, diagrams and Manufacturer's literature which are legible.
- .3 All instructions in the O&M Manuals are to be in simple language.
- .4 Edit Manufacturers' standard documents to delete extraneous information not applicable to the equipment, assembly, subassembly or material supplied. Cross out or remove and eliminate any extraneous material for models, options or sizes not furnished.

OPERATION AND MAINTENANCE MANUALS

2. PRODUCTS

- .1 Refer to individual Sections.

3. EXECUTION

3.1 Contents and Organization

- .1 Arrange the O&M Manual to match the numbering system in the Specifications.
- .2 Provide the Manufacturers' standard O&M Manuals for the equipment or instrument supplied. If the Manufacturers' standard manuals do not contain all the required information, provide the missing information in supplementary documents and Drawings.
- .3 When more than one (1) piece of identical equipment or instruments is supplied, provide only one (1) set of O&M manuals.
- .4 One (1) set of O&M manuals may be provided when more than one piece of similar equipment or instruments are supplied, such as different sizes of the same model and all similar pieces are covered in the same standard Manufacturer's O&M Manual.
- .5 When similar equipment or instruments are provided by the same Manufacturer, but are not covered in the same standard Manufacturer's O&M Manual, their specific manuals may be included in the same electronic manual.
- .6 Provide a cover page as the first page of each manual, with the following information:
 - .1 Contract name and number.
 - .2 Equipment number, or if more than one piece of equipment is provided, equipment numbers for equipment or instruments covered by the manual. Include functional description of equipment after each number.
- .7 Provide a table of contents listing the contents of the manual and identifying where specific information can be located.
- .8 Include the specific information described below in the O&M Manuals:
 - .1 General Information:
 - .1 Functional title of the system, equipment, material, or instrument.
 - .2 Relevant Specification Section number and Drawing reference.
 - .3 Address and telephone number of the Manufacturers and the nearest Manufacturers' Representative.

OPERATION AND MAINTENANCE MANUALS

- .2 Equipment Data:
 - .1 Insert Specification Section and completed equipment and instrumentation data sheets for equipment supplied. Attach all Addenda, Change Orders and Change Directives that refer to that specific item of equipment.
- .3 Operation Information:
 - .1 Include the Manufacturers' recommended step-by-step procedures for starting and stopping under normal and emergency operation. Include all specified modes of operation including recommended operation after the assembly or equipment has been in long term storage.
 - .2 Provide control diagrams with data and information to explain operation and control of systems and specific equipment. Identify normal operating set points and alarm conditions.
 - .3 Provide technical information on all alarms and monitoring devices provided with the equipment.
- .4 Technical Data:
 - .1 Insert Manufacturers' technical specification and data sheets.
 - .2 Insert Manufacturers' certified performance and calibration curves for the equipment and instruments.
- .5 Maintenance Information:
 - .1 Provide descriptions and schedules for Manufacturers' recommended routine preventative maintenance procedures including specific lubrication recommendations. Indicate service intervals as appropriate: daily; weekly; monthly; quarterly; semi-annually; annually; or after "X" hours of operation.
- .6 Maintenance Instructions:
 - .1 Provide requirements to set up and check out each system for use. Include all required and recommended step-by-step inspections, lubrications, adjustments, alignments, balancing and calibrations. Include protective device settings and warnings and cautions to prevent equipment damage and to insure personnel safety.
 - .2 Provide Manufacturers' description of routine preventive maintenance, inspections, tests and adjustments required to ensure proper and economical operation and to minimize corrective maintenance and repair.
 - .3 Provide Manufacturers' recommendations on procedures and instructions for correcting problems and making repairs.
 - .4 Provide step-by-step procedures to isolate the cause of typical malfunctions. Describe clearly why the checkout is performed and what conditions are to be sought. Identify tests or inspections and test equipment required to determine whether parts and equipment may be reused or requires replacement.

OPERATION AND MAINTENANCE MANUALS

- .5 Provide step-by-step procedures and list special required tools and supplies for removal, replacement, disassembly and assembly of components, assemblies, subassemblies, accessories and attachments. Provide tolerances, dimensions, settings and adjustments required.

- .7 Assembly Drawings:

- .1 Provide Drawings which completely document the equipment, assembly, subassembly or material for which the instruction is written. Provide the following Drawings as applicable: fabrication details, wiring and connection diagrams, electrical and piping schematics, block or logic diagrams, shop drawings, installation drawings, layout and dimension drawings and electrical component fabrication drawings.
- .2 Provide clear and legible illustrations, Drawings and exploded views to enable easy identification of the items. When illustrations omit the part numbers and description, both the illustrations and separate listing shall show the index, reference or key number which will cross-reference the illustrated part to the listed part. Parts shown in the listings shall be grouped by components, assemblies and subassemblies.

- .8 Bills of Materials:

- .1 Provide a clear, legible copy of the bill of materials that was shipped with the equipment. The bill of materials should list all equipment, instruments, components, accessories, tools and other items that were shipped with the equipment.

- .9 Lubrication Data:

- .1 Provide a table showing recommended lubricants for specific temperature ranges and applications.
- .2 Provide charts with a schematic diagram of the equipment showing lubrication points, recommended types and grades of lubricants, and capacities.
- .3 If the equipment or instrument is not lubricated, add a sheet under this Tab with the words "Not Applicable".

3.2 Field Changes

- .1 Following the acceptable installation and operation of an equipment item, modify and supplement the item's instructions and procedures to reflect any field changes or information requiring field data.

OPERATION AND MAINTENANCE MANUALS

3.3 Warranties

- .1 Provide hard cover 3-ring binder for 215 mm x 280 mm paper labelled "Warranties" with three (3) copies of:
 - .1 A list, in Specification Section order, of all warranties and guarantees required by the Contract Documents and all Manufacturers' standard warranties and guarantees. Include contact names and telephone numbers. Indicate the time frame of each warranty or guarantee on the list.
 - .2 Include, in Specification Section order, a copy of all written warranties and guarantees, which are required by the Contract Documents. Include all additional standard warranties and guarantees received by the Contractor.

END OF SECTION

TABLE OF CONTENTS

DIVISION 11

Section	Title
11050	Process Piping
11055	Detailed Piping Specification

PROCESS PIPING

1. GENERAL

1.1 Description

- .1 This Section describes the pipe materials, fittings, appurtenances, installation and testing of the process systems.
- .2 Use the general requirements specified in this Section integrally with the more specific requirements listed in Section 11055 – Detailed Piping Specification Sheet.
- .3 Piping supports are generally not shown on the process Drawings. Provide the design of piping supports, pipe guides, expansion joints and anchors based upon final piping layout. Typical support details and structural attachments shown on the Drawings indicate the level of quality that will be considered acceptable.
- .4 The Contractor must provide the necessary submittals and ensure the proper registration of piping systems and system components as required by the Manitoba Labour and Immigration.
- .5 Standard of Acceptance: items specified by manufacturer's name and/or catalogue number form part of this Specification in order to define the standard regarding performance, quality of material and workmanship. When used in conjunction with a referenced standard, shall be deemed to supplement the standard.

1.2 Definitions

- .1 Pressure terms used in this and other related sections are defined as follows:
 - .1 Operating Limits: the minimum and maximum pressure at which the piping system operates for sustained periods of time
 - .2 Test Pressure: the hydrostatic pressure used to determine system compliance.
- .2 Pipe and appurtenance location terms used in this and other related sections are defined as:
 - .1 Tunnels, Pumphouse and Buildings: within an environmentally controlled enclosure where temperature is maintained above 5°C.
 - .2 Exposed, Aboveground: outside or within an enclosure which is not environmentally controlled so that the temperature is maintained above 5°C. For the purpose of defining exterior protection systems, this definition is extended to vertical piping to a point of 0.5 m below finished ground level.
 - .3 Submerged: regularly or occasionally immersed in liquid; inside tanks or channels, and within 3.0 m above maximum water level of open tankage, including pipe and appurtenances within manholes, vaults, and chambers.

PROCESS PIPING

1.3 Reference Standards

- .1 Conform to the most recent version of the following reference standards:
 - .1 ANSI/ASME A13.1, Scheme for the Identification of Piping Systems
 - .2 ANSI/ASME B31.3, Process Piping
 - .3 ANSI/ASME B31.9, Building Services Piping
 - .4 CPC, Canadian Plumbing Code
 - .5 CSA CAN3-Z299.3, Quality Verification Program Requirements
 - .6 EJMA STDS-93, Standards of Expansion Joint Manufacturers' Association, Edition No. 6
 - .7 Fluid Sealing Association Technical Handbook, Rubber Expansion Joint Division
 - .8 MIL-STD-810C, Environmental Test Methods
 - .9 MSS SP25, Standard Marking System for Valves, Fittings, Flanges and Unions
 - .10 SSPC-P3, Canadian Government Standards Board
 - .11 SSPC-SP6, Canadian Government Standards Board
 - .12 SSPC-SP10, Canadian Government Standards Board
 - .13 National Fire Code of Canada
 - .14 NFPA 300 (2003 Edition)
 - .15 NPC, National Plumbing Code
 - .16 TSSA, Technical Standards and Safety Association
 - .17 Provincial Building Code
 - .18 Provincial Plumbing Code

1.4 Design Requirements

- .1 The design has been completed to the degree necessary for the Contractor to Bid. It is not fully detailed and will require the Contractor to undertake design of and responsibility for minor aspects for the piping systems to be installed.
- .2 All process piping shall meet requirements of the Process Piping Code, B31.3, whether or not it falls within the Code scope. Manitoba Department of Labour and Immigration shall be

PROCESS PIPING

the Code Authority whenever the piping system falls within the Code scope. The Contract Administrator shall be the Code Authority for process piping that does not fall within the Code scope.

- .3 Piping and Instrumentation Drawings, piping schematics, and piping layout Drawings are contained in the Drawings set. The Piping and Instrumentation Drawings (P&IDs) indicate all major pipework, valves, and appurtenances (other than cleanouts, purge points, etc.) The layout Drawings indicate the design concepts and are intended to illustrate a constructible method for the piping systems. Some appurtenances, supports, guides and anchors, and expansion joints are not fully shown. The Contractor's design will complement and detail these Drawings.
- .4 It is understood that some conflicts will arise that will require that the Contractor re-route some of his piping to allow for the installation of wiring, ventilation duct, or similar.

1.5 Submittals

- .1 For each piping system refer to Section 11055, submit documentation listing pipe, fittings, flexible connectors, expansion joints, linings, coatings, and valving to be used for each pipe size and category.
- .2 A copy of this Specification Section and all referenced sections with each paragraph check-marked to show compliance or highlighted to indicate deviation.
- .3 Provide hanger, guide, and anchor, support system design details including locations, load information, design calculations and illustrative drawings, signed and sealed by a Professional Engineer registered in the Province of Manitoba. Refer to Section 11055.
- .4 For expansion joints submit manufacturer's catalogue data, Shop Drawings and assembly drawings confirming general arrangement, dimensions, tolerances, materials of construction, weights and installation details. Submit calculations to substantiate expansion joint selection and amount of pre-compression, signed and sealed by a Professional Engineer registered in the Province of Manitoba. Refer to Section 11055.

1.6 Coordination

- .1 Process and Utility Piping identification
- .2 Process and utility piping is identified in the Drawings by a two component alpha-numeric code, (Line Label) as follows:
 - .1 The first component of the code indicates the nominal line size.
 - .2 The second component of the code identifies the process fluid being conveyed, (Commodity).
 - .3 The process fluid (commodity) codes are defined in the Drawings.

PROCESS PIPING

.3 Routing

- .1 Coordinate piping installation routes and elevations with installation of sheet metal, process equipment, HVAC, instrumentation, and electrical work.

1.7 Conflicts

- .1 Review the Drawings prior to installation of piping, conduit services, and fixtures by this or any other division. Identify any conflicts and cooperate with the Contract Administrator to determine the adjustments necessary to resolve these conflicts.
- .2 Confirm the routing of each section of pipework with other services prior to commencement of installation. Advise the Contract Administrator of any conflicts with existing services or services yet to be installed. Where necessary, amend the routing of pipework to avoid conflict and confirm with the Contract Administrator.

1.8 Shipment, Protection and Storage

- .1 Deliver pipe, fittings, and specials to Site using loading methods which do not damage pipe or coatings.
- .2 Piping materials delivered to Site will be clearly marked to indicate size, type, class/schedule, and coatings.

1.9 Warranty

- .1 Contractor shall supply new materials and re-do the Work should materials be found to be defective or not in compliance with the Specifications, or should the workmanship be found to be inadequate or the Work was not performed in accordance with the Specifications and referenced standards, codes and regulations. This warranty shall remain in effect for the maximum period of time allowed under Law.
- .2 Neither the Contract Administrator's inspections, checks, or any other tests or subsequent authorization to proceed with the Work, nor the Contract Administrator's waiving of the Contract Administrator's right to perform such tests, nor the Contract Administrator's decision not to solicit submission of material certificates or other quality assurance documentation relieve the Contractor from any degree of responsibility in regard to the Work or the corresponding warranty above. The Contractor agrees that the Contract Administrator's ability to fully assess the suitability of materials, procedures, worker qualifications and other relevant issues is limited. The Contractor bears full responsibility and is solely liable in these matters.

2. PRODUCTS

2.1 Function

- .1 Provide the pipe materials, fittings, and appurtenances as described below, for the piping systems shown.

PROCESS PIPING

2.2 Pipe Materials – General

- .1 All pipe materials to be new, free from defects and conforming to the reference standards identified in Section 11055.
- .2 Where any standard referenced has been superseded prior to bidding, the Contractor shall comply with the new standard.

2.3 Pipe Sizes

- .1 Where the pipe size is not specified, provide pipe with the sizes required by the National Plumbing Code. For small piping not described by the National Plumbing Code, use 12 mm nominal diameter.

2.4 Fittings

- .1 General
 - .1 Provide eccentric reducers in horizontal lines with the flat side on top, unless shown otherwise.
 - .2 Provide concentric reducers in vertical lines unless indicated otherwise.
 - .3 Provide long radius elbows unless otherwise shown. Provide smooth flow carbon or stainless steel elbows 350 mm and less, to ANSI B16.9. Provide mitred elbows greater than 350 mm, to AWWA C208 unless otherwise shown or specified. Use three piece construction unless otherwise shown or specified.

2.5 Structural Element Penetrations

- .1 Structural element penetrations are shown and referenced to a detail or Process/Mechanical Standard Detail. Where a structural element penetration is not referenced, conform to the Standard Detail relevant to the type of structure, exposure, and type of pipe.

2.6 Insulation

- .1 Provide insulation where shown on drawings. Minimum insulation thickness: 25 mm. Use greater thicknesses as recommended by the manufacturer if more than 25 mm is required to lower the outer skin temperature to below 40°C.
- .2 Provide stainless steel bands over the insulation at a maximum of 300 mm centers.
- .3 Provide insulation and recovering for all piping where the pipe surface will sweat, where heat retention is required, and at the locations indicated on the Drawings.
- .4 Do not insulate over expansion joints or flexible hose connectors, in order to permit periodic inspection of connector bolting.

PROCESS PIPING

- .5 Recover all insulated pipe. Align longitudinal seams in aluminum recovering to shed water. Overlap radial seams a minimum of 50 mm.

3. EXECUTION

3.1 Preparation

- .1 Prior to installation, inspect and field measure to ensure that previous work is not prejudicial to the proper installation of piping.
- .2 Make all minor modifications to suit installed equipment and structural element locations and elevations.
- .3 Piping arrangements indicated on the Drawings have been established on the basis of the "Design Standard" listed in the specific process equipment sections. If the equipment to be provided is not the Design Standard, modify the piping arrangement as necessary at no additional expense to the City.
- .4 Advise the Contract Administrator of all modifications. Do not commence work on the related piping until all modifications have been reviewed by the Contract Administrator.
- .5 Include any piping modifications in the Shop Drawings submitted prior to fabrication or installation.

3.2 Pipe Handling

- .1 Inspect each pipe and fitting prior to installation. Do not install damaged pipe..

3.3 Installation

- .1 Make adequate provision in piping and pipe support systems for expansion, contraction, slope, and anchorage. Supports, bracing, and expansion joints shown in the Drawings are schematic only. The Contractor is responsible for the design, supply, and installation of the piping system in general accordance with the indicated requirements.
- .2 Install pipe support system to adequately secure the pipe and to prevent undue vibration, sag, or stress.
- .3 Install expansion joints where shown and at other locations as necessary to allow for piping expansion and contraction.
- .4 Provide temporary supports as necessary during construction to prevent overstressing of equipment, valves, or pipe.
- .5 Slope instrument air piping to condensate traps. Provide condensate traps as recommended by the manufacturer of the instrument air compressor.
- .6 Do not cut or weaken the building structure to facilitate installation.

PROCESS PIPING

3.4 Testing

- .1 Give the Contract Administrator 24 hours notice prior to testing.
- .2 Do not insulate or conceal Work until piping systems are tested and accepted.
- .3 Supply all water, air, and inert gases required for pressure testing.
- .4 Supply all pumps, compressors, gauges, etc., required for testing.
- .5 Test all existing piping where it connects to new piping to the first valve in the existing piping. Repair any failures in existing piping which occur as a result of the test after informing the Contract Administrator of such failure.
- .6 Isolate all low pressure equipment and appurtenances during testing so as not to place any excess pressure on the operating equipment.
- .7 Release pressure safely, flush and drain liquid pipes after pressure tests. Release pressure safely and purge if needed all gas pipes after pressure tests.
- .8 Dispose of flushing water in manner approved by the Contract Administrator, which causes no damage to buildings or Siteworks.

END OF SECTION

DETAILED PIPING SPECIFICATION

1. GENERAL

1.1 Work Included

- .1 The piping specification sheets on the following pages detail the requirements for each type of process pipe included in the Work.
- .2 The piping materials are listed on the specification sheets.

1.2 Process Piping Commodity Summary

SEA	Service Air	Aquatherm Greenpipe SDR 7.4, UV Rated
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2. PRODUCTS

2.1 Schedule

- .1 SEA

GENERAL					
PROCESS FLUID	SYMBOL	OPERATING LIMITS		TEST CONDITIONS	
		PRESSURE (kPa)	TEMP. (°C)	PRESSURE (kPa)	DURATION
Service Air	SEA	0-750	5-30	1400	120 minutes
PIPE/FITTINGS					
LOCATION	SIZE (mm)	MATERIAL	RATING		
All	<75	Aquatherm Greenpipe SDR 7.4, UV Rated			

END OF SECTION

TABLE OF CONTENTS

DIVISION 17

Section	Title
17010	Instrumentation and Control General Requirements
17600	DCS Input/Output Index
17700	Instrument Index
17701	Instrument Specification Sheets
17702	Instrument Loop Drawings

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

1. GENERAL

1.1 Requirements of Work

- .1 Supply, install, commission, provide warranty and fully document a complete I&C system as shown on the Drawings and as specified herein. The I&C system may contain vendor component subsystems specified in this and other Sections of the Specification.
- .2 Component subsystems of the I&C system will include, but are not limited to, the following:
 - .1 Primary elements and transmitters.
 - .2 Final control elements.
 - .3 I&C field devices.
 - .4 I&C junction boxes and marshalling panels.
 - .5 Instrumentation cabling.
 - .6 Instrumentation power supplies.
 - .7 Conduit and cable tray.
- .3 The Contractor's responsibility also includes receiving, uncrating, examining for shortages or damage, assembling, field fitting, installing, mounting, wiring and testing of vendor supplied component subsystems.
- .4 Where packaged, stand-alone control systems are supplied under other Divisions of this Specification, provide cabling to connect to the required remote monitoring and/or control functions. Provide end-to-end Commissioning of all required remote monitoring and/or control functions. Ensure the correct functionality of any equipment supplied under other Divisions of this Specification.
- .5 Documentation referred to in 1.1.1 to include as a minimum:
 - .1 Equipment descriptive data.
 - .2 Equipment installation, service manuals, O&M Manuals and recommended spare parts lists.
 - .3 Schematics and interconnecting wiring diagrams.
 - .4 Records of conductor identification, field terminals, changes, etc.
 - .5 Instrumentation and control panel Shop Drawings, face layouts, schematics and point-to-point wiring diagrams.
 - .6 Records of as-built information for the complete instrumentation system.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .6 Documentation provided is formatted as follows:
 - .1 *Piping & Instrumentation Diagrams (P & IDS)* – depict the general intent of the control systems and are to be used as the governing document for the scope of Work.
 - .2 *Instrument Index* – an index of the detailed information for the devices shown on the P & IDS. The index lists the appropriate support documentation for the devices’ supply and installation. The instrument index is the controlling document for the supply of materials.
 - .3 *Input/Output (I/O) Index* – an index of the control system I/O points shown on the P & IDS, giving the supporting documentation as per the instrument index.
 - .4 *Instrument Specification Sheets* – detail the relevant data for the supply of devices.
 - .5 *Instrument Loop Diagrams (ILDs)* – show typical interconnections and hook-up of devices. The Contractor is to reproduce an ILD for each device and record all relevant as-built information on each sheet for submission at the completion of the Work. Fill in all terminal and wiring numbers, etc., from the Shop Drawings as they become available. A set of ‘B’ size (11 x 17) ACAD Drawings and associated files will be made available to the successful tenderer. Where an ILD is not shown for wiring of simple devices provide a legible sketch for as-built information.
 - .6 *Location Drawings* – indicate in plan and/or elevation views where the instrument elements are physically located. These Drawings are provided to assist the Contractor in estimating the amount of cable and ducting required. All instrument locations specified on the location drawings are approximate. Exact locations will be determined during construction. Allow for locations to be up to 3 meters in each direction.
 - .7 *Standard Details* – provide a reference for installation, operation and other instructions pertinent to a particular device.
 - .8 *Detailed Specification* – lists qualifications, quality of materials and workmanship, and supplementary information.
- .7 Definitions
 - .1 Interpret specialized terms not explicitly defined herein in accordance with ISA S51.1, NEMA ICS 1, ANSI/IEEE Std 100, and The Communications Standard Dictionary, by Martin H. Weik.
- .8 References
 - .1 This Specification contains references to the latest available versions of the following Documents. They are a part of this Section as specified and modified. In case of conflict between the requirements of this Section and those of the listed Documents, the requirements of this Section prevail.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

<u>Reference</u>	<u>Title</u>
API RP550	Manual on Installation of Refinery Instruments and Control Systems, Part I – Process Instrumentation and Control Sections 1 Through 13
ASME Section VII	Rules for Construction of Pressure Vessels
ASTM B68	Seamless Copper Tube
ASTM D883	Terms Relating to Plastics
IEEE 100	Dictionary of Electrical and Electronic Terms
ISA RP7.1	Pneumatic Control Circuit Pressure Test
ISA RP12.6	Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations
ISA S5.4	Instrument Loop Diagrams
<u>Reference</u>	<u>Title</u>
ISA S18.1	Annunciator Sequences and Specifications
ISA S51.1	Process Instrumentation Terminology
NEMA 250	Enclosures for Industrial Controls and System
NEMA ICS 1	General Standards for Industrial Control and Systems
NEMA ICS 2	Industrial Control Devices, Controllers, and Assemblies
NFPA 70	NEC
SAMA PMC 17-10	Bushings and Wells for Temperature Sensing Elements
UBC	Uniform Building Code
UL 1012	Power Supplies
UL 94	Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
Weik, Martin H.	Communications Standard Dictionary, Van Nostrand Reinhold Co.

.9 Related Work

.1 Process: Division 11.

.10 Qualifications

.1 The instrumentation Subcontractor shall be a firm normally engaged and fully competent in the type of work described in this Section of the Specification. The firm

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- shall have been continuously and successfully engaged in this business for at least five years.
- .2 The instrumentation Subcontractor must be experienced in the process and instrument requirements of this Contract.
 - .3 The instrumentation Subcontractor must show that it maintains a fully equipped and qualified organization, capable of performing the present work and of providing warranty service to the system after installation.
 - .4 Perform all instrument hook-ups, calibrations and checkouts with qualified journeyman instrument mechanics that are licenced and have CET registration. Instrument mechanics must be familiar with the devices being installed.
 - .5 Perform all control wiring installation and connections with qualified journeyman electricians.
- .11 Codes, Rules, Permits and Fees
- .1 Comply with all laws, ordinances, rules, regulations, codes and orders of all authorities having jurisdiction relating to this Work.
 - .2 Comply with all rules of the Electrical Safety Act of the Province, CSA Standards, ULC and the applicable building codes, whether specifically shown on Drawings or not.
 - .3 Give all required notices, submit Drawings, obtain all permits, licenses and certificates and pay all fees required for this Work.
 - .4 Furnish a certificate of final inspection and approvals from an inspection authority to the Contract Administrator.
- .12 Standards of Workmanship
- .1 Execute all Work in a manner, which will result in the completed installation presenting an acceptable appearance, to a level of quality defined in the general conditions of this Specification.
 - .2 Employ a competent supervisor and all necessary licensed tradesmen to complete the Work in the required time.
 - .3 Arrange and install products to fit properly into designated building spaces.
- .13 Unless otherwise specified or shown, install products in accordance with the recommendations and ratings of the product manufacturers.
- .1 Supply and execute installation of all instrumentation control tubing in accordance with Division 17.
- .14 Contract Drawings and Specifications

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .1 Refer to Division 1.
- .2 Supply and install all items and accessories specified by the Drawings or the Specification in the quality and quantity required. Perform all operations as designated by the Specification according to the methods prescribed, complete with all necessary labour and incidentals.
- .3 Treat any item or subject omitted from this Division's Specifications or Drawings, but which is mentioned or reasonably specified in other Divisions' Specifications or Drawings and pertains to the instrumentation and control system, as being integral to the overall system. Provide such specified items or subjects.
- .4 Provide all minor items and Work not shown or specified but which are reasonably necessary to complete the Work.
- .5 If discrepancies or omissions in the Drawings or Specifications are found, or if intent or meaning is not clear, consult the Contract Administrator for clarification before submitting Bid.
- .6 The responsibility to determine which Division provides various products and Work rests with the Contractor. Additional compensation will not be considered because of differences in interpretation of Specifications.

1.2 Equipment

- .1 Receiving, Storing, and Protection of Components During Construction
 - .1 Examine each component upon delivery to Site. Report all damage noted to the Contract Administrator prior to accepting or rejecting delivery. All instrumentation primary elements, control components, panels, etc., shall be placed in a secure, dry, heated storage building. Maintain the space temperature above 10°C and the space relative humidity below 50 percent.
 - .2 Perform a preliminary examination upon delivery to ensure that:
 - .1 All instrumentation and control components supplied for this project under this Section of the Specification comply with the requirements stated in the instrument Specification sheets.
 - .2 All instrumentation and control components supplied under other Sections of this Specification, to be connected to instrumentation and control components supplied under this Section of the Specification, comply with the requirements stated in the Contract Documents.
 - .3 Itemize all non-conformities noted above and forward them to the Contract Administrator. Any delays in construction resulting from the delivery to Site of non-conforming instrumentation and control components to be borne by the Contractor.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .4 Do not install primary elements or other sensitive equipment until construction is sufficiently completed to provide an "operating condition" environment. Notify the Contract Administrator prior to installing any equipment of this type.
- .5 Ensure that covers where required are properly installed on all equipment. Provide all covers, padding, guards, etc., as required to guard any equipment against damage.
- .6 Return all damaged equipment to the factory for total corrective repairs. If deemed necessary by the Contract Administrator, the damaged equipment shall be replaced with new product. The Contractor shall bear any costs due to construction delays resulting from the delay in delivery of acceptable equipment.

1.3 Documentation

.1 Bid Submittals

- .1 Submit a schedule within 30 days of award of Contract to the Contract Administrator showing projected ordering and delivery dates of all products to meet the required construction schedule. Provide all necessary information regarding ordering and delivery dates for whose delivery affects the construction schedule.
- .2 Submit Shop Drawings for all products supplied by this Division. Submit Shop Drawings for review prior to delivery of any products or equipment to jobsite and sufficiently in advance to allow ample time for checking.
- .3 Contractor to review, modify, and approve the Shop Drawings prior to submitting Shop Drawings to the Contract Administrator for review. Contractor approval of a Drawing indicates the following:
 - .1 The Drawing has been checked by the person making the approval.
 - .2 The equipment or material complies in all respects with the requirements of the Specifications and Drawings.
 - .3 The quantities, if indicated on the Drawing, are correct.
 - .4 The physical dimensions of the components are such that they can be installed without interference with the building structure or other equipment, and that, after installation, there are sufficient clearances on all sides for maintenance, servicing and operation of the equipment.
 - .5 The points of attachment are clearly indicated, i.e., TOP, BOTTOM, SIDE, etc.
 - .6 The arrangement and location are properly oriented.
 - .7 The product is suitable for its intended use.
- .4 Stamp and sign the Shop Drawing to show approval, indicating the above has been complied with. If Contractor revisions are too extensive, return the submission to the

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- supplier for revision, then repeat the Shop Drawing approval process before submitting them to the Contract Administrator.
- .5 Manufacture of products shall conform to Shop Drawings marked as reviewed by the Contract Administrator and returned to the Contractor.
 - .6 Keep one (1) complete, maintained set of Shop Drawings at the jobsite during the construction period, record Site modifications.
 - .7 Refer to Division 1 for further information on Shop Drawing submittals.
- .2 O&M Manuals
- .1 Refer to Division 1 for general O&M manual submittal information.
 - .2 In addition to the requirements specified in Division 1, provide the following information:
 - .1 Table of Contents – Arrange contents sequentially by systems under Section numbers.
 - .2 Systems Descriptions – A brief synopsis of each system typed and inserted at the beginning of each section. Include sketches and diagrams where appropriate.
 - .3 Maintenance and operating instructions for all equipment and controls – These operating instructions need not be manufacturer's data but may be typewritten instructions in simple language to guide the City in the proper operation and maintenance of his installation.
 - .4 A copy of all wiring diagrams complete with wire coding.
 - .5 Set of final reviewed Shop Drawings.
- .3 Record Drawings
- .1 Maintain on-site a complete set of As-built Drawings as listed in Division 1 of this Specification.
 - .2 In addition to the requirements as stated in Division 1, record on the Drawings the following information:
 - .1 Mark all change orders, alterations or additions.
 - .2 Show all instrumentation cable and control tubing.
 - .3 Show all changes to the numbers and location of outlets, motors, panels and end devices that may occur during the course of the Work.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .3 Before requesting the Total Performance certificate make any necessary final corrections to the Drawings and sign each print as a certification of accuracy and deliver all sets to the Contract Administrator for approval.

2. PRODUCTS

2.1 General

- .1 Refer to the requirements of Division 1
- .2 Selected Products
 - .1 Provide products and materials that are new and free from all defects.
 - .2 Products and materials called for on the Drawings or in the Specifications by trade names, manufacturer's name and catalogue reference are those, which are to be used as the basis for the Bid.
 - .3 The design has been based on the use of the first named product, where applicable equivalent products are listed.
 - .4 Provide the products specified unless a proposal for an alternative or substitute product has been accepted by the Contract Administrator.
- .3 Review of Products
 - .1 Immediately after notification of award of Contract, review with the Contract Administrator the list of products to be provided by this Division.
 - .2 After agreement on product list has been reached, no subsequent changes will be permitted except as specified hereafter.
- .4 Substitution of Products After Contract Award
 - .1 After acceptance of the list of products, no substitution of any item will be permitted unless the approved item cannot be delivered in time to comply with the Work schedule.
 - .2 To receive acceptance, proposed substitute products are to equal or exceed the quality, finish, and performance of those specified and/or shown, and not to exceed the physical space requirements allotted, as shown on the Drawings.
 - .3 Provide to the Contract Administrator documentary proof of equality, difference in price (if any) and delivery dates, in the form of certified quotations from suppliers of both specified items and proposed substitutions.
 - .4 Include costs for any required revisions to other structures and products to accommodate such substitutions.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

.5 Refer to Division 1 for additional information on substitutions.

.5 Quality of Products

.1 All products provided to be CSA Approved, and Underwriters' Laboratories of Canada approved where applicable.

.2 If products specified are not CSA approved, obtain approval of the relevant provincial regulatory authority. Pay all applicable charges levied and make all modifications required for approval.

.3 Refer to Division 1 of this Specification for further information.

.6 Uniformity of Manufacture

.1 Unless otherwise specifically called for in the Specification, uniformity of manufacture to be maintained for similar products throughout the Work.

.7 Product Finishes

.1 Products to be manufacturers' standard finish.

.8 Use of Products During Construction

.1 Any equipment used for temporary or construction purposes to be approved by the Contract Administrator and in accordance with Division 1 of this Specification. Clean and restore to "as new" condition all equipment prior to the time of Substantial Completion.

.2 The warranty period does not begin until the date of Substantial Completion of the Work.

2.2 Instrumentation

.1 General

.1 Instruments to be suitable for the environmental conditions in which they are to be installed.

.2 Determine where injurious conditions may be expected to occur and make proper provision to protect the instruments to ensure their proper and reliable operation.

.3 Provide power surge protectors, heating cables and devices to protect instruments, equipment and lines from being functionally impaired or damaged by power surges or environmental conditions such as moisture or freezing.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

2.3 Identification

- .1 Provide lamacoid nameplates with 5 mm white lettering on black background. Identify the loop tag number (where applicable) and the device name, function, and instrument range or setpoint value on the nameplate.
- .2 Where it is not possible to attach a lamicaid nameplate to a field instrument component, provide the component with a stainless steel metal tag firmly wired to the device and identified with the loop tag number.
- .3 Identify all wires where they terminate at the marshalling panels, junction boxes and field devices with a heat shrink sleeve with machine printed labeling.
- .4 Clearly mark all panels, pull boxes, junction boxes, etc., to indicate the nature of service.
- .5 Provide neatly typed circuit directories for panel power distribution systems to indicate loops or devices powered by the circuit and the fuse size.
- .6 Identify all exposed control conduits at all pull box locations, where the conduits enter or leave a room, and 13 m on centre throughout the room. This shall apply to conduits above removable ceilings. Use Thomas & Betts TY-RAP 5532-M labels conduit identification.
- .7 For direct current wiring use black for positive and white for negative.
- .8 For thermistor wiring to motors use red and blue coloured, insulated wire.

2.4 Control Circuit Protection

- .1 All control circuits and I/O points shall be individually fused.
- .2 Protection parameters shall match what is currently installed on-site at the NEWPCC.

3. EXECUTION

3.1 Site Examination

- .1 Refer to the requirements of Division 1.
- .2 No additional compensation will be given for extra Work due to existing conditions that a Site examination prior to Bid should have disclosed.

3.2 Coordination With Other Divisions

- .1 Examine the Drawings and Specifications of all Divisions and become fully familiar with the Work. Before commencing Work, obtain a ruling from the Contract Administrator on any conflicting issues between Divisions. No compensation will be made for any costs arising from conflict not identified before Work has commenced.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .2 Coordinate the Work to be performed under this Section of the Specification with all Divisions installing equipment to ensure that there are no conflicts.
- .3 Install anchors, bolts, pipe sleeves, hanger inserts, etc., required in ample time to prevent delays to other Division's installation Work.
- .4 Lay out the Work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural Drawings take precedence over electrical Drawings regarding locations of walls, doors and equipment.
- .5 Structural members shall not be cut without prior approval of the Contract Administrator.
- .6 Examine previously constructed Work and notify the Contract Administrator of any conditions, which prejudice the proper completion of this Work.

3.3 Product Handling

- .1 Use all means necessary to protect the products included in this Division before, during and after installation, and to protect products and installed Work of all other trades.
- .2 Any damage to the products and/or installed Work shall be repaired or replaced by the Contractor at no additional cost to the City, and to the approval of the Contract Administrator.
- .3 Remove advertising labels from all products installed that have such labels attached. Identification or CSA labels are not to be removed.
- .4 Remove dirt, rubbish, grease, etc., resulting from Work performed under this Section of the Contract from all surfaces.

3.4 Separation of Services

- .1 Maintain separation between the electrical wiring system, building piping, ductwork, and the instrumentation cables so that each system is isolated (except at approved connections to such systems) to prevent galvanic corrosion. In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is unacceptable.
- .2 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings are not to be used for the support of wiring.

3.5 Wire and Cable

- .1 Refer to Section 17124.

3.6 Equipment Connections

- .1 Prior to the connection of signal wiring to process control and instrumentation devices check the device voltage rating and polarity for compatibility with the corresponding loop and/or schematic diagram. Where device and circuit characteristics are found to be incompatible,

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

the connections are not to be made. Report the condition immediately to the Contract Administrator.

- .2 All control-wiring diagrams illustrate typical control circuits applicable to the type of equipment specified. Control circuits may vary with different manufacturer's equipment. Verify all control circuits with the suppliers of the equipment and make any corrections to the control wiring diagrams that may be required.
- .3 Provide power disconnect terminals in the marshalling panels for all devices or PLC/DCS input/outputs sourced from the panel. Provide local power disconnect switches for all 120 VAC power instruments. Mount adjacent to the instrument.
- .4 Provide a disconnecting means in the cable connecting each ultrasonic transponder to the transmitter. This disconnect shall consist of a terminal strip in a local WP junction box within approximately 3 m of cable from the transponder.

3.7 Wiring To Equipment Supplied By Others

- .1 Equipment supplied by the City or by other Divisions, that have external or field mounted control devices, are to be installed, wired and commissioned by this Division.

3.8 Access Panels

- .1 Provide access panels where instrumentation and control system junction boxes are concealed. Panels to be of adequate size for servicing of the concealed junction box and complete with necessary frames and hinged doors held closed with captive fasteners. The type and size of panels are to be coordinated with the Contract Administrator.
- .2 In removable ceiling areas provide markers on ceiling tile to locate equipment requiring access. Use a 25 mm diameter blue circle painted on the access panel to indicate that it is for instrumentation and control system access.

3.9 Instrument Mounting Stands

- .1 Supply and install instrumentation mounting stands as required. Stands are to be either floor or wall mounted. The mounting stands are to be fabricated from aluminum or galvanized steel.
- .2 Supply and install protective drip shields for any exterior stand-mounted instrumentation equipment. Drip shields are to extend 50 mm past the front and side faces of the equipment. Drip shields are to be fabricated from aluminum.

3.10 Sealing of Wall and Floor Openings

- .1 Seal all conduit and cable entries passing through outside walls of buildings, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade.
- .2 Seal openings after all wiring entries have been completed.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .3 Sealing material shall be fire resistant and shall not contain any compounds that could chemically affect the wiring jacket or insulating material. Cable penetrations through fire separations, if required, are to be sealed. Acceptable methods are Canstrut "Fire Stop", Electrovert "Multi-Cable Transit" or Dow Corning RTV Silicone Foam.

3.11 Sleeves

- .1 Provide sleeves of galvanized steel pipe with machine cut ends of ample size to accommodate conduits passing through walls, partitions, ceilings, floors, etc.
- .2 For walls, partitions and ceilings the ends shall be flush with the finish on both sides. For floors the ends shall extend 100 mm above finished floor level.
- .3 Fill the space between the sleeve and the conduit with fire stop material. Caulked around the top and bottom with approved permanently resilient, non-flammable and weatherproof silicone base compound. Ensure that the seal is compatible with the floor and ceiling finishes.
- .4 Locate the sleeves and position exactly prior to construction of the walls and floors.
- .5 Failure to comply with the above requirements shall be remedied at the Contractor's expense.

3.12 Testing of Instrumentation Loops

- .1 After all devices within a loop have been connected, check the loop for correct functioning and interaction with other loops, where applicable. Provide written notice to the Contract Administrator when the loops are going to be tested so that the tests may be witnessed at the Contract Administrator's discretion.
- .2 Check the operation of final control elements such as solenoid valves, actuators, etc., by manual control before checking with automatic control.
- .3 Test all tubing for leaks in compliance with ISA RP7.1 Isolate all instruments when tubing is being tested to protect against over pressure.
- .4 Perform tests and record results on test data forms, which are included in this Section. Develop additional and/or more detailed test forms as necessary to suit more complex instrumentation.
- .5 Sign and date all test reports. Submit the test reports to the Contract Administrator within five working days of testing.
- .6 Coordinate and cooperate with City staff, equipment suppliers, and other contractors to test Control system I/O points during loop testing.

3.13 Calibration

- .1 Instruments to be factory pre-calibrated and the calibration verified in-place after installation. Provide a printed record of the factory calibration parameters for "smart" devices.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .2 Prior to calibration completely program all "smart" transmitters including entries of the appropriate range and tag number. Provide a printed record of smart device serial numbers against their assigned tag number.
- .3 Instruments to be set up and calibrated by an accredited instrument technician working under the approval of the instrument manufacturer.
- .4 Calibrate all instruments to an accuracy of half of 1 percent of full range, or to the manufacturer's stated accuracy of the instrument whenever an accuracy of half of 1 percent is not achievable.
- .5 Prior to instrument installation perform the following applicable calibration for each instrument and its associated signal conditioning equipment:
 - .1 Calibrate all inline flowmeters by a draw-down test.
 - .2 Calibrate all analytical instruments as specified by the manufacturer using manufacturer supplied calibration standards or lab samples as required.
 - .3 Calibrate all vacuum and pressure instruments by certified calibration standard.
 - .4 Calibrate gas detectors using standard gas samples.
 - .5 Calibrate temperature instruments against standard lab thermometers or by certified calibration standard.

3.14 Commissioning

- .1 Refer to the requirements of Division 1 for additional commissioning requirements.
- .2 Inspections
 - .1 Provide two weeks' written notice to the Contract Administrator prior to energizing any system to allow for inspection by the Contract Administrator of the following:
 - .1 Proper mounting.
 - .2 Proper connections.
 - .2 During Commissioning demonstrate to the Contract Administrator proper calibration and correct operation of instruments and gauges.
- .3 Commissioning of the instrumentation and control system to include but not be limited to the following.
 - .1 Supervise installation of components, wiring connections and piping connections.
 - .2 Supervise wiring continuity and pipe leak tests.
 - .3 Verify instrument calibration and provide written report.

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

- .4 Function check and adjust under operational conditions the instruments and control equipment.
- .5 Coordinate instruments and control equipment supplier's service personnel as required for complete system testing.
- .6 Instruct plant personnel in correct method of operation of instruments and control equipment.
- .7 Direct plant personnel at hand-over as to final adjustment of the system for correct operation of plant.
- .8 Ensure that the instrumentation and control equipment suppliers cooperate to complete the Work of this Section.
- .9 Verify signal levels and wiring connections to all instrumentation and control equipment.
- .10 Coordinate and cooperate with City staff, equipment suppliers, and other contractors to commission Control system I/O points during equipment Commissioning.

3.15 Training

- .1 Provide training, described in detail in Division 1, as required by the plant's personnel to become fully competent in the proper operation and maintenance of all control devices, control valves, and ancillary instrumentation described under this Section of the Specification.

3.16 Test Forms

<u>Form No.</u>	<u>Title</u>
.1 ITR	Instrument Test Report
.2 LCR	Loop Check Report

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

LOOP CHECK REPORT

- CHECKED OUT OK
- NOT APPLICABLE
- FURTHER ACTION REQUIRED

	INSTRUMENT TAG NO.								
LOOP NO. _____ SHEET NO. _____ P & I DWG. NO. _____									
INSTALLATION COMPLETE									
Primary Element									
Impulse Lines									
Block and Drain Valves									
Air Supply/Filter/Reg.									
Wiring									
Tracing/Insulation/Housing									
Mounting and Location									
PLC/SCADA I/O & Status									
CALIBRATED									
Impulse Lines Press. Tested									
LOOP CHECKED									
Element To Receiver									
X Mtr. to Receiver									
X Mtr./Trans. to Receiver									
X Mtr./Trans. to Switches									
Switches to Annunciator									
Interlocking Circuit									
Controller to Valve									
Controller Action D or R									

REMARKS:

READY FOR START-UP

DATE: _____

Installed by: _____

Checked by: _____

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

INSTRUMENT TEST REPORT

SYSTEM: _____

SERVICE: _____ TAG NO. _____

LOCATION: _____

MAKE: _____ MODEL: _____

SERIAL NO.: _____ CSA: _____

ELEMENT: _____ RANGE: _____

DESIGN SETTING/RANGE: _____ CONTACT TO: _____ ON: _____

SIGNAL IN: _____ OUT: _____ ASSOCIATED INSTRUMENT: _____

INSTRUMENT CONDITION: _____ CONFORM TO SPEC: _____

PROJECT NO.: _____ DATA SHEET: _____

TEST METHOD	TEST 1				TEST 2			
	INPUT		OUTPUT		INPUT		OUTPUT	
PROCESS	INC.	DEC.	INC.	DEC.	INC.	DEC.	INC.	DEC.
TEST POINT 1								
TEST POINT 2								
TEST POINT 3								
TEST POINT 4								
TEST POINT 5								
COMMENTS								
GRAPHS								

TESTED BY: _____

CHECKED BY: _____

DATE: _____

DATE: _____

INSTRUMENTATION AND CONTROL GENERAL REQUIREMENTS

END OF SECTION

DCS INPUT/OUTPUT INDEX

1. GENERAL

1.1 References – General

- .1 Refer to Section 17010.

1.2 DCS I/O Index

- .1 The following spreadsheet gives an itemized list of the I/O between the DCS and the field devices. It is intended to serve as an aid for determining the cabling requirements for the Work specified in this Division.
- .2 All control circuits and I/O points shall be individually fused.
- .3 The DCS I/O and instrument power fixed cabling to the instrument sheds is existing, the wiring and cable to be completed for this project includes the cables interconnecting the probes to transmitters and the transmitters to the existing fixed cabling.

2. PRODUCTS

- .1 Not used

3. EXECUTION

- .1 Not used

DCS INPUT/OUTPUT INDEX

NO.	REV. NO.	TAG NAME					DESCRIPTION				P&ID DRAWING	I/O SPECIFICATION				
		PCU		DEVICE			FUNCTION	SERVICE	ENG. UNITS	SCALE / SP LOW-HIGH		ALARMS		I/O POINT TYPE	I/O POINT NO.	
		AREA	PNL	TAG								LO / 0	HI / 1			
1	0	C	A	C285	AT	11	Dissolved Oxygen Reading	SBR 2 Aeration Zone 1	Not used	mg/l	0 - 10	tba	tba	AI	1-2B-AI4	
2	0	C	A	C285	AT	12	PH Reading	SBR 2 Aeration Zone 1	Not used	PH	4 - 11	tba	tba	AI	1-2B-AI6	
3	0	C	A	C285	TT		Temp Reading	SBR 2 Aeration Zone 1	Not used	°C	TBA	tba	tba	AI	1-2B-AI5	
4	0	C	A	C285	AF	1	DO/PH Analyzer Fault	SBR 2 Aeration Zone 1	Not used	n/a	0 = Fault	Alarm	Normal	DI	3-5B-DI4	
5	0	C	A	C285	AT	21	Dissolved Oxygen Reading	SBR 2 Aeration Zone 2	Not used	mg/l	0 - 10	tba	tba	AI	1-6A-AI2	
6	0	C	A	C285	AT	22	PH Reading	SBR 2 Aeration Zone 2	Not used	PH	4 - 11	tba	tba	AI	1-6A-AI3	
7	0	C	A	C285	AF	2	DO/PH Analyzer Fault	SBR 2 Aeration Zone 2	Not used	n/a	0 = Fault	Alarm	Normal	DI	4-3B-DI14	
8	0	C	A	C285	AT	31	Dissolved Oxygen Reading	SBR 2 Aeration Zone 3	Not used	mg/l	0 - 10	tba	tba	AI	1-6A-AI4	
9	0	C	A	C285	AT	32	PH Reading	SBR 2 Aeration Zone 3	Not used	PH	4 - 11	tba	tba	AI	1-6A-AI5	
10	0	C	A	C285	AF	3	DO/PH Analyzer Fault	SBR 2 Aeration Zone 3	Not used	n/a	0 = Fault	Alarm	Normal	DI	4-3B-DI15	
11	0	C	A	C285	AT	41	Ammonia (NH ₄ -N) Reading	SBR 2 Decanter Zone	Not used	mg/l	0.1 -100	tba	tba	AI	1-6A-AI6	
12	0	C	A	C285	AT	42	Nitrite (NO ₂ -N) Reading	SBR 2 Decanter Zone	Not used	mg/l	0 - 20	tba	tba	AI	1-6A-AI7	
13	0	C	A	C285	AF	4	NH4-N/NO2-N Analyzer Fault	SBR 2 Decanter Zone	Not used	n/a	0 = Fault	Alarm	Normal	DI	4-3B-DI16	

END OF SECTION

INSTRUMENT INDEX

1. GENERAL

1.1 References – General

- .1 Refer to Section 17010.

1.2 Instrument Index

- .1 The following spreadsheet gives an itemized list of the instrumentation to be supplied as part of this Work.
- .2 All equipment supplied under this division and by other divisions shall be installed under Division 17.

2. PRODUCTS

- .1 Not used

3. EXECUTION

- .1 Not used

INSTRUMENT INDEX

RECORD NO.	REV. NO.	TAG NAME				DESCRIPTION		REFERENCES					Comments
						INSTRUMENT TYPE	SERVICE	SPEC. SHEET or SECTION	P&ID DRAWING	WIRING REF.	LOCATION DWG	SUPPLY CODE	
1	0	C	185	AT	1	2 Channel Analytical Transmitter	SBR 1 Aeration Zone 1	Existing	Not used		Not used	Existing	Device and related cables and wires to be re-tagged to match the "Tag Name" column.
2	0	C	185	AE	11	PH Probe	SBR 1 Aeration Zone 1	Existing	Not used		Not used	Existing	
3	0	C	185	AE	12	Dissolved Oxygen Probe	SBR 1 Aeration Zone 1	Existing	Not used		Not used	Existing	
4	0	C	185	AT	2	2 Channel Analytical Transmitter	SBR 1 Aeration Zone 2	Existing	Not used		Not used	Existing	
5	0	C	185	AE	21	PH Probe	SBR 1 Aeration Zone 2	Existing	Not used		Not used	Existing	
6	0	C	185	AE	22	Dissolved Oxygen Probe	SBR 1 Aeration Zone 2	Existing	Not used		Not used	Existing	
7	0	C	185	AT	3	2 Channel Analytical Transmitter	SBR 1 Aeration Zone 3	Existing	Not used		Not used	Existing	
8	0	C	185	AE	31	PH Probe	SBR 1 Aeration Zone 3	Existing	Not used		Not used	Existing	
9	0	C	185	AE	32	Dissolved Oxygen Probe	SBR 1 Aeration Zone 3	Existing	Not used		Not used	Existing	
10	0	C	185	AT	4	2 Channel Analytical Transmitter	SBR 1 Decant Zone	Existing	Not used		Not used	Existing	
11	0	C	185	AE	41	Nitrite Probe (NO ₂)	SBR 1 Decant Zone	Existing	Not used		Not used	Existing	
12	0	C	185	AE	42	Ammonia Probe (NH ₄)	SBR 1 Decant Zone	Existing	Not used		Not used	Existing	
13	0	C	285	AT	1	2 Channel Analytical Transmitter	SBR 2 Aeration Zone 1	17701-I101	Not used	ILD-001	Not used	CON	
14	0	C	285	AE	11	PH Probe	SBR 2 Aeration Zone 1	17701-I101	Not used	ILD-001	Not used	CON	
15	0	C	285	AE	12	Dissolved Oxygen Probe	SBR 2 Aeration Zone 1	17701-I101	Not used	ILD-001	Not used	CON	
16	0	C	285	AT	2	2 Channel Analytical Transmitter	SBR 2 Aeration Zone 2	17701-I101	Not used	ILD-001	Not used	CON	
17	0	C	285	AE	21	PH Probe	SBR 2 Aeration Zone 2	17701-I101	Not used	ILD-001	Not used	CON	
18	0	C	285	AE	22	Dissolved Oxygen Probe	SBR 2 Aeration Zone 2	17701-I101	Not used	ILD-001	Not used	CON	
19	0	C	285	AT	3	2 Channel Analytical Transmitter	SBR 2 Aeration Zone 3	17701-I101	Not used	ILD-001	Not used	CON	
20	0	C	285	AE	31	PH Probe	SBR 2 Aeration Zone 3	17701-I101	Not used	ILD-001	Not used	CON	
21	0	C	285	AE	32	Dissolved Oxygen Probe	SBR 2 Aeration Zone 3	17701-I101	Not used	ILD-001	Not used	CON	
22	0	C	285	AT	4	2 Channel Analytical Transmitter	SBR 2 Decant Zone	17701-I101	Not used	ILD-001	Not used	CON	
23	0	C	285	AE	41	Nitrite Probe (NO ₂)	SBR 2 Decant Zone	17701-I102	Not used	ILD-001	Not used	CON	
24	0	C	285	AE	42	Ammonia Probe (NH ₄)	SBR 2 Decant Zone	17701-I102	Not used	ILD-001	Not used	CON	

END OF SECTION

SUPPLY CODES: CON = Contractor Supply, OWN = Owner Supply, PKG = Part of Equipment Package

INSTRUMENTATION SPECIFICATION SHEETS

1. GENERAL

1.1 References - General

- .1 Refer To Section 17010.

1.2 Instrument Specification Sheets

- .1 The following data sheets provide information for instruments included as part of this Work.
 - I-101 Instrument Specification Sheet – DO & PH Measuring System
 - I-102 Instrument Specification Sheet – NO₂ & NH₃ Measuring System
- .2 All instruments described on each instrument specification sheet are to be from a single source. Design has been based on the first named product.
- .3 All of the transmitters and sensors supplied for this project must be fully compatible with existing “like” transmitters and sensors used at the SBR tanks (including calibrations, settings, and quick-connector wiring) such that individual sensors and transmitters are interchangeable between SBR 1 and SBR 2.

2. PRODUCTS

- .1 Not used

3. EXECUTION

- .1 Not used

INSTRUMENTATION SPECIFICATION SHEETS

INSTRUMENT SPECIFICATION NUMBER:	I101
DEVICE:	Dissolved Oxygen and PH Measuring System
TAGS:	Refer to Instrument Index
PROBE TYPE:	Submersible optical DO probe Submersible glass electrode PH probe
OPERATING PRINCIPLE:	DO: Fluorescence Quenching digital probe PH: Ion Selective Glass Electrode digital probe
PROBE HOLDER LENGTH:	Refer to Installation Detail Drawing.
SERVICE:	SBR Tanks Centrate. Refer to Process for characteristics
SELF CLEANING/CALIBRATION:	Air blast cleaning
TEMPERATURE COMPENSATION:	Integral c/w analog output for temperature
RANGE:	DO: 0-10 mg/L PH: 4-11 PH units
INACCURACY:	±0.5% of span or better
TRANSMITTER TYPE:	2 Channel digital transmitter suitable for connection of digital process sensors.
OUTPUT:	Isolated 4 to 20 mA analog output(s) for each channel c/w auxiliary 4-20maDC temperature output (shed 1 only). 2 configurable Form C alarm contacts N/O
COMMUNICATIONS:	Profibus PA preferred, Profibus DP alternate
POWER SUPPLY:	120 VAC, 60 HZ
ENCLOSURE:	EEMAC/NEMA 4X transmitter housing
MOUNTING:	(SENSORS) NPT thread for 2" vertical pipe mount. Refer to Installation Detail Drawing for probe mounting details. (TRANSMITTER) Wall mount; fabricate a mounting board for the transmitter c/w solenoid valves to match existing such that the transmitter can be relocated to another instrument shed or the other SBR without modification.
ACCESSORIES:	Sensor air blast cleaning heads with 10 m air blast supply tubing and quick-connect airline fitting for each probe. Air pressure regulator to match existing. All sensor, power, and

INSTRUMENTATION SPECIFICATION SHEETS

output cables shall be fitted with Turck Inc. quick-connect fittings to match existing connector types and pin-outs.
Calibration kit with reagents.

Solenoid valves for air blast control of each sensor probe.

MANUFACTURER AND MODEL:

Hach: Transmitter :Sc200, Cat No. LXV404.99.00552

Hach: LDO Model 2 DO probe, Cat No. 9020000

Hach: pHDsc pH probe, Cat No. DPD1P1

INSTRUMENTATION SPECIFICATION SHEETS

INSTRUMENT

SPECIFICATION NUMBER:

I102

DEVICE:

Nitrite (NO₂-N) and Ammonia (NH₄-N) Measuring System

TAGS:

Refer to Instrument Index

PROBE TYPE:

Submersible Nitrite - NO₂-N Probe
Submersible Ammonia - NH₄-N Probe

OPERATING PRINCIPLE:

NO₂-N: UV light absorbance digital probe
NH₄-N Ion Selective Electrodes digital probe

PROBE HOLDER LENGTH:

Refer to Installation Detail Drawing.

SERVICE:

SBR Tanks Centrate, Refer to process for characteristics.

**TEMPERATURE
COMPENSATION:**

Integral

RANGE:

NH₄-N: 0.0 to 100 mg/l. Analog output span: 0.1-100mg/l
NO₂-N: 0.0 to 750 mg/l. Analog output span: 0-20mg/l

TRANSMITTER TYPE:

Multi - Channel digital transmitter suitable for connection of digital process sensors.

OUTPUT:

Isolated 4 to 20 mA analog output(s) for each channel.
2 configurable Form C alarm contacts N/O

COMMUNICATIONS:

Profibus PA preferred, Profibus DP alternate

POWER SUPPLY:

120 VAC, 60 HZ

ENCLOSURE:

EEMAC/NEMA 4X transmitter housing
Submersible sensor probes

MOUNTING: (SENSORS)

Mounting adaptor for vertical 2" pipe mount. Refer to Installation Detail Drawing.

(TRANSMITTER)

Wall mount; fabricate a mounting board for the transmitter c/w solenoid valves to match existing such that the transmitter can be relocated to another instrument shed or the other SBR without modification.

ACCESSORIES:

Sensor air blast cleaning heads with 10 m air blast supply tubing and quick-connect airline fitting for each probe. Air pressure regulator to match existing. All sensor, power, and output cables shall be fitted with Turck Inc. quick-connect fittings to match existing connector types and pin-outs.

INSTRUMENTATION SPECIFICATION SHEETS

- MANUFACTURER AND MODEL:** S::CAN
- Spectro::lyser NO₂ probe, Cat No. Sp-2-002-p0-s-NO c/w calibration
 - Ammo::lyser NH₄ probe, Cat No. E-532-eco-pH-075 c/w calibration.
 - Con::Cube multi - channel digital transmitter, Cat No. D-315-230
 - Accessories as noted above

END OF SECTION

INSTRUMENT LOOP DRAWINGS

1. GENERAL

1.1 References - General

- .1 Refer to Section 17010.

1.2 Instrument Loop Drawings

- .1 The following Drawings show typical instrument loop wiring diagrams. One (1) Drawing per loop will be completed and submitted for approval after award of Contract. Refer to the Instrument Index for the list of devices requiring loop diagrams.
- .2 The following drawings are an integral part of this Specification Section:
 - ILD-01 Typical Analytical Transmitter
- .3 All control circuits and I/O points shown on the instrument loop wiring diagrams shall be individually fused.
- .4 The instrument loop wiring diagrams are intended to be typical. For instruments being supplied by Vendor Packages or under other Divisions refer to detailed wiring schematics and documentation provided by the supplier.
- .5 DCS inputs and outputs have been assigned for each application as indicated in the Input/Output index.

2. PRODUCTS

- .1 Not used

3. EXECUTION

- .1 Not used

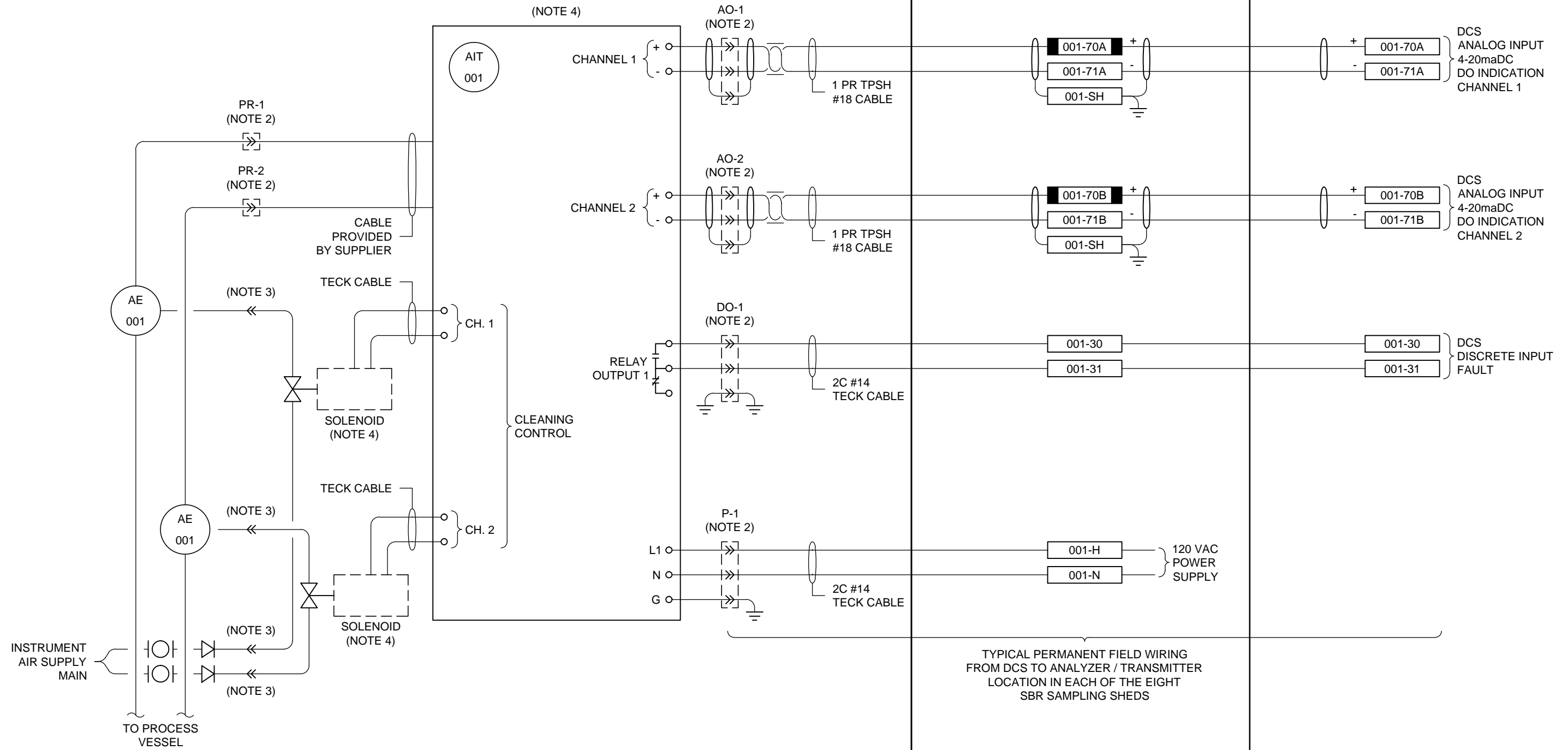
Analytical Transmitter - Instrument Loop Diagram

Loop No. 001

FIELD PROCESS AREA

CONTROL PANEL

DCS



NOTES:

1. THIS DRAWING IS TYPICAL FOR ONE OR MORE APPLICATIONS, REFER TO INSTRUMENT INDEX.
2. USE AMPHENOL ROUND STYLE MULTI-PIN QUICK CONNECTORS WITH NEMA 4X RATING & OPTIONAL THREADED DUST CAPS. CONNECTOR FITMENTS FOR PROBES, ANALOG I/O, DISCRETE I/O & POWER SHALL ALL BE UNIQUE. PROVIDE UNIQUE TAGGING AT ALL CONNECTIONS.
3. USE BARBED FITTINGS WITH STAINLESS STEEL LCLAMPS FOR ALL PNEUMATIC CONNECTIONS. PROVIDE UNIQUE TAGGING AT ALL CONNECTIONS.
4. MOUNT ANALYZER / TRANSMITTER AND SOLENOID VALVES TO A COMMON BACKBOARD TO FACILITATE RAPID RELOCATION.

ISSUE/REVISION

I/R	DATE	DESCRIPTION
02	18/07/17	ISSUED FOR TENDER: BID OP 656-2018
01	16/10/06	ISSUED FOR CONSTRUCTION:
00	16/06/23	ISSUED FOR TENDER: BID OP 547-2016

CONSULTANT

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PROJECT

2016 NEWPCC
 SBR UPGRADES

2230 MAIN ST.
 WINNIPEG, MB
 R2V 4T8

SHEET TITLE

TYPICAL ANALYTICAL TRANSMITTER
 INSTRUMENT LOOP DIAGRAM

SHEET NUMBER

ILD-001