

APPENDIX G – TRAINING REQUIREMENTS SAMPLE SPECIFICATION

SECTION A - DEFINITIONS

- A1. For the purpose of Appendix G, the following definitions apply:
- A1.1 **“SWP”**, or Safe Work Procedure, means a written, specific step by step description of how to complete a job safely from start to finish.
- A1.2 **“SOP”** or Standard Operating Procedure, means a written set of a set of step-by-step instructions compiled to complete task a task in accordance with design and facility requirements. The SOPs provide standardized documented guidance to plant operators for undertaking key operational and maintenance procedures.

SECTION B - TRAINING PROGRAM

- B1. **Scope**
- B1.1 The Contractor shall develop, implement, continuously update, and provide the City a training program for the upgrades to the chlorine systems at the Regional Pumping Stations.
- B1.2 The training program shall:
- (a) be designed to comprehensively train plant staff;
 - (b) be carried out in accordance with standards, practices, methods and procedures that are to a good commercial standard, conforming to applicable law and exercising the standard of care, skill, diligence, prudence and foresight which would reasonably and ordinarily be expected from a qualified, skilled and experienced person supplying similar services for similar projects, in a timely, good and workmanlike manner such that plant staff may competently operate and maintain the systems;
 - (c) be tailored for the specific audience in each course;
 - (d) ensure that each course accommodates plant staff shift schedules by providing multiple sessions covering the same content if necessary;
 - (e) be designed to maximize the transfer of learning, utilizing appropriate training methodologies;
 - (f) contain both classroom and field training courses, organized in a format to most effectively train plant staff including the classroom portion should comprise no more than 40 percent of the training time and the field portion at least 60 percent of the training time, completed on the same day;
 - (g) include ample opportunities for participants to ask questions and have their questions answered;
 - (h) be based upon the Operation and Maintenance Manuals with complete consistency between the training and the Operation and Maintenance Manuals, including SOP (Safe Operating Procedures), SWP (Safe Work Procedures) and lock-out/tag-out procedures;
 - (i) incorporate feedback from the training into the Operation and Maintenance Manuals;
 - (j) include the provision of the services of factory trained specialists and equipment manufacturers to instruct plant staff in the operation and maintenance of all equipment and system components during classroom and field training;

- (k) be scheduled and coordinated to not interfere with the operation and maintenance of the Deacon WTP and the RPS;
- (l) ensure that all training sessions include demonstration of learning by the participants. Evaluation methods should reinforce learning, monitor progress, and provide feedback on progress. Assessment should be based on course objectives and implemented in accordance with Section B.12;
- (m) ensure that all training courses are submitted to the Province of Manitoba to be evaluated for possibility of gaining continuing education credits for water treatment operators' certification; and
- (n) ensure that all operations personnel and required plant staff have completed the required training, as set out in this Specification section prior to Total Performance.

B2. Training Plan

B2.1 The Contractor shall develop, implement, update, and provide a training plan document that will detail the implementation of the training program.

B2.2 The training plan will include for each course:

- (a) course name;
- (b) overall training strategies;
- (c) detailed course description, including the specific Work components addressed in the course;
- (d) planned duration;
- (e) specific participant group to be trained;
- (f) specific and measurable learning objectives that can be evaluated at the end of the session;
- (g) format and implementation methodology; and
- (h) participant evaluation methodology.

B2.3 The training plan will organize and sequence the courses.

B2.4 The training plan will include a training schedule forecasting the number, timing, and duration of each training session.

B2.5 The training participants shall complete classroom and field training for a given unit process prior to commencing training in a separate process area.

B2.6 The Contractor shall submit the training plan for review by the City's Training Coordinator, including all associated course lesson plans a minimum of 25 Business Days prior to the commencement of commissioning or training whichever is earlier.

- (a) The City's Training coordinator has authority to determine if the training plan is adequate based the submitted documents and requirements for Operators Continuing Education Unit (CEUs) set out by the Province of Manitoba.

B3. Course Lesson Plans

- B3.1 The Contractor shall develop for each course lesson plan a detailed description and plan of the training.
- B3.2 Each course lesson plan shall be consistent with the training plant and provide a detailed description that includes:
- (a) the requirements of B2.2, more fully developed and detailed;
 - (b) instructor(s), including the qualifications;
 - (c) recommended and minimum number of training sessions;
 - (d) recommended and maximum number of training participants within each training session;
 - (e) the training participant evaluation methodology;
 - (f) training material in accordance with B13;
 - (g) identification of any applicable resources; and
 - (h) other supporting information as appropriate.
- B3.3 For each training course, the Contractor shall submit the course lesson plan and have received comments from the Contract Administrator a minimum of 50 Business Days prior to the scheduled start of training.
- B3.4 The Contractor shall:
- (a) not proceed with a training course until the corresponding course lesson plan and been reviewed and accepted by the Contract Administrator, and
 - (b) ensure that the portions of the Operations and Maintenance Manuals applicable to each training course have been reviewed and accepted by the Contract Administrator prior to the associated course lesson plan being submitted.
- B3.5 The Contract Administrator shall update each course lesson plan based upon the completed training and incorporate any changes made to the training. The revised course lesson plan shall be included with the training material.
- B4. Training Schedule**
- B4.1 The Contractor shall prepare, provide, and update a schedule of all training activities.
- B4.2 The training schedule shall include:
- (a) course names;
 - (b) course session dates and duration, and
 - (c) participant groups to be trained.
- B4.3 Integrate the training schedule with the Work Schedule.
- B4.4 The training schedule shall be coordinated with the City to ensure the planned training session dates include sufficient flexibility to allow for availability of the plant staff. The Contractor shall plan for and acknowledge that the plant staff training will be interspersed between the plant staffs' regular daily duties.

B4.5 Each training session shall be a maximum duration of four (4) hours per day and limited to Business Days with following windows of time:

- (a) 8:00 a.m. to 12:00 p.m., with a 15 minute coffee break, and
- (b) 1:00 p.m. to 4:00 p.m., with a 15 minute coffee break.

B4.6 Regularly update the training schedule based on the availability of the plant staff.

B5. Training Participants and Groups

B5.1 The Contractor shall provide and implement the training program for the plant staff that will or may be required to operate and maintain the systems installed.

B5.2 The plant staff participants groups include:

- (a) the operations group which consists of day and shift operators and are responsible for the operations of the Regional Pump Stations.
- (b) the mechanical maintenance group consisting of mechanics, millwrights, plumbers, and labourers;
- (c) the electrical maintenance group; and
- (d) the instrumentation maintenance group.

B5.3 In addition, the following City personnel may attend and observe the training:

- (a) W&W supervisors;
- (b) W&W operations engineers;
- (c) W&W SCADA analysts;
- (d) W&W training coordinators; and
- (e) the Project Manager and/or delegates of the Project Manager.

B6. Coordination with the City

B6.1 The Contractor shall coordinate with the Contract Administrator regarding dates and times for training sessions. All dates and times are subject to availability of plant staff.

B6.2 The Contractor shall provide all requests to schedule a training session a minimum of 25 Business Days prior to the planned session along with the course name and proposed Training Participant Groups such that the training session date can be confirmed 20 Business Days ahead of the planned session.

B6.3 All in class training sessions shall be held at the City of Winnipeg Drinking Water Treatment Plant's main boardroom, at one of the RPS, or both locations as determined by the City.

B6.4 Coordinate with the City as required to ensure all applicable plant staff are trained.

B6.5 Repeat the training session(s) for each group to allow for training of all plant staff. The minimum number of sessions for each group and associated constraints are identified in Table 1, with additional requirements as follows:

- (a) where a course is applicable to multiple participant groups, the total number of sessions shall not be less than the minimum number of sessions identified in Table 1 for any one group, plus one. For clarity, should a course be applicable to all participant groups (i.e. an overall system overview) a minimum of 5 classroom training sessions is required; and
- (b) additional classroom sessions shall be provided in the event that the course content is not appropriate for the potential number of participants.

Training Participant Groups	Approximate Number of Personnel	Minimum Number of Classroom Sessions	Minimum Number of Field Sessions
Operations Personnel	20	5	7
Mechanical Maintenance	10	2	3
Electrical Maintenance	5	2	2
Instrumentation Maintenance	6	2	2

B7. Coordination between the Contract Administrator and the Contractor

- B7.1 The Contract Administrator shall oversee the Contractor including suppliers, to ensure a comprehensive, cohesive training program is delivered.
- B7.2 The training shall be provided by the Contractor, subcontractors and suppliers.

B8. Instructor Qualifications

- B8.1 The Contractor shall provide instructor(s) for each course who:
 - (a) are experienced and qualified for the specific training course;
 - (b) have demonstrated prior experience in performing similar training; and
 - (c) have the appropriate instructional and articulate public speaking skills to communicate clearly to the Training Participants.
- B8.2 The Contractor shall implement appropriate plans and procedures to address potential unavailability of an instructor while maintaining the quality of instruction.
- B8.3 The Contractor shall ensure that instructors are familiar with the Work, including the Operation and Maintenance Manuals.

B9. Classroom Requirements

- B9.1 The Contractor shall:
 - (a) use appropriate learning resource materials, including slides and drawings, to aid in training clarity and effectiveness;
 - (b) make available applicable reference materials where it will be beneficial for the training participants to reference the material covered during the training. For example, paper copies of SOPs and SWPs should be provided, if beneficial to the training objectives;
 - (c) ensure all practical components are provided to ensure that training participants are able to see and hear the training. Provide projectors and screens as required, that are easily viewable and readable by all training participants; and

- (d) be responsible for any temporary networking or other associated computer and audio requirements to implement the training sessions.

B9.2 The Contractor shall structure the training to provide an interactive environment that promotes active participation. The instructor shall use discussion, questions, and activities as appropriate during each session to provide engagement, enhance learning and to verify that the information presented is being understood.

B10. Field Requirements

B10.1 Implement the training using the constructed systems, unless otherwise approved by the Contract Administrator;

B10.2 Provide field training sessions in a manner that all training participants can see and hear all demonstrations provided;

B10.3 Arrange for and require training participants to perform the demonstrated procedures, and

B10.4 Ensure all training is in accordance with SWPs and SOPs and include training on their application and use.

B11. Evaluation Requirements

B11.1 As part of each classroom training session, the Contractor shall provide and execute a written training evaluation methodology, such as a quiz or test, to demonstrate each individual training participant's understanding of the learning objectives and course content.

B11.2 The test or quiz shall be submitted to the City's Training Coordinator in advance of all training sessions for review and approval.

B11.3 The Contractor shall record the results of all classroom training participant evaluations and include in the training records.

B11.4 As part of each field training session, the Contractors shall provide and execute an evaluation method consisting of either written or practical demonstration components to test each training participant in their understanding of the learning objectives, course content, and ability to perform the tasks addressed by the course.

B11.5 The Contractor shall ensure that the evaluation components are sufficiently detailed to affirm that a passing grade of the evaluation signifies that the training participant is qualified to operate and/or maintain the component of the system associated with the training course.

B11.6 The Contract Administrator shall review the evaluation results have the Contractor update the training material as required to improve the training for subsequent sessions.

B12. Training Feedback Requirements

B12.1 At the end of each training session, provide each training participant with a "Training Participant Feedback Form".

B12.2 Collect the forms and deliver to the City a copy of each Training Participant Feedback Form.

B12.3 Utilize feedback provided to update the training material and improve the training for subsequent sessions.

B13. Training Material

- B13.1 The Contractor shall provide a copy of all training materials used in each classroom and field training course within the training program.
- B13.2 The training material shall be provided in electronic native, editable file format and include the following:
- (a) course lesson plans, refer to B3;
 - (b) list of all course materials;
 - (c) classroom slide presentations in MS PowerPoint format;
 - (d) other audio/visual material;
 - (e) handouts;
 - (f) speaking notes (as applicable); and
 - (g) course training participant evaluation material with answer keys.
- B13.3 The training material shall be organized by course, with the material systematically arranged in a consistent manner.
- B14. Training Records**
- B14.1 The Contractor shall provide to the Contract Administrator comprehensive training records indicating the specific training provided, along with the supporting documentation in accordance with the training program.
- B14.2 The Contractor shall record all training participants for each training session on a training participant register.
- B14.3 For each session the training record shall include:
- (a) training participant registers;
 - (b) results of evaluations by individuals and summarized by course; and
 - (c) training participant feedback forms.
- B14.4 Organize the Training Records in a hierarchical manner by:
- (a) area or general as applicable;
 - (b) training participant groups (e.g. Operations, Mechanical Maintenance, etc.) or general as applicable.
- B14.5 The Contractor shall provide all training records in pdf file format.
- B14.6 The Contractor shall submit all Training Records no later than 50 Business Days after commissioning or the completion of training whichever is later.
- B15. Deliverables**
- B15.1 The Contractor shall provide all material used in the training to the City, including:
- (a) the training plan in accordance with B2;

- (b) course lesson plans in accordance with B3;
- (c) training material in accordance with B13; and
- (d) training records in accordance with B14.

B16. Completion of Training

B16.1 Upon completion of the requirements for each course in the Training Plan, the Contractor shall provide a completed and signed Declaration of Course Completion document to the Contract Administrator.

SECTION C - TRAINING CONTENT REQUIREMENTS

C1. General

C1.1 The purpose of Section C is to provide general guidance to the Contractor regarding the requirements of the Training Program. However, the indication of any specific training requirement in Section C does not reduce or eliminate the requirement of the Contractor to provide comprehensive training in accordance with Section B1.2.

C1.2 The training program shall address all aspects of the Work, including:

- (a) overview of each process and the process flow diagrams;
- (b) process layout, including major equipment;
- (c) building and equipment layout for each system, including P&ID's;
- (d) process/mechanical equipment and systems;
- (e) electrical equipment and systems;
- (f) automation systems; and
- (g) safety systems.

C1.3 The Contractor shall include the following in all training sessions as applicable:

- (a) all activities covered by a SWP;
- (b) all activities covered by a SOP;
- (c) all activities covered by a lock-out/tag-out;
- (d) changing the modes of operation of the systems;
- (e) operating and/or monitoring the system remotely (from SCADA or an HMI); and
- (f) operation of the system during fault/trouble/alarm conditions.

C1.4 Learning Requirements

- (a) The trained personnel will be able to:
 - (i) operate the systems under occupied mode and emergency mode;
 - (ii) restore the systems after an emergency event;

- (iii) troubleshoot and maintain all aspects of the mechanical/process, electrical, and automation systems; and
- (iv) place all components of the system in a safe, zero energy state.

C2. **Specific Limitations**

C2.1 Except as indicated elsewhere in Appendix G, the following are not required to be included in the training program:

- (a) civil maintenance, except any special considerations associated with working safely around electrical equipment;
- (b) basic trade knowledge of a journeyman in the electrical group;
- (c) basic trade knowledge of a journeyman in the mechanical group;
- (d) basic calibration and maintenance procedures for instrumentation that are currently used within the water system facilities; and
- (e) PLC programming other than specific application nuisances that would not be common knowledge to a programmer.

C3. **Classroom Training**

C3.1 The Contractor shall provide classroom training, which other than the overview course, shall be specific for each training participant group.

C3.2 The classroom training topics for all training participants shall at a minimum include:

- (a) an overview of the process/system, including the locations of equipment and alarms;
- (b) the function of the process/system in occupied mode and emergency mode;
- (c) an overview of the SCADA interface and functionality;
- (d) placing every component of the process/system in a safe, zero energy state with the appropriate safety provisions; and
- (e) emergency procedures.

C3.3 For the operation personnel in addition to the requirements of C3.2 include at a minimum:

- (a) an overview of the Operations and Maintenance Manuals as they are applicable;
- (b) the required equipment exercise procedures and intervals;
- (c) the start-up, shutdown, occupancy operation, and emergency procedures; and
- (d) any routine inspection procedures.

C3.4 For the mechanical maintenance personnel in addition to the requirements of C3.2 include at a minimum:

- (a) an overview of the Operations and Maintenance Manuals as they are applicable;
- (b) the start-up, shutdown, occupancy operation, and emergency procedures, including system integration and interlocks, if any;

- (c) any routine inspection and troubleshooting procedures of specific equipment trouble symptoms;
- (d) routine inspection and troubleshooting procedures for the purposes of predictive maintenance;
- (e) routine preventive maintenance, including applicable specific details on lubrication, maintenance of corrosion protection of the equipment, and ancillary components and the use of special tools;
- (f) safety features and procedures related to the maintenance of the equipment, referencing and utilizing specific SWP;
- (g) the required equipment exercise procedures and intervals; and
- (h) disassembly and assembly of equipment, if applicable, for purposes such as routine inspection or maintenance of the equipment.

C3.5 For the electrical maintenance personnel in addition to the requirements of C3.2 include at a minimum:

- (a) an overview of the Operations and Maintenance Manuals as they are applicable;
- (b) the configuration of the upgraded distribution system with a detailed understanding of the single line diagram;
- (c) locations of all electrical equipment, as required;
- (d) manual and automatic switching procedures, as they relate to electrical;
- (e) routine preventative maintenance;
- (f) identification and brief description of recommended predictive maintenance;
- (g) any equipment and troubleshooting procedures,
- (h) safety features and procedures related to the maintenance of the equipment, referencing and utilizing specific SWP;
- (i) understanding of the arc flash mitigation systems, arc flash identification, and protective equipment selection;
- (j) understanding and troubleshooting of electrical interlocks;
- (k) the start-up, shutdown, occupancy operation, and emergency procedures, including system integration and interlocks, if any;
- (l) black start procedures, if any; and
- (m) the required equipment exercise procedures and intervals.

C3.6 For the automation maintenance personnel in addition to the requirements of C3.2 include at a minimum:

- (a) an overview of the Operations and Maintenance Manuals as they are applicable;
- (b) locations of all automation devices, including networking;

- (c) overview of the configuration/reconfiguration of the PLC systems, including which component or PLC processes various functions;
- (d) basic theory of the system, equipment and communication between the components;
- (e) troubleshooting and identification of issues;
- (f) identification of and general procedures for routine preventive maintenance;
- (g) equipment inspection and troubleshooting procedures;
- (h) safety features and procedures related to the maintenance of the equipment, referencing and utilizing specific SWP;
- (i) overview of the configuration of the historian system, as applicable; and
- (j) overview of the configuration of any HMI systems.

C4. Field Training

C4.1 The Contractor shall provide field training, which shall be specific for each training participant group.

C4.2 The field training topics for all Training Participants, tailored specific to each training participant group, shall include at minimum the:

- (a) overview of the systems, including locations of specific equipment;
- (b) demonstration of routine inspections and round checks, including the reading of gauges;
- (c) demonstration of SOPs;
- (d) equipment / system operation including alarms;
- (e) demonstration of start-up and shutdown procedures;
- (f) demonstration of the required equipment exercise procedures;
- (g) placing every component of the Work in a safe, zero energy state with appropriate safety provisions, including barriers and grounding and in accordance with the SWPs; and
- (h) demonstration of the use of all special tools and equipment.

C4.3 In addition to the requirements of Section C4.2, the field training topics for Operations personnel shall include at minimum the identifying and reviewing safety items and demonstration of SWPs applicable to Operations personnel;

C4.4 In addition to the requirements of Section C4.2, the field training topics for mechanical Maintenance personnel shall include at minimum the:

- (a) identification of all equipment and instrumentation, including discussing the purpose, basic operation, and interpretation of any indicators or readouts;
- (b) demonstration of the required equipment exercise procedures;
- (c) identification and review safety items and demonstration of SWPs applicable to Maintenance personnel;

- (d) troubleshooting of equipment problems;
- (e) performing of routine maintenance procedures, including the routine disassembly and assembly of equipment, as applicable; and
- (f) performing of repair procedures.

C4.5 In addition to the requirements of Section C4.2, the field training topics for electrical Maintenance personnel shall include at minimum the:

- (a) identification of all equipment and instrumentation, including discussing the purpose, basic operation, and interpretation of any indicators or readouts;
- (b) performing of switching procedures;
- (c) identification and review of safety items and demonstration of SWP applicable to the electrical Maintenance personnel;
- (d) racking of breakers (low voltage);
- (e) key and electrical interlock systems, as applicable;
- (f) performing of preventive maintenance activities;
- (g) troubleshooting of equipment problems;
- (h) detection, without test instruments, of specific equipment trouble symptoms utilizing senses, including visual, audible, smell and touch cues;
- (i) adjustment of protection settings (but not programming);
- (j) replacement of protection relays, including loading of protection settings;
- (k) performing of maintenance procedures, including the routine disassembly and assembly of equipment, as applicable;
- (l) routine predictive and preventive maintenance requirements; and
- (m) performing of repair procedures.

C4.6 In addition to the requirements of Section C4.2, the field training topics for the automation Maintenance personnel shall include at a minimum the:

- (a) identification of all automation equipment, including discussing the purpose, basic operation, and interpretation of any indicators or readouts;
- (b) identifying and reviewing of safety items and demonstration of SWPs applicable to the automation Maintenance personnel;
- (c) calibration and maintenance of instrumentation that is new and unique to the installation;
- (d) replacement of PLC modules and other automation components;
- (e) software programming of PLC systems; and
- (f) setup and configuration of any HMI operator workstations or interfaces.

SECTION D - TRAINING COMPLETION

D1. General

D1.1 The Contractor shall perform the training in accordance with the training program and to the satisfaction of the Contract Administrator. The Contract Administrator and the City may provide feedback, which shall be incorporated into subsequent training sessions or require repeat of one or more training sessions to address training quality issues.

D1.2 All training criteria shall be interpreted in accordance with the Contract as determined by the Contract Administrator.

D2. Training Completion

D2.1 The training is considered complete if the following has been carried out to the satisfaction of the City.

D2.2 Plant staff have been fully trained, and such training is in accordance with the training plan, the course lesson plans and this Section.

D2.3 The Contract Administrator has issued correspondence that indicates the acceptance of all the final associated training material and training records that have been submitted by the Contractor.