

Base Commissioning Plan

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Base Commissioning Plan

Client: City of Winnipeg

Prepared by

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April 28, 2025

Project No. 60711772

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1.0 Purpose

The purpose of this plan is to be used in conjunction with Section 01 91 31 of the 30-2025 technical specifications as a Base Commissioning Plan, which will define the approach to the management and administration of the commissioning activities and to provide a clear guidance document for use in the Contractor's development of a Detailed Commissioning Plan. This Base Commissioning Plan will outline the steps to commission the upgraded UV facility of NEWPCC and provide adequate training to its operations team.

The Base Commissioning Plan assembles elements of the commissioning procedures and workflows to act as a high-level reference for use in the development of the Detailed Commissioning Plan that outlines the key commissioning activities of the project. This Plan will provide a preliminary outline to ensure that all system components are installed, tested and operationally verified before handover for full scale operation.

This Base Commissioning Plan is to be updated by the Contractor in collaboration with the equipment vendors to produce the Detailed Commissioning Plan in line with the contract, final design, technical specifications and manufacturers' recommendations.

The Detailed Commissioning Plan to be developed by the Contractor will be used by all members of the Delivery Team, including the City, AECOM and the Contractor.

2.0 Scope

The scope of the Base Commissioning Plan for NEWPCC Upgrade: UV Facility project includes but not limited to the following:

- Concept and preliminary details for bringing project components on-line relative to the project construction, ongoing operations and other projects at the NEWPCC such as the Headworks Facilities Project and DCS Migration Project.
- Plan to minimize impact to the facility's capability to meet its regulatory obligations and interference with other NEWPCC projects.
- Details of any planned Operational impacts.
- Details with regard to the various aspects of commissioning including training, inspection, quality, start-up, testing, verification and handover to operations.
- Roles and responsibilities identification for the Contractor, AECOM and the City, procedures and processes, quantified anticipated resources, equipment, utilities and consumables.

3.0 Abbreviations

Common abbreviations are given below.

Term	Definition
MCC	Motor Control Centre
NEWPCC	North End Water Pollution Control Center
nm	nanometres
NOA	Notice of Alteration
O&M	Operation and Maintenance
TAB	Testing, Adjusting and Balancing
UV	Ultraviolet

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4.0 Commissioning Impacts and Mitigations

Commissioning can be staged to minimize downtime and to gain efficiency in the commissioning process. All scheduling, plans, and procedures are to be coordinated with the Contract Administrator. The Contractor is to update the project schedule to maintain effective commissioning flow and to avoid unanticipated impacts.

To bring the project online, the City prepared an NOA to the province. This NOA will allow this project to bypass UV disinfection from late October 2025 to late February 2026. This period will be used to complete the Critical Stages of the work, as defined in 30-2025 tender documentation. The Contractor is required to have two UV channels and associated systems (MCCs, transformers and gates) completed and operational by the end of the Critical Stages period. All training and limited commissioning are required to ensure operability of the two UV channels, to meet disinfection requirements of the Environment Act Licence. Formal commissioning activities can occur post Critical Stages period and will follow the Detailed Commissioning Plan.

5.0 NEWPCC Operations Impacts and Mitigations

Commissioning activities at NEWPCC will temporarily impact its operations. These impacts should be considered and minimized in every aspect of commissioning as NEWPCC must remain continuously operable (24 hours a day, 365 days a year). As two UV channels will be installed during the bypass period and handed over to City's operation team, parallel operation to meet license limits while completing the work and fully commissioning the project will be required. This will require coordination between the Contractor and City's operations team through the Contract Administrator. If possible, conduct critical commissioning tests and demonstrations during low demand periods, to minimize impact on operations or meeting the license requirements.

6.0 Commissioning Stages

The commissioning process has been planned in three phases: Pre-commissioning, Commissioning, and Post-Commissioning. Each phase below includes detailed activities for the Contractor to complete and ensure efficient execution, risk mitigation, and adherence to project timelines.

6.1 Pre-Commissioning

All items in the Pre-Commissioning stage must be complete with associated documentation submitted and approved by the Contract Administrator prior to proceeding to the Commissioning stage.

6.1.1 Documentation Review

- Verify that all required submittals, including equipment shop drawings, test certificates, and Operation and Maintenance (O&M) manuals, have been received, reviewed and approved.
- Ensure as-built drawings, equipment specifications and process flow diagrams reflect the final installed conditions.
- Ensure all Pre-Commissioning forms, have been received, reviewed and approved. These forms include:
 - Form 100 – Certificate of Equipment Delivery, as attached to 01 65 00 Specification.
 - Form 101 – Certificate of Readiness to Install, as attached to 01 65 00 Specification.
 - Form 102 – Certificate of Satisfactory Installation, as attached to 01 65 00 Specification, with associated detailed inspection reports signed off by the Manufacturer's Representative.

6.1.2 Equipment Installation Verification

- Conduct visual inspections of UV reactors, transformers, MCCs, piping, valves, gates, control panels, and instrumentation.
- Perform pre-start-up pressure, static, flushing, cleaning, "bumping" testing, and loop validation during construction as specified in the individual sections of the technical specifications. This

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testing is to be witnessed and certified by the Contract Administrator and is not considered part of the Commissioning requirements.

- Perform detailed pre-start inspections using approved installation/start-up check lists from the vendors. Submit associated inspection reports noting any deficiencies identified by the Manufacturer's Representative. Rectify any deficiencies to the Contract Administrator's satisfaction. The Manufacturer's Representative will be required to re-inspect the installation to verify all deficiencies have been addressed.
- Plumbing and process systems:
 - "Bump" each item of equipment in its "stand-alone" mode.
 - After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
- HVAC equipment and systems:
 - "Bump" each item of equipment in its "stand-alone" mode.
 - After equipment has been started, test related systems in conjunction with control systems on a system-by-system basis.
 - Perform TAB on systems. TAB reports to be approved by the Contract Administrator.
- Electrical:
 - Test grounding systems for ground resistance as specified in Section 26 05 28.
 - Conduct continuity test and resistivity test on all power cables as specified in Section 26 08.05.
 - Ensure that all installation/pre-commissioning tests required in Division 26 and 40 of the technical specifications were completed successfully.
- Verify installation of components, wiring connections, and piping connections.
- Verify proper installation of the Transformers and MCCs.
- Confirm that all mechanical and electrical connections are completed per design specifications.
- Commissioning activities can only proceed after the successful completion of the specified instrumentation and control tests. Refer to Division 26 and Division 40 of the technical specifications for additional requirements and tests.
 - The following must be completed prior to proceeding with commissioning:
 - Instrument Calibrations;
 - Initial Control Settings and adjustments;
 - All field devices have been configured, tested;
 - PLC/SCADA IO and loop checks have been completed;
 - Proper mounting and connections have been made;
 - Verify the correct installation of components, wiring connections, and piping connections; and
 - Verify wiring continuity and the successful completion of pipe leak tests.
 - Demonstrate to the Contract Administrator proper field calibration and correct operation of instruments and gauges. Provide a written report to the Contract Administrator that records the functional checks and any adjustments for the instruments and control equipment under operational conditions.
 - Verify signal levels and wiring connections to all instrumentation and control equipment.
- Verify alignment, anchoring, and connections of:
 - UV reactors and isolation gates; and
 - Level control instruments.
- Confirm that all gates operate as intended and flow paths are clear of any obstructions.

6.2 Commissioning

The systems and interfaces to be commissioned are noted below:

- UV systems;
- Transformers;
- MCC;
- Gates and actuators;
- Roll-up or overhead doors;
- Ventilation fans;
- Monorails;

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- Lighting system;
- Fire alarms;
- Associated electrical, instrumentation and controls; and
- Associated HVAC, exhaust and plumbing systems.

6.2.1 Demonstration: Dry Testing (Without Flow)

- Contractor is to notify the Contract Administrator of their readiness to demonstrate the operation of the equipment. Coordinate and schedule the Demonstration with the Contract Administrator.
- Contractor will demonstrate that the equipment is properly installed in cooperation with the Manufacturers' Representatives. Alignment, piping connections, electrical connections, etc., will be checked and if appropriate, code certifications provided.
- Test leakage for each gate under specified seating and unseating head conditions.
- Run the equipment for one 1 hour, where possible. Verify local controls by cycling the equipment through several start-stop operations, modulating its output, or some combination. Operating parameters will be checked to ensure that they are within the specified or Manufacturer's Representative's recommended limits, whichever is more stringent. This step shall be repeated for each modified system.
- Power up electrical systems and verify correct voltages.
- Check communication between UV system components and the SCADA system.
- Confirm that motorized gates, valves, and pumps respond to control signals.
- Verify wiring continuity
- Performance of pipe leak tests.
- On satisfactory completion of the one hour demonstration, the equipment will be stopped, and critical parameters will be rechecked.

6.2.2 Running Testing

- Conduct Operating Testing for the Transformers and MCCs according to Section 26 12 13 of Appendix D - Supply of Transformers Tender No. 929-2024 and Section 01 91 31 of Appendix C – Supply of Motor Control Centres.
- Sample the transformer oil at energization and after 3 months of operation for Oil and Gas analysis. Test facility will produce a report comparing the results of both tests.
- After cleaning, test each UV bank to verify that equipment can perform its specified function without mechanical or electrical defects, or operational difficulties.
- Restart and run the equipment continuously for a minimum of seven (7) days. Simulate conditions to represent maximum (or most severe), average, and minimum (or least severe) conditions. These conditions, to be described in the Detailed Commissioning Plan, will be mutually agreed to by the Manufacturer's Representative, the Contractor, and the Contract Administrator based on the technical specifications, as well as the methods utilized to create the simulated conditions, and the time periods allotted to each.
- Gradually introduce flow to confirm that hydraulics function as expected.
- Verify that isolation gates and flow control valves operate properly.
- Verify gate position feedback is accurate.
- Verify flow measurement is consistent with UV lift pump curves.
- Monitor sensors to ensure accurate readings.
- Validate SCADA, PLC programming, alarms, and system responses.
- Conduct daily *E.coli* sampling throughout the Running Test:
 - Collect and send final effluent samples to an accredited laboratory for *E.coli* analysis, UV transmittance (%UVT) and total suspended solids (TSS) concentrations at their own cost.
 - Collect grab samples for each day that the UV system is discharging effluent to the outfall (one (1) sample set per day).
- Each set of samples shall include the following analyses:
 - The most probable number (MPN) Fecal Coliform count per 100 mL in the UV disinfection channel influent (upstream of first lamp bank) and effluent (downstream of last lamp bank, but before weir gate).
 - %UVT at a wavelength of 254 nm of the UV disinfection channel influent.

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- TSS concentration in the UV disinfection channel influent.
 - Collect adequate sample such that the City may split the sample and perform its own testing, at its discretion.
- Running Test shall demonstrate that the UV system meets the *E.coli* limits.
- Passing the Running Test for UV systems is based on achieving *E.coli* count less than 200 MPN/100 ml for all effluent UV samples based on a 7-day Geometric Mean over the 7-day period.
- Running Test shall be completed as follows:
 - Operate all controls and other devices under the supervision of the Manufacturer's Representative to ensure they are functional.
 - Demonstrate the effectiveness of all system components and control features in all modes of control (Remote Auto, Remote Manual and Local control). Demonstrate local control of all devices when local controllers and/or HMI are not in service.
 - Test and simulate failure modes to demonstrate the system response to fault in Automatic and Local modes. Test all alarms and interlocks to verify system response to failures.
 - Automatic shutoff and alarm for various failure modes. This includes process monitoring and shutdown sequences are operating as intended for both life safety and process safety.
 - Operation of mechanical cleaning system and chemical cleaning system where applicable.
 - Operation of all monitoring instruments, all control functions, both at local system, HMI, and SCADA OIT(s).
 - At the time of the tests, make final adjustments necessary to place equipment in satisfactory working order.
 - Test and calibrate equipment and accessories in accordance with Supplier's printed instructions over full operating range of equipment.
 - Final tune PID loops for all control systems. Force minimum, maximum and average flow range to verify the PID control functional.
- Submit the results of the Running Test within 24 hours to the Contract Administrator. Submit final documented and summarized results to the Contract Administrator within 5 Business days. Results should include but not limited to the following:
 - Pass or Fail status of all tasks and commentary on the performance of each task.
 - The headloss through each UV channel at peak flow.
 - The average power draw of the UV system.
 - The peak power draw of the UV system.
 - Leakage rate of the gates.
- Complete the Running Test with assistance from the Manufacturer's Representative to the satisfaction of the Contract Administrator and the City prior to initiating the Performance Test as defined by clause 1.2.20 of Section 01 91 31 of the technical specification.

6.2.3 UV System Activation and Performance Testing

- The Contractor is to coordinate with the Manufacturer's Representative to ensure a complete testing plan for the UV system is included in the Detailed Commissioning Plan.
- The Contractor shall run the Performance Test in cooperation with the City's operation staff and with on-site supervision assistance from the Manufacturer's Representative. The Manufacturer's Representative is responsible for confirming that the instruments are within the accuracy tolerances required for system operation and performance.
- Restart the Performance Test if a critical failure occurs. Critical failure is any failure that prohibits the process from functioning successfully or creates a safety hazard.
- Perform all system components and control features in all modes of control (Remote Auto, Remote Manual and Local control). Verify interface monitoring, alarm, and control of the UV system with Plant SCADA.
- Supply all water, UV feed, chemicals, temporary power, heating, and/or any other ancillary equipment or services required to complete the initial demonstration, running test and Performance tests.
- Run the Performance Test for 30 consecutive days.
- Collect and summarize data to demonstrate that the system meets the requirements.
- Simulate conditions that represent maximum (or most severe), average, and minimum (or least severe) flow and UVT conditions. These conditions, to be described in the Detailed

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Commissioning Plan, shall be mutually agreed to by the Manufacturer's Representative, the Contractor, and the Contract Administrator, considering the information contained in the technical specifications, the methods utilized to create the simulated conditions, and the time periods allotted to each.

- The Performance Test shall be completed for the entire UV system.
 - Turn on UV reactors and confirm proper start-up sequence.
 - Run the UV system in automatic mode.
 - Simulate various operating conditions to ensure system resilience.
 - Monitor lamp intensity, power consumption, and sensor calibration.
 - Assess system response to power loss, sensor failures, and alarm triggers.
- Test redundancy features such as communication failure, PLC exchange, UV system switchover, etc.
- Conduct extended performance monitoring under normal operating conditions.
- Verify alarms, shutdown sequences, and emergency procedures.
- At Performance Test completion, confirm all instruments remain within calibration tolerances. Rectify and recalibrate any out of calibration instruments.
- If the initial demonstrations, Running Tests or the Performance Test reveal any defects, promptly rectify the defect and repeat the test to the satisfaction of the Contract Administrator at no additional cost to the City.
- Collect and send final effluent samples for each newly equipped UV channel to an accredited laboratory for analysis.
- Collect samples daily for the Performance Test duration. Each sample set is to include the following analyses:
 - The most probable number (MPN) Fecal Coliform count per 100 mL in the UV disinfection channel influent (upstream of first lamp bank) and effluent (downstream of last lamp bank, but before weir gate).
 - The %UVT at a wavelength of 254 nm of the UV disinfection channel influent.
 - The TSS concentration in the UV disinfection channel influent.
- Performance Test shall demonstrate that the UV system meets monthly *E.coli* limits. The criteria to pass the Performance Test is to record an *E.coli* count of less than 200 MPN/100 ml for all effluent UV samples based on a 30-day Geometric Mean.
- Submit the initial results of each Performance Test within 24 hours to the Contract Administrator.
- Final documented and summarized results shall be submitted in a format acceptable to the Contract Administrator within 5 Business days.
- The Contract Administrator reserves the right to request additional testing at no additional cost.
- During the Performance Test, the City shall have the option of collecting samples for independent analyses to confirm measurements and analyses conducted.
- At the end of the Performance Test, confirm that the equipment is still within calibration. If calibration exceeds the manufactures acceptable requirements, address the issue and extend Performance Testing by seven (7) days.
- Ensure all Commissioning forms, have been received, reviewed and approved. These forms include:
 - Form 103 – Certificate of Equipment Satisfactory Running Test, as attached to Section 01 91 31.
 - Form 104 – Certificate of Equipment Satisfactory Performance Test Performance, as attached to Section 01 91 31.
- The Manufacturer's Representative and the Contractor shall provide the Performance Test Report within 5 Business days of completion of the Performance Test.
- The Performance Test Report shall include the following as a minimum:
 - Performance Test conditions and procedures.
 - Corrective actions taken.
 - Retesting results (if necessary).
 - Other pertinent information (if any).
 - Conclusions.
 - Recommendations for future actions.

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NEWPCC Upgrade: UV Facility									
Tag.	Description	Relevant Specs.	Trade responsible	Form 100	Form 101	Form 102	Form 103	Form 104	Specific Test requirements

Note: The Contractor is responsible for populating this table to include all equipment, instrumentation and controls. The filled/updated **Table 1** is to be attached to the Detailed Commissioning Plan.

6.3 Post Commissioning**6.3.1 Operator Training and Handover**

- Provide hands-on and classroom training sessions for plant staff, covering system operation, SCADA system monitoring, alarm response, troubleshooting, and routine maintenance. All training sessions are to be professionally recorded and edited into a comprehensive training video package.
- Deliver final documentation, including O&M manuals, spare parts lists, training videos, and warranty information.
- Refer to Section 01 79 00.

6.3.2 Commissioning Completion and Acceptance

- Perform final inspections and verify that all commissioning checklists and Forms 103 and 104 have been completed.
- Conduct final walkthrough and sign-off by authorized representatives.
- Obtain approval from the City for full system operation.
- Transition the system to the plant's operational team for long-term use.
- Issue formal acceptance certificate upon successful commissioning.
- Submit the completed Commissioning Report within two weeks of Commissioning completion, for Contract Administrator review prior to granting Substantial Performance.
- Final Commissioning Report to include:
 - Summary of activities, performance results, and acceptance documentation.
 - Description of Commissioning activities and documentation.
 - Description of Commissioning of integrated systems and documentation.
 - Completed installation checklists if required by manufacturer.
 - Completed Running and Performance Test Report(s).
 - Final settings of commissioned equipment.
 - Training Plans.

A structured Detailed Commissioning Plan following these three key stages will ensure a controlled and efficient start-up of the UV disinfection facility, maximizing reliability and compliance with disinfection requirements.

7.0 Commissioning Team and Responsibilities**1. Commissioning Agent**

- Third-party Agent of the Contractor.
- Develop the Detailed Commissioning Plan, including detailed commissioning checklists and procedures.
- Oversee and execute commissioning activities.
- Coordinate with the Contractor, Manufacturers' Representatives, and facility personnel.

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2. Contract Administrator

- Witness and monitor commissioning activities and certify test results.
- Approve all Contractor submissions related to commissioning.

3. Contractor and Subcontractors

- Perform equipment installation and pre-commissioning activities.
- Testing.
- Integrating Commissioning activities into the project schedule.
- Provide documentation, including O&M manuals.

4. City Personnel

- Attending Commissioning activities to verify installation and performance of equipment.

Table 2: Anticipated Resources

Name	Role	Responsibility	Cx Equipment	Utility	Consumable	Application

- Contractor is to fill **Table 2** and include any anticipated equipment, utilities and consumables in their Detailed Cx plan.
- Any spare parts or consumables used during testing and commissioning are to be replaced, as the complete spare parts inventory is to be replenished at the end of the warranty period.

8.0 Coordination with Other NEWPCC Projects

NEWPCC is undergoing several major upgrades through different projects by different contractors, while remaining in operation. Collaboration with other ongoing NEWPCC projects including Headworks and DCS Migration are essential to the success of this Project. Coordination between NEWPCC projects will be through the Contract Administrator, as the point of contact for this project.

9.0 Manufacturer's Representatives for Pre-Purchased Equipment

Where it is requested that a Manufacturer's Representative supervises or checks installation and/or commissions individual pre-purchased equipment, conditions of the associated supply contract are applicable. These conditions are to be reviewed and incorporated into the Detailed Commissioning Plan for pre-purchased equipment. The Contractor is responsible for coordinating with the vendors and making arrangements to having their Manufacturer's Representatives on site at appropriate times to suit the Contractor's progress of work.

Each of the major equipment suppliers will be required to provide a technically qualified Manufacturer's Representative to perform the initial start-up, commissioning, and training of their respective scope of supply, as per the supply Contracts.