



SCOPE OF WORKS

Port Douglas Waste Water Treatment Plant – UV Disinfection System

Contract No.: DSC2021-036

Scope of Works

1. General

Douglas Shire Council (DSC) is responsible for the operation of the Port Douglas Wastewater Treatment Plant (WWTP). The plant was upgraded in 1999, which included installation of an effluent UV disinfection system.

The existing UV disinfection unit is a Trojan 3000 unit. The system is an in-channel unit consisting of two banks of UV lamps, operating in duty/standby mode during average flow conditions and duty/duty mode during peak flows. The UV system is installed within a concrete channel with dimensions as per the Drawing No. 460- S-289. Council now wish to replace this system.

The Scope of work is for the Supply and Installation of a New UV Disinfection system and associated equipment at the Port Douglas WWTP.

The detailed scope of work shall include, but not be limited to:

- Removal of existing UV unit and placement in nominated area as advised by Council. Council shall arrange for separate disposal.
- Supply and installation of a new UV disinfection system and associated equipment, including, but not limited to power supply and control cubicle.
- Provision of telemetry signal cabling for status and alarms from the UV unit control cubicle to the Principal's SCADA system via the Main Electrical Switchboard. SCADA programming to be undertaken by others.
- Labels and notices in accordance with Occupational Health and Safety requirements. These are to ensure safe and correct operation and use of equipment. All such signs and labels to be supplied and installed by the contractor.
- All necessary appurtenances including fixings and supports.
- A site inspection to finalise measurements prior to supply and installation.
- Delivery to site at the Port Douglas WWTP and unloading of all equipment and materials supplied by the Contractor including storage where necessary.
- Site installation, including mechanical and electrical works, including upgrading of existing electrical switchboard.
- The supply of spare parts as recommended.

2. UV Disinfection Unit Specifications

2.1 General

The Ultra Violet (UV) disinfection plant shall consist of either an in-channel system, with two (2) banks of lamps, each to provide 50% capacity at maximum flow. Each bank shall have the capacity to provide disinfection of average flows, and shall operate in duty/standby mode.

The UV disinfection system shall be installed in the existing concrete channel as shown in Drawing No. 460-S-289. The Tenderer shall provide details of clearances and layout for its equipment installation.

2.2 UV Lamps

The UV plant shall utilise low pressure UV lamps. The lamps shall be mounted in a way that permits removal of the lamps for maintenance, without disturbing the operation of the remaining lamps.

Lamp ballasts shall be of the electronic type.

Lamp support frames shall be sufficiently robust to ensure that flexing during handling does not occur.

All materials exposed to UV radiation shall be UV resistant. Wetted metallic parts shall be 316 stainless steel (316 L where welded). All other wetted parts shall be resistant to mild acids.

The individual lamps shall be isolated to ensure that water ingress at one lamp connector will not enter the lamp frame and the electrical wiring and connection of the other lamps.

The Contractor shall supply all equipment necessary to provide onsite cleaning of the lamps, including lamp racks/banks.

2.3 Control and Monitoring

(a) UV Dose Control

UV dosage will be controlled by a minimum of one UV bank. Lamp output shall be able to be varied as a function of flow. No less than the minimum UV dosage must be supplied for all flows.

The control system must incorporate sufficient "dead band" or other means of ensuring that multiple switching of the lamps does not occur.

If multiple lamp banks are provided, then a means shall be provided to automatically rotate the duty lamp banks.

(b) Instrumentation

A UV intensity sensor shall be installed in each reactor of the UV disinfection plant. The sensor shall detect only germicidal UV wavelengths and shall monitor UV intensity changes due to lamp degradation and sleeve fouling.

The disinfection unit shall incorporate an hours-run meter for each lamp.

(c) Telemetry and Alarms

There is an existing flow meter on the effluent discharge pipeline. A 4-20 mA flow signal will be made available for the Contractor's use for UV dosage control purposes.

The Contractor shall be responsible for connection of the flow signal wiring to the UV Disinfection Plant.

The Contractor shall make available the following control signals, via a communication card (Ethernet IP):

- Power failure alarm;
- Lamp failure alarm for each individual lamp;
- Low UV intensity alarm;
- Low UV Dose alarm;
- Lamp status;
- Automatic Wiper status;
- Comms fault;
- UV intensity indication;
- UV Calculated Dose;
- UV Setpoint Dose;
- UV Transmissivity (UVT);
- System Flowrate;
- Lead Bank status;

These control signals shall be wired by others from the UV Disinfection system control panel to the WWTP's Main Electrical Switchboard. SCADA programming shall be undertaken by others.

2.4 Automatic Lamp Wiper

The UV disinfection system shall have automatic wiper capability for each bank of lamps.

2.5 Electrical Requirements

Each lamp of the disinfection unit shall be powered via heavy duty weatherproof power receptacles, supplied from the power supply and control cubicle, and shall be fitted with earth fault circuit interrupters. The power receptacles shall be mounted adjacent to the unit.

The power supply and control cubicle shall house the UV intensity monitor, hours run indicators, main isolator and control equipment and shall be suitable for fixing to a concrete slab foundation provided by others.

Alternative arrangements for power and control/instrumentation equipment will be accepted provided ease of maintenance and safety requirements are met.

3. UV System Performance Specifications

3.1 Flow Rates

The UV disinfection system shall be designed to disinfect effluent from the WWTP prior to discharge to the environment, or for reuse. The effluent is filtered through a tertiary media filter system prior to UV disinfection.

The unit shall operate satisfactorily over the following range of flow rates:

- Maximum Potential Flow: 120 L/s
- Average Flow: 60 L/s
- Minimum Flow: 0 L/s

3.2 Water Quality

The disinfection system shall be sized to disinfect drinking water with the following characteristics:

- Suspended Solids (maximum): 3 mg/L
- Turbidity (maximum): 5 NTU
- UV transmittance (minimum): 70%

3.3 UV Dose and Performance Requirements

The UV disinfection unit shall be sized to provide a minimum UV dose of 40 mJ/cm² under the following combination of conditions:

- all lamps have reached the end of their life;
- maximum lamp fouling before cleaning;
- minimum water transmittance of 70%

4. Electrical Wiring

The Contractor shall supply and install all electrical wiring associated with the UV Disinfection System and associated facilities.

All electrical wiring shall only be carried out by licensed electricians fully to the requirements of the SECV and AS 3000.

Wiring to all equipment required to operate under fire conditions and all fire interlock wiring shall be MICC type.

All fuses shall be "GEC" red spot type. Circuit breakers shall not be used.

Wiring to all equipment shall be from each of the new UV Disinfection Plant control cubicles.

Equipment requiring local manual control shall be provided with local stop-start control switches, which shall be wired back to the control cubicle to control equipment contactors and starters.

All control wiring shall be ELV. Only 3-phase motors shall be installed (excepting where only single-phase equipment is available).

5. Power Distribution and Control Cubicles (PDCCs)

The Contractor shall be responsible for the detailed layout of components of the cubicles.

The finished cubicles shall be of robust stainless steel construction suited to a corrosive marine environment. The cubicle shall provide minimum IP66 degree of protection to AS1939. All components and wiring shall be readily accessible via the access doors provided.

The Contractor shall supply and install the following for all equipment on the facia of the UV Disinfection control cubicle:

- Run/Fault indication
- UV Intensity meter
- Hours Run meter

6. Testing, Commissioning and Operator Training

The Contractor shall supply all test instruments and equipment required.

Fully commission, test and balance all equipment to relevant standards. Submit test results for approval. On approval arrange witnessed site testing to confirm and demonstrate results.

The Contractor shall demonstrate the systems and train the Principal's Operators in their use.

7. Warranties

The Contractor shall warrant the installation for 52 weeks from Practical Completion and make good any defects during this period.

Any defective item repaired or replaced shall be warranted for a further 52 weeks.

Warranties on any items or equipment that are less than this period shall be extended by the Contractor without extra cost to the Principal.

8. Operations and Maintenance Manuals and As-Constructed Drawings

The Contractor shall provide complete and detailed sets of Operating and Maintenance Manuals.

The Contractor shall also provide a complete set of as-constructed drawings.

9. UV Disinfection System Installation Sequence

Council will maintain disinfection with temporary chlorine dosing while the UV disinfection system is being upgraded. It is imperative that the installation time is minimised.