

**SECTION 44 44 73
ULTRAVIOLET DISINFECTION EQUIPMENT**

PART I -GENERAL

1.01 DESCRIPTION

- A. Work Included: This section describes the work necessary to furnish and install a horizontally mounted ultraviolet disinfection system to treat effluent flow before discharge.
- B. Method of Measurement and Basis of Payment: Payment will be made per the unit price for UV Disinfection Equipment and Chamber. Partial unit payment may be made based on percentage of completion. The Contractor and the Owner's Representative shall agree on percentage of completion.

1.02 SUBMITTALS

- A. Full shop drawings and catalog information showing operating characteristics, construction, dimensional properties, power requirements, controls and installation procedures for the UV disinfection equipment.
- B. Detailed dimensional drawing of Manufacturer's required channel and chamber configuration, compatible with the unit to be provided and including any and all locations for anchor bolts, conduit penetrations and other features as may be required.

PART II - PRODUCTS

2.01 DESCRIPTION

- A. The contractor shall furnish and install one Ultraviolet Disinfection System, complete and ready for operation in accordance with the specifications stated herein. The system shall be a horizontal series type containing at least two independently operable lamp sets, each designed to treat average flow of 120,000 gallons per day or 85 gpm, and total peak flow of 345,000 gallons per day or 240 gpm of effluent having the characteristics as described in section 2.02, below. For redundancy, each of the lamp sets shall be capable of operation with the other removed for maintenance. The ultraviolet disinfection system shall be capable of meeting E.coli limits set at 206 cfu / 100 ml monthly average and fecal coliform limits set at 400 cfu / 100 ml monthly average when operated in accordance with the manufactures operation and maintenance instructions. The system shall be designed for installation in a gravity flow effluent channel. Manufacturers: Enaqua; Trojan Technologies, Inc, Aqua Azul, or equal.

2.02 SYSTEM DESIGN PARAMETERS

- A. Influent Characteristics - The flow entering the System shall be of the Quality of water to meet the following characteristics:
 - 1. Inlet Water Quality:
 - a. Maximum suspended solids - 30 PPM
 - b. Maximum BOD₅ - 30 PPM

SECTION 44 44 73
ULTRAVIOLET DISINFECTION EQUIPMENT

2. Effluent Water Quality:
 - a. Average fecal coliform: 400 cfu per 100 ml sample geometric mean for samples collected daily in any consecutive 30 day period
 - b. Maximum daily fecal coliform: 1000 cfu per 100 ml

2.03 MATERIALS

A. Materials of Construction

1. Trough Housing Assembly - The trough housing assembly shall be constructed to allow the total system flow rate to pass through with the minimum head loss, in combination with acting as a housing for the UV light modules. All wetted and non-wetted surfaces of the Trough Housing Assembly shall be type 304 stainless steel. The inlet connection of the trough housing assembly shall be a flanged inlet and outlet box for connection.
2. Lamp Module Assembly - The lamp module frame shall be made of 304 stainless steel. The interconnecting cable from the lamp module to the conduit shall be indoor/outdoor type and shall be abrasion, flame, ozone, and fungus resistant. The lamp module assembly shall be tolerant to a temperature range of - 50 degrees C to + 90 degrees C. Lamp connectors shall ensure waterproof connection.
3. Quartz Gland Fitting - The quartz gland fittings shall be precision machined fittings made of Teflon. An o-ring groove shall be furnished to provide a water tight seal against the quartz sleeve.
4. UV Lamps - The ultraviolet disinfection unit shall utilize low pressure mercury germicidal lamps of instant start, hot cathode type using triple coiled filaments as cathodes. Each lamp shall produce ultraviolet light with at least 90% of the emission within the wavelengths of 2537 Angstroms. The lamp shall be rated to produce zero level ozone. The rated lifetime of the lamps shall be in excess of 8,500 hours.
5. Quartz Sleeves - The quartz sleeves shall be type 214 clear fused quartz and shall contain 99.9 percent Silicone Dioxide. The sleeves shall be rated for UV transmission of 95 percent and shall not be subject to solarization over the duration of rated service life.
6. Remote Sensor - The remote sensor probe shall be submersible and sensitive to 253.7 NM wavelength. The sensor shall be mounted with a watertight quartz sleeve and shall be mounted by means of a type 304 stainless steel clamp and shall be mounted to one of the quartz sleeves and directed at a lamp.
7. Outlet Baffle - A stainless steel outlet baffle shall be installed in the lamp housing assembly to control the water level in the trough so the UV lamps are submerged in the effluent irrespective of the design flow rate.
8. Controls: A NEMA 4 steel electrical control enclosure shall be provided to house the power ballasts, controls and current monitoring systems. Individual lamp and power status shall be monitored by observing the light emitting diodes (LED's) mounted on the control panel for easy viewing. A continuous duty fan shall be mounted within the enclosure, complete with replaceable filters, for providing constant cooling of the ballasts. An on/off switch shall enable power shut-off during servicing. Power and

SECTION 44 44 73
ULTRAVIOLET DISINFECTION EQUIPMENT

control leads shall be provided in sufficient length to allow connection from the lamp module to the panel without splicing, plus 3 feet of slack. A UV intensity monitor shall be furnished as a detection system for measuring the 254 nanometer component of UV spectrum. A remote sensor mounted within the trough housing assembly shall measure the UV intensity in the effluent and send the signal to the monitor controller mounted on the control panel. The control voltage shall be 118 volt, single phase 60 Hz. A pedestal shall be supplied to allow bottom entrance of all electrical connections. All controls shall be mounted to a removable sub-panel within the enclosure and shall be wired and spaced in accordance with the latest release of the National Electric Code. The control console shall be supplied with a properly sized GFCI safety switch to act as the main disconnect for the system.

9. Control Panel shall be mounted on uni-strut (2 posts) directly adjacent to concrete structure. Uni-strut shall NOT be mounted directly to concrete structure.
10. Primary power shall be fed from the Primary System Control Panel. All wiring and conduit required between the Primary Control Panel and the UV Control Panel shall be furnished and installed by the Contractor.
11. Control Panel (or separate adjacent cabinet) shall include a 15 amp single circuit Manual Transfer Switch with male plug to allow operator to manually switch from utility power to portable power.

PART III – PERFORMANCE

3.01 INSTALLATION

- A. The Contractor shall install the UV system and controls in accordance with the manufacturer's instructions. Chamber size and dimensions as shown on the drawings may not match the unit to be provided. The Contractor shall make modifications to the chamber as required to provide compatibility with the approved provided unit, with changes subject to shop drawing approval prior to construction. Changes in the chamber to suit the provided unit shall be at the Contractor's cost. Prior to system start-up, a manufacturer's representative shall inspect the installation and shall direct the Contractor in performance of any required corrections.

3.02 START-UP

- A. The contractor shall provide the services of a representative of the manufacturer who shall instruct the Owner's operator in the proper operation and maintenance of the ultraviolet disinfection unit, including instructions in conducting all required operational tests.

3.03 SPARE PARTS

- A. Prior to project close-out, the following spare parts shall be provided to the Owner:
 1. Two UV Lamps
 2. Two Lamp Sleeves
 3. Four End Plug assemblies
 4. One face shield

**SECTION 44 44 73
ULTRAVIOLET DISINFECTION EQUIPMENT**

3.04 O&M MANUALS

- A. The Contractor shall furnish to the Owner 4 bound copies of the manufacturer's Operation and Maintenance manual for the specific equipment supplied and installed. The manuals shall contain contact information for the authorized service representative, including telephone, fax and internet address.

END OF SECTION 44 44 73