

## SECTION 234312 - UV-C Germicidal Irradiation Wall-mounted or ceiling-mounted Upper-air fixtures

## A. GENERAL

## A.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

## A.2 SUMMARY

- A. Sections includes the following wall / ceiling-mounted upper-air system components:
  - 1. UV-C Germicidal Irradiation Fixture for targeted in-room Air Disinfection in high-risk, occupied indoor areas with ceiling heights of up to 9 feet, featuring louver assemblies engineered to collimate light to control UVC energy in the lower space.
  - 2. Surface Treatment and Maintenance of Coiling Coils UV-C Germicidal Irradiation Fixture for targeted in-room Air Disinfection in high-risk, occupied indoor areas with ceiling heights of 9 feet or greater, featuring open, non-collimated assemblies engineered to treat air volume in larger open spaces while controlling UVC energy in the lower space. (NOTE: Open louvered fixtures should not be installed in areas with highly reflective ceilings. Use louvered fixtures if high reflectivity is possible ensure safe stray energy levels in the lower occupied space).
  - 3. Related Work Specified in other sections:

## A.3 REFERENCES

- A. Current ASHRAE Handbook—HVAC Applications Chapter 60 – Ultraviolet Air and Surface Treatment
- B. Current ASHRAE Handbook—HVAC Systems and Equipment Chapter 17 – Ultraviolet Lamps Systems

## A.4 SUBMITTALS

- A. Product Data: Manufacturer's literature for UV-C Fixtures indicated.
  - 1. Dimensions, weights, capacities, and ratings.
  - 2. Wiring diagrams.
  - 3. Catalog cuts, engineering data sheets, list of unit numbers, UV-C Fixtures output and power consumption
  - 4. Product Certificates: For each type of UV lamp, fixture, and system.
  - 5. Sample warranty.
  - 6. Operation and maintenance data.
  - 7. Warranty
- B. Installation, operation, and maintenance manuals.
- C. UV-C Fixture Selection and Performance Summary
- D. Intensity Profiles

Computation Modeling Software report, showing tabular and graphical representation of UV-C disinfection modeling calculations, irradiation, intensity, and UV dosage calculations used to determine fixture placement, energy distribution and projected

E. Certifications

A.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum 5 years of documented experience.

B. Competency of Supplier/Manufacturer/Installer

1. The supplier/local distributor of the UV-C Fixtures system to have a qualified service organization in active operation. The organization to have had a history of competent service experience in installing and maintaining the specific types of systems described in the specifications, and has on its payroll sufficient qualified, experienced personnel to guarantee satisfactory performance of the installation. All maintenance personnel used in fulfilling the requirements of the installation shall be qualified to maintain this type of equipment.

C. Built in accordance with ISO 9001 procedures

A. Products: Performance Requirements Ultraviolet Lamps for Use in HVAC&R Units or Air Ducts on Irradiated Surfaces."

1. NRTL (UL,ETL) Compliance:

- a. UV-C Fixtures shall comply, meet or exceed ETL / UL Standards: 153 & 1598.
- b. UV-C Fixtures to be factory tested and the design, construction and installation to be in accordance with all applicable regulations having jurisdiction.

2. The manufacturer shall have the following test and verification capabilities and shall be able to provide test reports, as required, for the following:

- a. Testing for lamp life: verification that the UV-C lamps and power supplies will properly perform to the manufacturers rating.
- b. Test UV -C lamp systems according to ASHRAE 185.2, "Method of Testing UV -C Lights to Inactivate Airborne Microorganisms."
- c. UV-C material degradation test chamber and testing capability and data bank of typical materials performance under exposure to UV-C (ASHRAE 17.6)
- d. The manufacturer shall apply power to each UV-C Fixture and test the operation of power supply and test lamps during production, and provide date

- code for each UV-C Fixture.
3. The manufacturer shall have the capability to factory apply UV-C transparent polymer sleeves to lamps when specified.
  4. Upper room fixture(s) shall be installed in sufficient quantity to provide a minimum irradiance of 40  $\mu\text{W}/\text{cm}^2$  in all areas of the room being treated by UVGI.

#### A.6 DELIVERY, STORAGE, AND HANDLING

- A. Store UV-C Fixtures in a clean, dry place and protect from weather and construction traffic. Handle UV-C Fixtures carefully to avoid damage to components, enclosures and finish. Do not install any damaged components; instead replace them and return damaged components to equipment manufacturer.
- B. Comply with manufacturers' installation instructions and drawings regarding fixture placement for proper energy distribution fixture placement for proper energy distribution.

#### A.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's stated limits.

#### A.8 WARRANTY

- A. UV-C Fixtures shall be warranted to be free from defects in material and workmanship for a continuous operation period of 5 years from date of delivery.
- B. Lamps shall provide the intensity needed to meet or exceed the specified inactivation rates for a minimum of 9000 hours of continuous operation.

### B. PRODUCTS

#### B.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, acceptable manufacturers:
  1. Lumalier UV
  2. Evergreen UV

#### B.2 Design Requirements

- A. In-room Air Disinfection
  1. Wall-Mounted and Ceiling-Mounted upper air fixture
    - a. Irradiation – UV-C Germicidal Irradiation System is to be designed and installed in sufficient quantity so as to provide an optimum distribution of UV-C energy across the treated space.
    - b. When installed, the intensity will be sufficient to disinfect the target micro-

organism, Influenza and Coronavirus at a rate as scheduled on drawings .

### B.3 UV-C Germicidal Irradiation Upper-Air System

- A. UV-C Germicidal Irradiation Upper-Air System shall consist of the UV-C Fixtures needed to meet the level of irradiance as scheduled on drawings.
- B. The manufacturer shall use computation modeling software for selecting the appropriate number of UV-C Fixtures for the UV-C Germicidal Irradiation Upper-Air System of each treated space. The software shall produce tabular and graphical representation of UV-C disinfection modeling calculations, irradiation and UV dosage calculations to determine fixture placement, energy distribution and projected disinfection rates of targeted pathogens.

### B.4 UV-C Fixtures

- A. UV-C Fixtures shall be germicidal with factory assembled and tested housings and mounting structures. Each UV-C Upper Air Fixture shall consist of a lamp, lamp socket(s), power supply and lamp wiring. Provide disconnect for 120 V power.
- B. Power Supply:
  - 1. Power supply shall be of a high efficiency, high frequency, high power factor type with capability to operate with an input of 100-277VAC matched to the lamp and designed to maximize radiance and reliability.
  - 2. The power supply shall be protected from failure in the event of lamp failure and capable of operation indefinitely when powered with no lamp or failed lamp.
  - 3. The power supply shall be UL listed and designed for maximum UVC output and reliability.
- C. Housings:
  - 1. Shall be designed and constructed of heavy gauge aluminum for mounting on any wall, ceiling, or as shown in the plans.
  - 2. Shall be designed to mount using key -hole mountings holes at 16" centerlines.
  - 3. IF wall mounted, shall mount at a 3% upward angle.
  - 4. If ceiling mounted with collimating louvers, louvers must be mounted parallel or up to 3% upward angle so as not to exceed NIOSH / OSHA maximum UVC irradiance levels at eye levels in occupied lower space.
  - 5. BWG wiring for hard wire installation, protected my metal-clad cabling.
- D. Baffles:
  - 1. Shall be designed to be of non -reflective powder coated aluminum to minimize
  - 2. Unsafe levels of stray UV -C light energy, as defined by NIOSH / CDC, from entering the occupied zone, while providing 170° distribution of collimated UV -C energy (wall mounted) or 360° distribution (if ceiling hung) throughout room.
- E. Sockets
  - 1. shall be constructed of UV-C resistant materials
  - 2. The Lamp Socket shall accommodate a single ended four-pin UV-C lamp
  - 3. Wires from the lamp socket to the power supply shall be coated with UV resistant material and rated at 600 volts.

## F. Lamp:

1. Lamp shall be a be Compact Twin Tube bulb, low pressure UV-C lamp non-proprietary, commercially available standard output (SO),. Lamp tubes shall be constructed of Sodium Barium glass and internally coated, designed to extend lamp life and maintain output. Uncoated quartz lamp tubes shall not be acceptable. Lamp Watts shall be printed on all lamps, no exceptions.
2. Lamps shall be equipped with a four-pin lamp base.
3. When specified, lamps with UV-C transparent polymer sleeves shall be provided. Application of the polymer sleeve shall have the benefit of protecting the lamp and in the event of breakage, contain the glass and mercury for disposal. (Note: sleeves reduce UPC output by approximately 11%)
4. Lamp life shall be a minimum of 9000 continuous hours of service.
  - a. The lamp shall produce no less than 85% of its initial UV-C output at end of useful life.
  - b. Manufacturer shall provide proof of testing data that shows lamp intensity at the end of useful lamp life.
  - c. Each lamp shall contain no more than 4.5 milligrams of mercury.

## G. Driver

1. Shall be UL Listed, waterproof, 120-277Vac +/-10% - 50/60Hz, high power factor, low THD, Class P, Sound Rated "A", auto -matching, Type 1 Outdoor types with thermal and end of lamp life protection and no PCB's.
2. Shall maximize lamp output, energy efficiency and reliability and warranted for five (5) years.

## H. Safety

1. UV -C system shall include an On/Off toggle switch(s) and shall have a safety disconnect switch when the baffles are removed for cleaning or lamp change out.
2. Caution labels/signage shall be applied to walls indicating upper -air UVGI is in use and shall advise to switch off lamps before entering upper room

## B.5 Execution

## A. Installation Of Upper Air Fixture

1. Install UV -C lamp systems according to manufacturer's installation manual and drawings unless otherwise indicated
2. Install UV lamps in each UV -C lamp system.
3. Install UV -C lamp systems in locations that are accessible and that will permit servicing and maintenance.
4. Provide six feet (6fy) of wiring loom to facilitate lamp connection to a remotely located power supply and/or power supply housing, such that lamp and loom can be mounted anywhere in the system.
5. Identify UV -C lamp systems with equipment labels.
6. After installation, adjust UV -C lamp systems and supports to maximize exposure to surfaces, before energizing system.

## B. Electrical Connections:

1. Provide electrical power and service disconnects to products requiring electrical connections.
  2. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
- C. Switches and Circuit Breakers:
1. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems"
- D. Operational Test:
1. After installing UV -C lamp systems, and after electrical circuitry has been energized, test units to confirm proper operation.
  2. Confirm proper operation of safety interlock power switches
- E. Cleaning
1. Wipe lamps clean using manufacturers' recommended cleaning methods and materials.
- F. Demonstration
1. Engage a factory -authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain UV -C lamp systems.