HVAC UVC Germicidal Irradiation (UVGI) Performance Specification

For IAQ & Heat Transfer Efficiency: HVAC Mould, Bacteria & Odour Control

GENERAL

Specification requirements of germicidal UVC Emitters to achieve improved indoor air quality (IAQ), the restoration of heat transfer, airflow and pressure drop, reduced maintenance costs, reduction in chemicals on Air Handling Unit Cooling Coils and Drain Pans.

Requirements and performance for UVC Energy Fields on Cooling Coils to achieve these outcomes, including to deactivate and remove Biofilm and prevent Biofilm from forming.

Australian/New Zealand electrical safety and EMC compliance

The complete UVC emitter system shall be independently tested and certified for electrical safety in its supplied configuration, including the ballast/controlgear, UVC emitter, lamp holders, cables, connectors and plugs.

Testing and certification shall comply with the following standards, in the editions current at the date of certification, with certificates valid and unexpired at the date of tender:

- AS/NZS 61347.1 — Lamp control gear: General and safety requirements
- AS/NZS 61347.2.3 — Particular requirements for electronic control gear for fluorescent lamps
- AS/NZS 60335.1 :2020 —Electrical appliances: General safety requirements
- AS/NZS 60335.2.65 :2015 — Particular requirements for air-cleaning appliances
- AS/NZS CISPR 15 — Electromagnetic compatibility and radio-disturbance limits

Certification of the ballast or any other individual component alone shall not be accepted as evidence of compliance of the complete UVC system.

Certification shall include the applicable operational endurance test conducted using the matched ballast, UVC emitter, cables and connectors forming the supplied system, together with the required temperature, abnormal-operation, electrical-safety, heat and fire-resistance testing.

Tenderers shall provide:

- The Australian or New Zealand certificate of conformity or certificate of suitability covering the complete supplied system;
- The certificate schedule identifying the proposed brand and model;
- Evidence that the operational endurance test covered the matched system configuration;
- Evidence of EMC compliance, for example the applicable EMC test report; and
- Evidence of RCM compliance and registration of the responsible supplier on the EESS database.

All certificates and test reports shall be issued or accepted by appropriately accredited Australian or New Zealand certification and testing bodies. Overseas certificates, component-only approvals, CE marking or supplier declarations shall not be accepted as substitutes for Australian/New Zealand complete-system certification.

Acceptable Manufacturers

Steril-Aire LLC, Models SE, RSE GTS & EGTS Series, or approved equal. A product offered as an equal is accepted where the tenderer demonstrates compliance with every requirement of this specification and submits the evidence listed under Verification with the tender. The named reference product is limited to products of Steril-Aire LLC; a product or company with a similar or derivative name is not the named product. The UVC/UVGI system shall be supplied by the manufacturer or its authorised Australian/NZ distributor.

UVC EMITTER PERFORMANCE & EQUIPMENT DESIGN REQUIREMENTS

Consistent with AIRAH DA15 Manual Section 12.7.4, UVGI for coil cleaning. Where the values below differ from DA15, the values below apply:

Irradiance on the Down Stream Coil Face: End of life irradiance on the cooling coil face shall exceed 750 µW/cm² at the end of 18,000 hours of operation, measured in 2–2.5 m/s airflow at 10-13 °C. Initial irradiance at the extreme edges of the coil shall be not less than 930 µW/cm², measured under the same conditions. (Necessary to deactivate and remove biofilm and prevent biofilm from forming.)

Units shall be high output, HVAC-type, germicidal UVC light sources, factory assembled and tested. Components shall include a high efficiency electronic power source, Emitter sockets and Emitter tube, all constructed to withstand HVAC environments.

High efficiency electronic power sources shall be suitable for a 230 V, 50 Hz supply and capable of igniting each Emitter at temperatures from 1 °C to 70 °C in airflow velocities common to HVAC systems. They shall be Programmed Start and equipped with RF, line noise suppression and End of Emitter Life Circuit Protection.

Emitter tube shall be of the high output, hot cathode, T5 (15 mm) diameter, and medium bi-pin type. They shall produce 95% of their energy at 254 nm and be capable of producing the specified output at airflow velocities common to HVAC systems and at temperatures of 1 °C to 70 °C. UVC Emitters shall produce no ozone or other secondary contamination.

WARRANTY

Fixture and Emitter shall be 100% warranted to be free from factory defects for a period of 18,000 continuous hours of operation.

The Power Supplies/electronic Ballasts shall have a lifetime warranty, conditional on emitters being replaced at 18,000 hours of continuous operation with the manufacturer's genuine emitters.

Tenderers shall submit their warranty terms, stating the warranty period, whether it is based on time or hours of operation, which components are covered (including power supplies and other electrical components) and for how long, and all exclusions.

VERIFICATION

Provide Cooling Coil UVC Energy Field drawings showing irradiance exceeding 750 µW/cm² on all parts of the cooling coil at the end of the 18,000 hours of operation, measured in 2–2.5 m/s airflow at 10–13 °C. State whether the drawings are modelled or measured, and provide the supporting test data.

Irradiance drawings shown in still, ambient air will not be accepted.

Provide three Australian/NZ case studies showing HVAC efficiency and or IAQ improvements, validated by a party independent of the supplier.

DESIGN REQUIREMENTS

Irradiation — Emitters are to be installed downstream of the coil horizontally across the full face of the coil without the use of reflectors in sufficient quantity and in such an arrangement so as to provide an output as specified in this document and equal distribution of UVC energy on the coil and in the drain pan. To maintain energy efficiency, the UVC energy produced shall be of the lowest possible reflected and shadowed losses.

INSTALLATION OF UVC EMITTERS

- Coordinate with installation of HVAC equipment and install Emitters as indicated after such equipment is properly installed.
- Provide an interlock switch on access to the UVC Emitters to turn the emitters off when the access is opened.
- Provide a view port to enable the maintenance technician to view Emitters to determine that they are operating.
- Install provided Caution Labels on all access to the Emitters.
- Provide control for cycling the Emitters with the AHU run times if not 24/7 operation.
- If specified (optional) provide fault/status monitoring capable of informing BMS if there is an Emitter failure.

UVC IRRADIANCE DESIGN AND IN-SITU MEASUREMENT REPORT

The manufacturer shall provide, with the Cooling Coil UVC Energy Field drawings, a design and in-situ measurement report for at least one type of emitter, taken from an installed and operating AHU or FCU in Australia or New Zealand. The report shall establish the correlation between the design irradiance and the irradiance measured in situ.

The report shall include:

- Design sheet: coil dimensions, emitter model, quantity and positions, emitter-to-coil distance, design airflow and air temperature, the irradiance energy field across the coil face, and the minimum, maximum and average irradiance at initial operation and at 18,000 hours of operation;
- Measured sheet: design and measured irradiance shown side by side at the coil extremities (corners) and centre; the measured emitter-to-coil distance, airflow and air temperature; the

measured minimum, maximum and average irradiance; and notes explaining any variation from design;

- Measurements made at the coil using a calibrated radiometer/photometer accurate to +/- 3% radiometric and photometric for NIST transfer standards in the monochromatic irradiance at 254 nm; and
- The date of measurement, the name of the person who carried it out, and confirmation that all UVC emitters were operational.

OPTIONAL VERIFICATION COMMISSIONING (WHERE A DISCREPANCY ARISES)

Commissioning is not required as part of the standard installation; however, the client may elect to include verification commissioning to confirm that installed UVC irradiance meets this specification, such as where system performance or the irradiance report is in question. Verification commissioning shall apply to the UVC system(s) nominated by the client. Where the installation is shown to comply, the cost of verification commissioning shall be borne by the client. Where the installation is shown not to comply, the cost shall be borne by the supplier. Verification commissioning shall be carried out as follows and witnessed by the client representative::

Intensity — UVC measurement shall be made at the coil using a calibrated radiometer/photometer accurate to +/- 3% radiometric and photometric for NIST transfer standards in the monochromatic irradiance at 254 nm.

Verification commissioning shall be carried out by the manufacturer's field representative or its authorised Australian/NZ distributor. It shall verify the intensity level of each affected UVC system, demonstrating that it has met or exceeded the minimum and average UVC intensities as specified in the UVC Emitter Germicidal Lamp Disinfection Schedule in the Mechanical Drawings Section. The Schedule shall state minimum intensities not less than those stated under Irradiance on the Down Stream Coil Face.

Verification commissioning shall be performed on the affected AHU(s) during operating conditions, after the UVC emitters have operated for at least 10 minutes.

Points of measurements for UVC system minimum intensity shall be demonstrated by measuring at the four extreme corners (extreme position is defined as one square centimetre of coil at one corner of the area covered by the lamp) of the coil surface in the same plane as the irradiated surface. Each corner shall meet or exceed specified minimum intensity as defined in the UVC Emitter Germicidal Lamp Disinfection Schedule.

Additionally, points of measurements shall be taken every one (1) square metre across the face of the coil. The average intensities shall be calculated by averaging the four (4) corner measurements with those measurements taken every one (1) square metre.

Points of measurement shall be made using a calibrated radiometer/photometer accurate to +/- 3% radiometric and photometric for NIST transfer standards in the monochromatic irradiance at 254 nm. This measurement shall be used to verify compliance.

The verification commissioning report, demonstrating and verifying design intensity levels, actual recorded levels and measurement locations, shall be provided to the client upon completion.