SECTION 234320 - AIR PURIFICATION SYSTEM

PART 1 - GENERAL

DESCRIPTION OF WORK

This section describes the design, performance and installation of an air purification system intended for use as part of another manufacturer's air handling unit.

REFERENCED CODES & STANDARDS

The following codes and standards are referenced throughout. The edition to be used is that currently enforced by the authority having jurisdiction (AHJ) or in absence of such direction that referenced by the current enforceable IBC code or as indicated by the contract documents, except where specifically referenced by this section of the specifications.
ASHRAE Standards 62 & 52
National Electric Code NFPA 70
UL 867-2007 including ozone chamber test required as of December 21, 2007
QUALITY UL 2998 Environment – No Ozone Certification
The cold plasma equipment and power supply shall be UL listed.
ASHRAE 62 now requires all electronic air cleaners to be UL 2998 certified as an ozone free device. Products without UL 2998 shall not be acceptable.

RELATED WORK

Facility Access and Protection
Ductwork
Filters
Water and Refrigerant Piping
Electrical Wiring
Control Wiring

and IP ASSURANCE

Basis of design is Global Plasma Solutions GPS FC-48. Approved equals by Airgenics and Bioxgen subject to specification.
The Air Purification System shall be a product of an established manufacturer within the USA. Direct Current (DC) Ion modules manufactured outside the USA and assembled in the USA on mounting plates or formed channels shall not be acceptable.
A qualified representative from the manufacturer shall be available to inspect the installation of the air purification system to ensure installation in accordance with manufacturer's recommendation.
Technologies that do not address gas disassociation such as UV Lights, Powered Particulate Filters and/or polarized media filters shall not be considered. Uni-polar ion generators shall not be acceptable. "Plasma" particulate filters shall not be acceptable. Any system containing titanium dioxide (Ti02), which has been listed by the CDC as a known carcinogen, shall not be acceptable.
The Air Purification Technology shall have been tested by UL to prove conformance to UL 867-2007 including the ozone chamber testing and peak ozone test for electronic devices. Manufacturers that achieved UL 867 prior to December 21, 2007 and have not been tested in accordance with the newest UL 867 standard with the ozone amendment shall not be acceptable. All manufacturers requesting prior approval shall submit their independent UL 867 test data with ozone results to the engineer for preliminary review and during the submittal process. All manufacturers shall submit a copy with their quotation. Contractors shall not accept any proposal without the proper ozone testing documentation.
The maximum allowable ozone concentration per the UL 2998 chamber test shall be 5 PPB. Manufacturers with ozone output exceeding these ozone values shall not be acceptable.

All manufacturers shall have their product tested to UL 2998 Environmental Standard for confirmation of no ozone with certificate available. The final report shall indicate the ozone levels and high voltage output the device's electrode(s) were operating during the test. Reports that do not include high voltage output during the UL 2998 testing shall not be acceptable.

SUBMITTALS

Product Data: Submit manufacturer's technical product data for ion generators including:

Schedule of plasma generators indicating unit designation, number of each type required for each unit/application.

Data sheet for each type of plasma generator, and accessory furnished; indicating construction, sizes, and mounting details.
Performance data for each type of plasma device furnished.
Product drawings detailing all physical, electrical and control requirements.
Copy of UL 867 independent ozone test.
Copy of UL 2998 conformance certificate.
Statement on the manufacturer's letterhead stating that the technology contains no titanium dioxide (Ti02).
Operating & Maintenance Data: Submit O&M data and recommended spare parts lists.

PRODUCT DELIVERY, STORAGE AND HANDLING

Deliver in factory fabricated shipping containers. Identify on outside of container type of product and location to be installed. Avoid crushing or bending.
Store in original cartons and protect from weather and construction work traffic.
Store indoors and in accordance with the manufacturers' recommendation for storage.

WARRANTY

Equipment shall be warranted by the manufacturer against defects in material and workmanship for a period of eighteen months after shipment or twelve months from owner acceptance, whichever occurs first. Labor to replace equipment under warranty shall be provided by the installing contractor.

PART 2 - PRODUCTS

2.1 GENERAL

A. The air purification system(s) shall be of the size, type, arrangement and capacity indicated and required by the unit furnished and shall be of the manufacturer specified.

2.2 BI-POLAR IONIZATION DESIGN & PERFORMANCE CRITERIA

A. Each piece of air handling equipment, so designated on the plans, details, equipment schedules and/or specifications shall contain a Plasma Generator with Bi-polar Ionization output as described here within.
B. The Bi-polar Ionization system shall be capable of:
   1. Effectively killing microorganisms downstream of the bi-polar ionization equipment (mold, bacteria, virus, etc.).
   2. Controlling gas phase contaminants generated from human occupants, building structure, furnishings and outside air contaminants.
   3. Be Self Cleaning requiring minimal maintenance. Units that are not self cleaning will not be acceptable.
   4. Capable of reducing static space charges.
   5. Effectively reducing space particle counts.

6. When mounted to the air entering side of a cooling coil, keep the cooling coil free from pathogen and mold growth.
7. All manufacturers shall provide documentation by an independent NELEC accredited laboratory that proves the product has minimum kill rates for the following pathogens given the allotted time and in a space condition:

A. MRSA - >96% in 30 minutes or less
B. E.coli - > 99% in 15 minutes or less
C. TB - > 69% in 60 minutes or less
D. C. diff - >86% in 30 minutes or less
E. Noro Virus -> 93.5% in 30 minutes or less
F. Legionella -> 99.7% in 30 minutes or less

Manufacturers not providing the equivalent space kill rates shall not be acceptable. All manufactures requesting prior approval shall provide to the engineer independent test data from a NELAP accredited independent lab confirming kill rates and time meeting the minimum requirements stated in section 2.2 B, points 6A, 6B and 6C. Products tested only on Petri dishes to prove kill rates shall not be acceptable. Products being sold under different trade names than those tested shall not be acceptable.

7. Capable of modular field assembly in six inch (150mm) sections.

C. The bi-polar ionization system shall operate in a manner such that equal amounts of positive and negative ions are produced. Uni-polar ion devices shall not be acceptable. Ionizers with positive and negative output (DC type) shall not be acceptable. All ionizers provided shall be AC type ionizers with one electrode pulsing between positive and negative.

1. Air exchange rates may vary through the full operating range of a constant Volume or VAV system. The quantity of air exchange shall not be increased due to requirements of the air purification system.
2. Velocity Profile: The air purification device shall not have maximum velocity profile.

D. Humidity: Plasma Generators shall not require preheat protection when the relative humidity of the entering air exceeds 85%. Relative humidity from 0 - 100%, condensing, shall not cause damage, deterioration or dangerous conditions within the air purification system. Air purification system shall be capable of wash down duty.

E. Equipment Requirements:

1. Electrode Specifications (Bi-polar Ionization):

a. Each alternating current (AC) Ionization Bar with Bi-polar Ionization output shall include a minimum of eighteen carbon fiber cluster ion needles per foot of coil face width shall be provided. The entire cooling coil width shall have equal distribution of ionization across the face. Systems without ion needles at least 0.50” (12.5mm) apart shall not be acceptable. The plasma electrode shall require no more than 1.0” (25mm) in the direction of airflow for mounting. All hardware required for mounting shall be provided by the air purification manufacturer except self-tapping screws for the power supply. Bi-polar ionization tubes manufactured of glass and

steel mesh shall not be acceptable due to replacement requirements, maintenance, and performance output reduction over time, ozone production and corrosion.

b. Electrodes shall be provided in 6.0" (150mm) increments, epoxy filled for an IP55 rating and utilizing brass connection hardware that is recessed into the connection joint once fully engaged and assembled.

c. Electrodes shall be energized when the main unit disconnect is turned on.

d. The ionization output shall be a minimum of 60 million ions/cc per inch of cooling coil width as measured 1 inch from the cold plasma needles.

e. Ionization bars shall be provided with magnet mounting kits to prevent penetration into cooling coils.

f. Ionization bars shall be constructed of UL 94VO and UL746C composite material.

F. Air Handler Mounted Units:

a. Where so indicated on the plans and/or schedules Plasma Generator(s) shall be supplied and installed. The mechanical contractor shall mount the Plasma Generator and wire it to the remote mount power supply using the cables provided by the air purification manufacturer. A 24VAC, 115VAC or 208-230VAC circuit shall be provided to the plasma generator power supply panel. No more than 15 watts shall be required per power supply. Each power supply shall be capable of powering up to 6 ionization bars or a total of 50 linear feet of bar(s). Each plasma generator shall be designed with fiberglass housing, liquid tight flexible conduit and a high voltage quick connector.

G. Plasma Requirements:

2. Plasma Generators with Bi-polar ionization output shall be capable of controlling gas phase contaminants and shall be provided for all equipment listed above.

a. The Bi-polar ionization system shall consist of Bi-Polar Plasma Generator and power supply. The Bi-polar system shall be installed where indicated on the plans or specified to be installed. The device shall be capable of being powered by 24VAC, 115VAC or 208-230VAC without the use of an external transformer. Ionization systems requiring isolation transformers shall not be acceptable.

b. Ionization Output: The ionization output shall be controlled such that an equal number of positive and negative ions are produced (AC Ionizers only are acceptable). Imbalanced levels shall not be acceptable.

c. Ionization output from each bar shall be a minimum of 120 million ions/cc per inch of bar when tested at 1" from the ionization bar. Bars with needles spaced further apart than 0.5" shall not be acceptable.

d. Each plasma electrode shall be made from an all fiberglass composite, UL 94V0 and UL 746C rated material for prevention of corrosion and electrical insulation.

3. Ozone Generation:

a. The operation of the electrodes or Bi-polar ionization units shall conform to UL 2998 as tested by UL proving no ozone output.

H. Electrical Requirements:

4. Wiring, conduit and junction boxes shall be installed within housing plenums in accordance with NEC NFPA 70. Plasma Generator shall accept an electrical service of 24VAC, 115 VAC or 208-230VAC, 1 phase, 50/60 Hz. The contractor shall coordinate electrical requirements with air purification manufacturer during submittals.

I. Control Requirements:

5. All Plasma Generators shall have internal short circuit protection, overload protection, and automatic fault reset. Systems requiring fuses shall not be acceptable.
6. The Plasma Generator power supply shall have internal circuitry to sense the ionization output and provide dry contact alarm status to the BMS as well as a local "Plasma On" indication light.
7. The installing contractor shall mount and wire the Plasma device within the air handling unit specified or as shown or the plans. The contractor shall follow all manufacturer IOM instructions during installation.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for maintaining all air systems until the owner accepts the building (Owner Acceptance).

3.2 ASSEMBLY & ERECTION: PLASMA GENERATOR

A. All equipment shall be assembled and installed in a workman like manner to the satisfaction of the owner, architect, and engineer.
B. Any material damaged by handling, water or moisture shall be replaced, by the mechanical contractor, at no cost to the owner.
C. All equipment shall be protected from dust and damage on a daily basis throughout construction.

3.3 TESTING

A. Provide the manufacturers recommended electrical tests.

3.4 COMMISSIONING & TRAINING

A. A manufacturer's authorized representative shall provide start-up supervision and training of owner's personnel in the proper operation and maintenance of all equipment.

END OF SECTION 234320