DIVISION 15

1.0 KITCHEN EXHAUST ELECTROSTATIC AIR CLEANER WITH ODOR CONTROL

1.1 Equipment Description

1.1.1 The Air Cleaner shall handle the contaminated air from kitchen exhaust hoods containing grease, smoke (aerosols), odors(vocs and svocs)

1.1.2 The unit shall be modular in construction and shall have individual sections of inlet, prefilter, ionization collector section(s) [with or without automatic washing system]; housing for MERV 17 class I safety filter; odor adsorption section(s) outlet transition and UL 762 exhaust fan; unit is supplied with control panel, motor starter, one point wiring and plumbing

1.1.3 Outdoor package available which includes upblast fan; NEMA 12 control Box; weather-resistant housing and heat trace

1.2 Equipment specifications

1.2.1 The air filtration system shall be a Green Kitchen Designs GreaZ®Zapper Model (2000, 4000, 8000) modular two stage Penny-type Electrostatic precipitator (with/without) a wash system.

1.2.2 The system shall be provided with (single/double pass) odor control housings. Carbon panels shall be provided for the first pass only.

1.2.3 The system shall be a single(2000) or double (4000/8000) pass configuration and can be provided with GreaZ®Ztoppa - MERV 17 media filters for an additional 25% CFM capacity.

1.2.4 Particulate filtration efficiency shall be evaluated using ASTM 2519 or ASHRAE 52.2 using an aerosol generator and oleic acid as the test challenge. The specified unit shall have demonstrated a removal efficiency of at least 95% for the 0.3 micrometer particle size

1.2.5 Unit shall comply with UL 867 and UL 710 standard or equivalent standards. The units shall be in complete accordance with ASHRAE standard 52-76 for air cleaners test and rating of Efficiency, Resistance and Dust holding capacity.

1.2.3 Ozone Generation concentration shall not exceed 0.05 PPM.

1.2.4 A manufacturer shall supply the unit with expertise in design and manufacturing of products specified in this section with a minimum of 30

years of documented experience.

1.3 Principle of Operation

1.3.1 The factory welded transition shall assure even air distribution to the precipitator entrance and eliminate leakage of grease and/or wash water

1.3.2 The pre-filter (perforated steel) shall remove large grease particles.

1.3.3 The electronic filter shall remove the smaller grease and smoke particles.

1.3.3.1 The principle of operation shall be based on electrostatic deposition.

1.3.3.2 The particle shall pass by an ionizing wire, which will induce a positive charge on the particle. The particle then shall pass between closely spaced aluminum plates , which are held at a positive charge and a ground.

1.3.3.3 As the charged particle travels between the two aluminum plates it shall be forced away from the plate held at the identical polarity and drawn towards the grounded plate. Once attached the particle shall remain on the plate until cleaned off during washing.

1.4 Unit Housing

1.4.1 Housing shall be 16 gauge (1.5mm) CRS with epoxy coat finish construction. All critical seems shall be welded.

1.4.2 Each section shall include single door access, located on one side of the unit. The access door shall be mounted on steel hinges and secured with adjustable,gasket sealed lever latches allowing for component access and removal. All doors shall be gasketed to prevent air and water leakage.

1.4.3 High voltage contacts on the housing shall be made of phosphor/bronze

1.4.3 Enclosure for electrical components shall be included to prevent leaks to the power supply.

1.4.5 Unit shall have flanges on the inlet for connecting ductwork.

1.4.6 Unit shall be attached to exhaust fan with factory welded transiton

1.4.7 Entire unit shall come mounted on unitary steel rail. For smaller units; C-channel shall be used. For larger units; I-beam shall be used. Combination lifting lugs/tie rod female connector shall be welded into the beams. Autowash units shall have removal drain pan that slides into I-beam track.

1.4.8 Unit shall be provided with drainage fitting. All drainage piping shall be metal. For autowash, water column exceeding the system static by one inch shall be field installed by contractor

1.4.9 Electrical contacts shall be in the door for ease of maintenance.

1.4.10 Each unit shall have track guides for proper alignment of cell, making it possible to change the direction of airflow by reversing the orientation of electronic collector cell(s).

1.5 Finish

1.5.1 The external casing finish shall be a durable industrial grade semi gloss Baked on epoxy ester, not less than 3-mil minimum thickness.

1.7 Prefilter

1.7.1 Access to the prefilter shall be from the side through the same hinged door To gain access to the electronic cells.

1.7.2 Separator section shall be designed for an equal airflow across the entire Air cleaning unit.

1.7.2 Prefilter shall be perforated steel for nonwash system. For autowash systems frame is washable aluminum 0.25 inch (6.4 mm) thick mesh. 8 layers of mesh are used to optimally remove larger particles of grease and dust before the main filter. Face of each prefilter shall be 4 square feet

1.8 Electronic cells

1.8.1 Electronic cells described in this section refer to a full size cell. Half size cells can be specified when air volume does not exceed name CFM.

1.8.2 Ionizing-Collecting cell shall be of one-piece construction 10.75 inches (273mm) deep in direction of airflow. Face area of each cell shall be 4.08 squarefeet (0.38 square meters) and the effective collecting area 240 square feet (22.29square meters)

1.8.3 Frame All support framing, end plates and ionizer ground electrodes shall be 0.080-inch (2.03-mm) thick aluminum. 1.8.3 Handle shall be located on the side of the cell for removal of the cell from the air cleaner. The handle shall be grounded to the frame of the cell. Engraving shall be on the handle indicating “this side out”.

1.8.4 Contacts shall be made of phosphor bronze on the front of the cell. They shall make contact with the ionizing, collector and ground sections of the cell.

1.8.5 Ionizer section

1.8.5.1 Ionizing wires shall be minimum of 11 per electronic cell, with a length of 20.32 inches (533.4 mm) each.

1.8.5.2 Ionizing wires shall be constructed of 0.010 inches diameter (0.25 mm) Tungsten for prevention of corroding or breaking. Wires shall be fixed at one end and spring mounted on the other for ease of maintenance.

1.8.5.3 There shall be 10 grounding plates between the wires stabilize the ionization field for better performance. Grounding plates shall be no greater then 1.964 inches (49.89 mm) apart, and 0.063 inches (1.6 mm)thick.

1.8.5.4 Insulators for the Ionizer shall be made of ceramic measuring 1.0 inches (25.4 mm) thick by 2.25 inches (57.15 mm) square with a center hole measuring 0.275 inches (6.95 mm) in diameter. The insulators should have a protective coating of glazing to retard tracking. Insulators shall not number less than 4 in the ionizer section.

1.8.6 Collector section

1.8.6.1 Grounding plates shall be a minimum of 0.025 inches 0.635 mm) thick aluminum. The plates shall be 7.64 inches (194 mm) deep in the direction of airflow. Grounding plates shall be a minimum of 54 quantity per cell. Spacing between grounding plates shall be at 0.3678 inches (9.34 mm). Spacing between the grounding plates and the charged plates shall be at 0.1839 inches (4.67 mm).

1.8.6.2 Charged plates shall be a minimum of 0.025 inches (0.635 mm) thick aluminum. The plates shall be 7.14 inches (181.36 mm) deep in the direction of airflow. Charged plates shall be a minimum of 55 quantity per cell. Spacing between charged plates shall be at 0.3678 inches (9.34mm).

1.8.6.3 Separator rods shall be made of aluminum with notches to hold the ground and charged plates apart at given lengths. Rods shall be 0.25 inches (6.35 mm) in diameter. The separator rods shall run the length of the cell to the frame of the cell. There shall be at least 11 rods total per cell.

1.8.6.4 Insulators for the collector shall be made of ceramic measuring 0.8 inches (20.32 mm) thick by 2.25 inches (57.15 mm) square with a center hole measuring 0.275 inches (6.99 mm) in diameter. The insulators should have a protective

coating of glazing to retard tracking. Insulators shall not number less than 10. Insulator shall be out of the air stream.

1.8.6.5 Markings shall be on the cell to inform clean weight of the cell Engraving shall be on the cell indicating direction of the airflow.

1.9 Power Supply

1.9.1 Power supply shall be of a 100% solid state type.

1.9.2 Power supply shall be mounted within the air cleaner out of the air stream and wash components.

1.9.3 Voltages

1.9.3.1 Input voltage shall be 108-132Vac, 60 HZ, 1 phase

1.9.3.2 Output High frequency with built in short circuit and arc protection, providing a dual high voltage output of (+)9.5 KVDC for the ionizer and(+) 4.7 KVDC for the collector

1.9.4 The power supply shall operate over a temperature range of –20 to 140 degrees F (-38 to 85 degrees C)**.**

1.9.5 Be self-protecting

1.9.6 Accommodate a neon light indicating the performance status

1.10 Interlock switches

1.10.1 Location –Integrally grounded, door operated electrical safety interlock switch shall be provided to prevent access to the high voltage collector cells without first interrupting the primary input power.

1.11 Wash system

1.11.1 Detergent pump

1.11.1.1 Detergent used shall be Safe Air Service CellSafe® detergent.

1.11.1.2 Pump shall move 0.083 GPM (18.85 liters per hour) of detergent, and have a vertical rise rating of 7 feet (2.13 meters)

1.11.2 Water valve

1.11.2.1 Water wash temperature shall be 125 to 160 degrees F (51 to 71

degrees C).

1.11.2.2 Shall use approx. 35 gallons of water per wash cycle per cell.

1.11.3 Manifold motor and gears

1.11.3.1 Manifold motor shall be located within the unit out of the air stream.
1.11.3.2 Manifold motor for spray assembly shall have a minimum of 4 RPM.
1.11.3.3 Gears shall be constructed of heat treated steel.
1.11.3.4 Manifold motor housing shall be made of cast aluminum.
1.11.3.5 Manifold motor shall have a life expectancy of 20 years operated at normal conditions.

1.11.4 Detergent valve

1.11.4.1 Detergent usage shall be 3 – 5 % in water

1.11.5 Piping

1.11.5.1 All piping shall be NPT.
1.11.5.2 Nozzles
1.11.5.2.1 Spray bar assembly in its entirety shall achieve 100% coverage of the collector cell. Assembly shall be located for overhead component cleaning.
1.11.5.2.2 Water wash spray shall articulate over a 73-degree range of motion.
1.11.5.2.3 Spray bar shall traverse along the cell with a minimum Of 1.5 inches (3.81 cm) of travel.
1.11.5.2.4 There shall be a minimum of 9 nozzles per cell spaced No more than 4 inches (10.16 cm) and no less than 3 Inches (7.62 cm) apart.
1.11.5.2.5 Pressure of spray on the cells shall be no greater than 75 psi (517 KPa)
1.11.5.3 Piping installed between solenoids shall be brass and solderless and installed in series to make for easier service and replacement.

1.11.6 Solenoid valves shall be fail-closed to prevent excessive leaking in the event of failure.

1.12 Sequence controller

1.12.1 Sequence controller shall be housed in a NEMA 4 enclosure and suitable for remote mounting, unless outside, where it shall be in a NEMA 12

1.12.2 Shall be factory mounted on the unit and wired by the factory contractor.

1.12.3 Operator shall have the ability to field adjust the length of time

individually for the system cool down, detergent pump cycle, rinse cycle, fan dry cycle and cumulatively for the overall wash cycle time.

1.12.4 Sequence controller shall automatically open and close solenoid valves, activate relays to shut down relevant fans, air conditionings coils, and reduce flow during detergent soak spray and soak.

1.12.5 Wash initiation shall be completely automatic clock controlled. Clock shall be seven day programmable and correct for daytime savings time

1.12.6 When initiated, will sequence through a 5-step process including system cool down, detergent soak, hot water wash, rinse, fan dry with precipitator off and system return to operation.

1.12.7 For wash units a seven day start/stop clock is utilized to both control the system and the wash cycle

1.13 3 Year Limited Parts Warranty is included for precipitator and one year for the fan.

1.14 Odor Neutralizer

1.14.1 Equipment Description

1.14.1.1 The Odor Neutralizer shall be used to handle the contaminated air from kitchen exhaust hoods containing odors (VOCs andSVOCs).

1.14.1.2 A double pass housing shall be specified unless space is limited

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1.14.2 Principle of Operation

1.14.2.1 The principle of operation shall be based on Adsorption in the airstream. Adsorption is the process where a gas is taken to a porous substance and held there. Gases and vapors travel through the carbon filter and are adsorbed into the micropore structure of the carbon.

1.14.2.2 Activated Carbon is used only to adsorb materials that are in the gaseous or vaporized state. Materials that cannot be removed by particulate filters.

1.14.3 Carbon Panels

1.14.3.1 Panels shall be of a V-bank configuration built into a rectangular frame.

1.14.3.2 Panels shall measure 23.625 inches (60 cm) by 17.5 inches (44.45 cm). Panels in V bank shall be 2-inch (5.05-cm) thick minimum.

1.14.3.2 Panels shall be 26 gauge (.45 mm) black powder coated steel.

1.14.3.3 Panels shall hold a minimum of 20 pounds carbon each.

1.14.3.4 Airflow shall not exceed a face velocity of 75 ft per minute (22.86 meters per minute).

1.14.3.5 Panels shall be refillable.

1.15 Fire Suppression:

1.15.1 Requirement

1.15.1.1 Because this application requires a fire suppression system be included in the duct system, the purchaser at installation shall install one. This fire suppression system shall be to local building codes approved by insurance underwriter. The fire suppression system shall be installed and operational before the air cleaner is in operation.

1.15.1.2 The unit shall be pre-piped with drops for either Ansul or Pyrochem nozzles