**PART 1 – GENERAL**

**1.01 SUMMARY**

A. Section Includes: Kitchen ventilation system. Including, but are not limited to:

1. Make-up Air Unit with Heating and Cooling.

2. Exhaust Fan.

3. Ductwork and Appurtenances.

4. Controls.

B. Related Requirements:

1. Division 01: General Requirements.

2. Division 26: Electrical.

3. Section 11 4013: Food Service Equipment (Middle and Senior High Schools).

a. Kitchen hood including fire suppression system.

b. Fly fans.

4. Section 22 10 00: Plumbing.

5. Section 23 05 00: Common Work Results for HVAC.

6. Section 23 05 13: Basic HVAC Materials and Methods.

7. Section 23 05 48: HVAC Sound, Vibration and Seismic Control.

8. Section 23 20 13: Above Ground HVAC Piping.

9. Section 23 20 16: Underground HVAC Piping.

10. Section 23 30 00: Air Distribution.

11. Section 23 80 00: Heating, Ventilating and Air Conditioning Equipment.

**1.02 SYSTEM DESCRIPTION**

A. Kitchen ventilation system shall provide heating, ventilating and cooling to prevent extreme temperatures in the kitchen. Kitchen temperature shall be controlled by room thermostat. Supply air fan shall automatically shut off when kitchen fire alarm is activated.

**1.03 SUBMITTALS**

A. Provide in accordance with Division 01 and Section 23 0500: Common Work Results for HVAC.

B. Manufacturer's Data:

1. Complete list of items to be furnished and installed under this Section.

2. Manufacturer's specifications and other data required to demonstrate compliance with specified requirements, three sets of operation and maintenance manuals, and service, parts list, and installation instructions.

C. Shop Drawings:

1. Submit Shop Drawings and layout drawings of complete kitchen ventilation system, including, but not limited to, dimensioned location of exhaust hood, exhaust fan, heating, ventilating, cooling, make-up air unit, and ductwork.

2. Provide Drawings for the kitchen ventilation system in accordance with requirements of NFPA 96.

D. Closeout Submittals: Submit Project Record Documents and Operations and Maintenance Manuals in accordance with Section 23 0500: Common Work Results for HVAC.

**1.04 QUALITY ASSURANCE**

A. Standards: Kitchen ventilation system fabrication and installation shall comply with NFPA 96 standards, applicable provisions of Section 23 05 00: Common Work Results for HVAC, and the California Mechanical Code (CMC).

B. Qualifications of Manufacturers: Products used in the Work of this Section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a minimum of 5-year history of successful production.

C. Qualification of Installers: Provide adequate number of skilled workmen, thoroughly trained and experienced in necessary crafts, and completely familiar with specified requirements and methods needed for proper performance of the Work of this Section.

**1.05 INSTRUCTIONS**

A. Prior to Substantial Completion, provide a 2 hour instruction period on system and equipment operation and maintenance procedure before or during completion test, in compliance with Section 23 0500: Common Work Results for HVAC, to designated Owner personnel. Coordinate and arrange for instruction period.

B. Instructions shall be provided by an individual who has been thoroughly trained and experienced to demonstrate proper operation and maintenance procedure of particular system and equipment.

**1.06 PRODUCT HANDLING**

A. Comply with provisions stated under Section 23 0500: Common Work Results for HVAC.

**1.07 COORDINATION**

A. Coordinate activities in accordance with provisions of Section 01 3113: Project Coordination.

**PART 2 – PRODUCTS**

**2.01 KITCHEN HOOD DUCTWORK**

A. Make-up air supply and exhaust duct connections for kitchen hood shall be furnished in parallel configuration only. Exhaust duct shall have a minimum velocity of 1,500 fpm and a maximum velocity of 2,100 fpm. Exhaust duct shall be constructed of stainless steel Type 304, 18 gage minimum with welded joints. Make-up supply ductwork shall be constructed of stainless steel Type 304, 18 gage minimum with welded joints on parallel duct arrangement. Duct installation shall conform to NFPA 96. Exhaust duct connecting collars shall be of heat expansion type. Field weld exhaust duct to mating flange at canopy, in accordance with CMC requirements. Factory fabricated ductwork, when approved, shall be furnished by duct manufacturer and shall be UL listed as grease duct for restaurant cooking appliances.

B. Clean-outs and other openings: Refer to CMC requirements.

C. Duct enclosure: Refer to CMC requirements.

D. Prevention of grease accumulation: Refer to CMC requirements.

E. Other requirements of CMC and Section 23 3000: Air Distribution.

**2.02 KITCHEN HOOD EXHAUST FANS (KEF)**

A. Exhaust fan shall be roof-mounted, upblast, belt-driven type, complete with centrifugal backward inclined blades, UL listed for removal of smoke and grease laden air. Unit shall be rated for continuous service at 300 degrees F conforming to UL 762 and shall be rated in accordance with ANSI/AMCA 210. Unit shall be compatible for installation with kitchen hood specified. Utility type fans may be furnished where building configuration does not permit the installation of upblast roof exhausters.

B. Unit shall be Loren Cook Company, Greenheck, or Supreme Fan, or equal.

**2.03 KITCHEN MAKE-UP AIR UNIT (MU)**

A. Make-up air unit shall be roof mounted type factory built-up assembled and wired in accordance with NFPA 70: NEC and ETL listed to ANSI Z83.8 and CSA 2.6 standards as a package. The energy usage shall be designed to meet ANSI/ASHRAE Standard 90.1

B. The unit shall be Carrier, Trane, or equal, designed for 80 percent or better thermal efficiency with power vented natural gas furnace, and shall be furnished with the following:

1. Centrifugal fan, permanently lubricated bearings, EE motor and adjustable link belt drive. Motor and blower shall be rubber in shear vibration isolated.

2. Disposable media type air filters 2 inches thick of MERV 13 efficiency, shall be provided in the air stream, unless indicated otherwise in the drawings. Units provided with evaporative cooler shall be provided with aluminum mesh cleanable filters.

3. Outside air shall enter unit through an outside air hood with moisture elimination louvers and bird screen or evaporative cooler with 1” pre-filter unless otherwise indicated on the Drawings.

4. Heat exchanger shall be manufactured from 409 (E-3) stainless steel. Furnace section shall have a factory-installed condensate drain. Furnace shall be provided with a constant discharge temperature heating control with modulated control. Discharge air set point shall be adjustable from 50 to 120 degrees F.

5. Factory-installed mixing box shall be supplied with flanged 100 percent return air opening in bottom and 100 percent outside air opening in back. Manufacturer shall provide factory-installed motors, dampers, linkage and actuators for outside air and return air inlets with a potentiometer. This configuration shall provide 100 percent outside air during EF On mode. When system switch (EF Off) is activated, mixture of outside air and return air as controlled with a minimum amount of outside air as determined by the potentiometer setting. On shut down, the outside damper shall close.

6. Cabinet shall have through-the-base utility knockouts. Control, burner and blower service compartment doors shall be hinged. Blower door hardware shall be heavy duty stainless. Control and burner door hardware shall be heavy duty external hardware. Unit cabinet shall be supplied with double wall steel construction with factory installed 1 ½ pound density insulation. R value of insulation shall be 3.8 or greater. Insulation with foil backing is not acceptable. The packaged system shall have a pre-coat RAL 1001 white paint finish. Finish shall be a minimum 60 gloss on G90 galvanized steel. Painted metal shall pass 1,000 hour salt spray test per ASTM B117. Unit shall be designed with heavy 16 gage pre-painted steel rail perimeter base. Base shall feature provisions for corner lifting, with lifting strap holes to facilitate handling and installation.

7. Cooling of outside air shall be provided by either evaporative cooling or DX cooling coil depending on mode of operation.

a. Evaporative cooling manufacturer shall supply 12-inch glass fiber evaporative cooling media. Unit shall have a water hammer arrester for the water flow metering device. Evaporative cooling unit shall be all stainless steel construction provided with a factory-installed water distribution system. Re-circulating system shall be equipped with auto drain down upon unit shut down. System shall also include a water hammer arrestor.

b. For cooling, unit shall be provided with a DX split system when indicated on the drawings. Manufacturer shall provide a factory-installed cooling coil in a cabinet. Manufacturer shall also provide a remote condensing unit section for DX cooling. The condensing unit shall be designed for outdoor mounting. Unit shall use non-ozone depleting R-410a refrigerant. Units 7.5 tons and above shall have dual circuits with independent scroll compressors. Dual circuits shall have independent liquid line receivers. Condensing units shall be Carrier, Reznor, Trane, York, or equal.

1) Evaporator coils:

a) Aluminum plate fins mechanically bonded to enhanced copper tubes with joints brazed.

b) Tube sheet openings shall be belled to prevent tube wear.

c) Evaporator coil shall be of full-face active design.

d) Dual circuit models shall have face-split type evaporator coil.

2) Condenser coils Type A, B or C are acceptable.

a) Type A: Copper-tube, aluminum-fin coil, with liquid subcooler. Internally enhanced 3/8 inch OD seamless copper tubing mechanically bonded to aluminum fins.

b) Type B: Spine Fin™condenser coil shall be continuously wrapped, corrosion resistant aluminum with minimum brazed joints. This coil is 3/8 inch OD seamless aluminum tubing glued to a continuous aluminum fin. Coils are lab tested to withstand 2,000 pounds of pressure per square inch. The outdoor coil provides low airflow resistance and efficient heat transfer. The coil is protected on four sides by louvered panels.

c) Type-C: Coil shall be air-cooled Micro-Channel heat exchanger technology (MCHX) and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered between the refrigerant manifolds. Coils shall consist of a two-pass arrangement. Coil construction shall consist of aluminum alloys for fins, tubes, and manifolds in combination with a factory applied corrosion-resistant coating.

C. Unit shall be supplied from factory with EPAct compliant premium efficiency ODP blower motor and factory installed VFD for two speed operation.

D. Unit shall be provided with a remote control panel that will provide the control functions that are indicated on the drawings including but not limited to the following:

a. Thermostat for space temperature control.

b. Fan on/off and speed indicator lights.

c. Manual on/off switch.

E. Make up air unit shall be provided with an automatic cut-off through a field furnished detector in the event of fire.

F. Electrical wiring, components and connections including electrical grounding shall be made in accordance with the National Electrical Code (NFPA 70). A separate line voltage supply shall be run directly from the main panel to a fused disconnect switch, at the unit, and then making connection to leads in the unit junction box. External wiring shall be made within approved conduit and shall have a minimum temperature rise rating of 60 degrees C. The unit shall be electrically grounded in accordance with the National Electrical Code (NFPA 70) when installed if an external source is utilized. Units shall be equipped with a 24 volt control transformer; protective air proving switch; resiliently isolated venter motor and a high temperature limit control. Operation shall be controlled through an integrated circuit board. The circuit board shall monitor heater operation and have LED diagnostic lights to identify abnormalities in control functions.

**PART 3 – EXECUTION**

**3.01 EXAMINATION**

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to proper and timely completion of Work. Do not proceed until unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

A. Kitchen ventilation system shall be installed in accordance with manufacturer's instructions and shall comply with NFPA 96 and CMC.

B. Exterior surfaces of roof-mounted equipment shall be weatherproofed.

**3.03 COMPLETION TEST**

A. Project Inspector shall be notified 48 hours in advance of testing. Notify fire authorities and test components of system and sequence of operation in presence of and for observation of the Project Inspector and fire inspectors.

**3.04 CLEANUP**

A. Remove rubbish, debris and waste materials and legally dispose of off the Project site.

**3.05 PROTECTION**

A. Protect the Work of this Section until Substantial Completion.

END OF SECTION