SECTION 15800 - AIR HANDLING EQUIPMENT

1.1 GENERAL

A. All air handlers installed shall conform to the University of Rochester specification Guideline for Semi-Custom and Pre-Engineered Air Handling Units. If the Consultant believes this specification should be modified in anyway, he shall apply, in writing and providing whatever supporting information may be requested, to the Directors of Central Utilities and the effected Operations & Maintenance Group for a variance.

B. No system shall be constructed which does not fully meet the functional needs of the area(s) being served as defined in the Architect’s schematic design report. The equipment utilized, whether new or existing, must be compatible with the infrastructure (utilities) supporting it. When existing equipment is utilized, deficiencies and inefficiencies due to incompatibilities with the infrastructure shall be corrected.

C. Modification or extension of existing systems must include calculation of the entire system's current capacities and demands (both supply and return).

D. All new and renovated air handling systems shall be designed so that the draining of coils for freeze protection is not required.

E. Systems shall be designed and operated to meet the latent heat gains of the area served.

F. The primary chilled water control on air handling equipment will be the discharge air temperature of the unit set at the maximum necessary to meet the space requirements (including dehumidification).

G. In all other applications (heat pumps, direct expansion systems, equipment, etc.) shall take their Chilled Water from the return. Flow will be controlled by the return water temperature at not less than 80 degrees unless approved in writing by the Director of Central Utilities.

H. The maximum working pressure drop between the supply and return connections to the Chilled Water system shall be 15 psig.

I. Project work must include rebalance of the entire system, both supply and return, it is a pressure independent system.

2.1 AIR CONDITIONERS

A. Window air conditioners and domestic water cooled air conditioning units are generally not accepted as a means of air conditioning. All projects should make a concerted effort to use central utilities distributed services.

B. Equipment must meet or exceed N.Y.S. Energy use guidelines.

C. Unit shall not be supported from window frame, but from separate bracket supports. Unit shall be completely enclosed with galvanized sheet metal between outside bottom of air conditioning unit and window sill to eliminate nesting.

2.2 FAN COIL UNITS

A. Shall be designed for combination heating and cooling units complete with cabinet, heating and cooling coil (separate coils), drain pan, fan(s), motor, fan plenum, grills, air filter(s), and return air grill.

B. Unit Casing - Shall be fabricated from 18 gauge steel, insulated and sound proofed with glass fiber insulation, prime coat of baked-on enamel finish, removable panel for servicing.

C. Fans - Shall be blow-through design, centrifugal wheels (aluminum or non ferrous), direct connected to motor shaft. Fan and motor shall be mounted on a 14 gauge steel support platform. Motor shall have built-in overload protection and provided with rubber isolation bases. Bearings shall be bronze sleeve type with oil reservoirs.
D. Speed controller - Shall be controlled by two or three speed switch (Hi-Lo-Off or Hi-Med-Lo-Off), direct connected to fan motor. Temperature control shall be as specified with Powers, Johnson or Honeywell flow control valves.

E. Coils and drain pan - Shall be provided with water heating and cooling coils, suitable for a working pressure of 200 psig, coils shall be installed at no greater than 30 degrees from vertical. Drain pan shall be fabricated from 18 gauge stainless steel (or equivalent material), insulated on all inside surfaces and pitched to drain port. A second drain pan shall be provided under the coil pan to catch condensate drips from coil end valves and piping. Drain pan connection – 1” FPT connection min.

F. Filter section - shall be removable throw away type with viscous impingement type of media. Filter shall have its own rack with holder lock.

2.3 UNIT HEATERS - PROPELLER TYPE

A. Shall be provided complete with casing, coil, fan, motor, supports, temperature, electric, and safety controls.

B. Rating shall be in accordance with ASHRAE standards and approved by the AMCA.

C. Heating coils - shall be seamless copper tubing with copper or aluminum fins.

D. For steam pressures over 100 psig the tubes shall be red brass, admiralty brass, or equal. Fins shall be mechanically bonded and be at least .0095” thick for aluminum or .008” thick for copper. Header shall be cast brass, cast bronze, copper or gray close grained cast iron. Coils shall be designed for 125 psig WSP, 200 psig OWG and 300 psig air pressure test under water.

E. Casings - shall be stamped steel, with adjustable louvers, and shall be galvanized or bonderized with factory finish baked enamel.

F. Fans - Shall be propeller type, direct connected to motor. Motor shall be single phase fractional horse power with thermal overload on capacitor, split phase or shaded pole type.

G. Mounting - shall be from overhead building construction, rigidly affixed by minimum of two hangers and isolated from structure by means of double deflection rubber-in-shear vibration isolators.

H. Thermostats - shall be furnished and installed for each unit heater, suitable for unit heater control.

2.4 CENTRIFUGAL WALL EXHAUSTER

A. Shall be all aluminum construction, backward curved non-overloading wheel.

B. Fan housing shall be aluminum or stainless steel with like exposed fastenings.

C. The drive power assemblies shall be isolated from the housing, with the drive motor out of the air stream.

D. Housings shall be removable for service access.

E. Fan shall be provided with factory mounted, U.L. listed unfused disconnect, located in the motor compartment.

F. Fan with wheels 12 inches and up shall be licensed to bear the AMCA seal.
G. Motor - fractional horsepower size shall be capacitor, split phase, or shaded pole type with lifetime lubricated bearings. (single pole type)

H. Grills and shutters - shall be provided and of same manufacturer as the fan. Bird guard shall be 1/2” spacing to comply with safety codes. Shutters shall be automatic closing, self opening type with bronze or nylon end shaft bearings. Shutter blades shall be felted and coupled together with tie rods.

2.5 PROPELLER FANS

A. Shall be of steel construction with aluminum or steel blades and permanently lubricated bearings.

B. Fan blades shall be of air foil design and licensed to bear the AMCA seal on fans 12 inches and larger.

C. Panel Fans:

<table>
<thead>
<tr>
<th>Wheel</th>
<th>Panel</th>
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<tbody>
<tr>
<td>12” and under</td>
<td>18 gauge steel</td>
</tr>
<tr>
<td>14” to 24”</td>
<td>16 gauge steel</td>
</tr>
<tr>
<td>24” and up</td>
<td>14 gauge steel min.</td>
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D. Panel shall be complete with deep throated orifice.

E. Panel shall be galvanized or bonderized and have two coats factory applied baked enamel.

F. Shutters and guards - shall be the product of the same manufacturer as the fan. Shutters shall be self-opening on discharge side complete with bronze or nylon bearings. Guards shall be provided on inlet side of fan, fabricated of 1/2” sq. wire spacing and meet OSHA standards.

G. Motor shall be provided with a non-fused U.L. approved disconnect. Single phase fractional horsepower motors shall be capacitor, split phase or shaded pole type.

2.6 ROOF EXHAUST FANS

A. Where available, direct drive fan is preferred to minimize maintenance.

B. Shall be provided with aluminum housing, strong enough to withstand a horizontal pressure of 30 lbs per square foot of projected area. Housing shall be provided with quick release caught for service access, (fan, motor, and bearings). Vibration isolators shall be provided to isolate all rotational movement and fan wheel shall be non-overloading type centrifugal fan of welded steel or aluminum construction statically and dynamically balanced. Ball bearings shall be grease-pack ball bearing pillow blocks.

C. Drive - Shall be belt driven with cast iron or steel pulley and capable of adjustment 10% above or below specified speed.

D. Motor - Shall be suitable for vertical shaft operation, equipped with non fusible U.L. listed disconnect, and shall be located out of the air stream, suitable for outdoor conditions.

E. Dampers - shall be self-opening back draft dampers, with spring or counter balance return, located at top fan curb. Bearings shall be bronze or nylon bushings.
F. Curbs - shall be prefabricated double shell insulated aluminum or galvanized 2” thick. Curb shall be manufactured out of min 18 gauge.

G. Fan, curb and dampers shall be of same product manufacturer.

2.7 STANDARD AIR HANDLING FAN UNITS (Modular design & configuration typically 3000 – 20,000 cfm capacities)

A. Fan units shall provide inspection ports and maintenance access opening for:
   - Mixed air section
   - Filter section
   - Leaving side of the cooling coil
   - Fan (and drive motor) section
   - Humidifier section
   - Internal controls, safeties, control devices, etc.
   - Air flow measuring station

B. Units shall be structurally sound and support unit features including the added pressure and weight of maintenance personnel

C. No through – wall metal connection and properly insulated avoiding heat loss and condensation external to the unit.

D. Air pressure testing or leak testing – determine limits and test at factory or on site. Air leakage should not exceed ½ of 1 % airflow leakage at 1.5 times the operational static pressure.

E. Utilization of ball bearing on damper ends or equal bear, resistance free mechanisms. Large damper sections actuated from a common driven shaft instead of sections driven and connected from damper blade to damper blade.

F. De-stratification systems installed where air-mixing sections cannot proficiently de-stratify both air streams. Mixing sections do not necessarily completely mixed both air streams and therefore air temperature stratification exists. The mechanical contractor with his unit manufacture are responsible for eliminating potential air and flow stratification within the unit; not the controls contractor. Temperature stratification should not exceed +/- 5 F of average mixture temperature anywhere in the cross-sectional air stream of the unit.

G. The filtration system and size shall be based on a life cycle analysis over a 5-year term for the pre/mid, and finial filter sections. Stay with standard size filters (24”x 24”).

H. Determine if the fan system shall be draw through or blow threw with consideration to fan horsepower and the heat contributed to the discharge air temperature of the unit.

I. Heating & cooling coil sections and specification as so noted in the “Design Section” of this document.

J. All mechanical piping and unit features shall have access and drain ports installed to fully drain and “burp” air from the systems.

K. All metals in direct contact with the cooling coil condensate shall be stainless steel or otherwise coated/protected with lifetime expectancy. Condensate pans shall be pitched to the drain(s); double pitched pans preferably. Drain connections shall be a size of 1 - ¼” minimum.

L. The chilled water cooling piping should have winterization scheme if the coil is left dormant over the winter season. A retrofit referred to as the “Air Drying – lay-up” system is recommended if no other means has been offered other than simply draining the coil systems. The Facilities
Departments connected to the central utilities cooling system is migrating from the use of glycoling cooling coils as a coil winterization means.

M. The McMaster Bridge loop system required on all fan unit installations. Should exceptions arise, such as building McMaster Bridge loops, then as a minimum, each unit shall have a chilled water supply and return temperature sensor installed in the mechanical chilled water.

N. Steam coil equalization across the condensate trap, typically called the vacuum breaker, shall not be vented to the ambient air. Breaking a vacuum with air introduces in-condensables in steam system hampering heat output, control, and introducing corrosives. The vacuum breaker piping shall extend down to the leaving side of the condensate trap securing the closed loop. A high temperature limit is installed in the piping between the trap connection and the vacuum breaker as a redundancy measure should the vacuum valve (check valve) fail or hang up.

2.8 HEATING AND COOLING COILS – Reference Air Coils Design Standard 238216

END OF SECTION 15800