

## **SPECIAL SPECIFICATION**

### **SECTION 15720S**

#### **AIR HANDLING UNITS**

##### **PART 1 - GENERAL**

###### **1.01 SECTION INCLUDES**

- A.** Air handling units **for the MicroLab and Weapons Integration Facility.**

###### **1.02 RELATED SECTIONS**

- A.** Section 13085S – Seismic Protection
- B.** **Section 15051S – Piping Systems**
- C.** **Section 15070S - Vibration Isolation.**
- D.** Section 15081S - Duct Insulation
- E.** Section 15170S – Motors.
- F.** Section 15891S - Ductwork
- G.** Section 15862S - Air Filters.
- H.** Section 15950S - Testing, Adjusting and Balancing.

###### **1.03 REFERENCES**

- A.** AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B.** AMCA 300 - Reverberant Room Method for Sound Testing of Fans.
- C.** ARI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.
- D.** ARI 430 - Standard for Central-Station Air-Handling Units.

- E. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedures for Fans.
- F. NFPA 70 - National Electrical Code.
- G. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

#### 1.04 SUBMITTALS

- A. Shop Drawings: Submit for fan room layouts showing equipment, piping, and ductwork.
- B. Product Data:
  - 1. Indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, gages, and finishes of materials. Indicate dimensions, weight, capacities, required clearances, and location and size of field connections.
  - 2. Include data for filter media, filter performance data, filter assembly, and filter frames.
- C. Fan Performance Curves: Submit with specified operating point clearly plotted. Base performance curves on tests in accordance with ARI standards. Conduct tests in ARI-approved laboratory.
- D. Sound Power Levels: Submit for both fan outlet and casing radiation at rated capacity. Base sound power levels on actual factory test data on fan sizes and accessories being furnished. Conduct tests in ARI-approved laboratory.
- E. Provide operation and maintenance manuals for air handling units.

#### 1.05 QUALITY ASSURANCE

- A. Performance Ratings: Conform to ARI; bear ARI 430 certified rating seal.
- B. Sound Ratings: Test air handling unit in accordance with AMCA 300 or ASHRAE 68.
- C. Air Coils: Certify capacities, pressure drops, and selection procedures in accordance with ARI 410.
- D. Manufacturer: Regularly engaged in production of components who issues complete catalog data on total product.
- E. Base performance on sea level conditions unless otherwise scheduled.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in factory-fabricated protective containers, with factory-installed shipping skids or lifting lugs.
- B. Store in clean dry place and protect from weather and construction traffic. Handle to avoid damage to components, enclosures, and finish. Replace damaged equipment.

## 1.07 ENVIRONMENTAL REQUIREMENTS

- A. Provide complete unit including components designed to operate within range of **12** degrees F to **96** degrees F ambient temperature and 20 to 70 percent relative humidity.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. **Engineered air or engineer approved equal.**

### 2.02 CASING

- A. Minimum 16 gage G90-U galvanized steel structural frames and minimum 2-inch thick double wall panels. Construct double wall panels of minimum 18 gage G90-U galvanized steel exterior panels and minimum 22 gage G90-U galvanized steel interior panels. Construction shall allow air handler interior cleaning of microbial growth and other debris. Provide gaskets between gage and access panels. Reinforce and brace unit housing with steel angle framework to provide rigidity and prevent pulsations.
- B. Insulate casing sections with 2-inch thick, 1-1/2 pounds per cubic foot density, glass fiber insulation, "K" value at 75 degrees F maximum 0.26 BTU per inch per square foot per degree F per hour. Insulation and adhesive shall meet requirements of NFPA 90A. Install insulation in manner to not be disturbed if panels are removed.
- C. Provide minimum 3/4-square foot, maximum 6-square-foot galvanized steel inspection doors for flush mounting, with gasket, latch, and handle assembly where internal access for removal of motor and belts is required. Provide access section through doors. Provide heavy-duty cadmium plated Vent-Loc style latch and handle assembly. Piano door hinges will not be acceptable. Provide safety interlock on access doors which prevent entry into fan section while fan is running.

- D. Construct coil section so coils can be removed without affecting structural integrity of casing. Completely enclose connections, coil headers, and return bends. Do not use coil frame as structural member for coil section.
- E. Provide one-piece drain pans constructed from Type 304 stainless steel on air side with insulation between pan and casing. Drain pan shall have raised lips, welded corners, and pipe drain connection. Cross break and pitch to drain connection. Provide drain pans extending under complete cooling coil section, hot water coil section, steam coil section, and humidifier section. Provide drain pans extending 24 inches minimum downstream of cooling coil and downspouts for cooling coil banks more than one coil high.
- F. Blow-Through Units: Provide galvanized internal wall in coil section opposite cooling coil.
- G. Design all sections for 450 ppm max velocities where possible.**

#### 2.03 FANS

- A. Provide fan sections with **backward inclined** or air foil, centrifugal type fans as scheduled.
- B. Provide self-aligning, grease lubricated, ball or roller bearings with lubrication fittings extended to exterior of fan casing with zerk fitting rigidly attached to casing. Provide lubrication fittings on side of unit away from mechanical room wall. See Drawings for orientation of units.
- C. Mount motor drive and fan on integral isolating framework. Mount isolating framework on vibration isolators on interior of casing.
- D. Provide internal flexible connection on discharge of fan to isolate fan from casing.

#### 2.04 MOTORS AND DRIVES

- A. Motors and Controllers: As indicated.
- B. Bearings: AFBMA 9, L-50 life at 200,000 hours, heavy-duty pillow block or flange type, self-aligning, grease-lubricated ball bearings.
- C. Shafts: Solid hot rolled steel, ground and polished, with key-way, and protectively coated with lubricating oil. Shafts shall not pass through first critical speed as unit comes up to rated rotations per minute.
- D. V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Variable and adjustable pitch sheaves for motors 15 horsepower and under, except

those equipped with variable frequency drive (VFD). Select variable and adjustable pitch sheaves so required rotations per minute is obtained with sheaves set at mid-position. Provide fixed sheave for motors equipped with VFD and motors 20 horsepower and over. Provide matched belts and drive rated for minimum one and one-half times nameplate rating of motor. Include one additional set of drives for final adjustments.

## 2.05 COILS

- A. Provide coil section with coils and access to both sides of coils. Enclose coils with headers and return bends fully contained within casing. Slide coils into casing through removable end panel with blank off sheets and sealing collars at connection penetrations.
- B. Provide counterflow chilled water coils, minimum six rows deep to meet or exceed specified design load for sensible and total heat removal requirements.
- C. Rate coils in accordance with ARI certified data. Select coil to provide capacity in accordance with water flow and temperatures scheduled on Drawings with maximum water pressure drop through coil of 10 feet and maximum velocity in tubes of 5 feet per second. Provide coil with maximum face velocity indicated on Drawings.
- D. Provide chilled water, hot water, steam, or refrigerant coils as scheduled.
- E. Provide 1/2-inch or 5/8-inch outside diameter copper tube coils with aluminum plate fins, maximum ten fins per inch with copper or cast iron headers.
- F. Provide nonfreeze or steam distributed type steam coils.
- G. Provide coils with plate fin wall thickness of 0.0055-inch and tubes of minimum wall thickness of 0.016-inch. Space tubes 1-1/2 inches apart. Connect tubes to header which provides equal flow to all tubes and provide single point connections for supply and suction piping.

## 2.06 FILTERS

- A. Filter Box: Steel, similar to casing construction, with filter guides and access doors from both sides, for side loading and permanent filter frames.
- B. Arrangement:
  - 1. Flat, angle, or high capacity arrangement.
  - 2. Provide 2-inch deep permanent frames.
  - 3. Provide disposable filter.

- C. Provide UL listed filters with Class II rating.

## 2.07 FABRICATION

- A. Provide vertical or horizontal, single zone and multizone type air handling units of draw through or blow through arrangement suitable for low or medium pressure operation, as schedule on the drawings.
- B. Fabricate units with fan and coil section with centrifugal fan, fan motor, mixing boxes, damper sections, filter section, guards, belt drives, chilled water, hot water, coil section, humidifier section, and other accessories.
- C. Factory fabricate air handling units of sizes, capacities, and configuration as indicated.
- D. Single Zone Draw Through Units: Provide factory built sectional air handling units of the horizontal or vertical type complete with chilled water cooling coil, hot water coil, low velocity filter section or flat filter as indicated, motor, belts and components specified.
- E. Multizone Blow Through Units: Provide conventional, sectional multizone type as indicated complete with coil section, with chilled water coil and a bypass around the cooling coil, with no coil in the bypass unless shown otherwise, complete with air distribution plate zone dampers and components specified.

## 2.08 SOURCE QUALITY CONTROL

- A. Coils: Test at minimum pressure of 150 percent of pressure specified for system, but not less than 250 pounds per square inch-section or more than 500 pounds per square inch-section. Submerge each coil in water while air test pressure is applied.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Assemble units by bolting sections together. Make joints and connections fully gasketed and air-tight.
- C. Install filters.
- D. Ensure sound power requirements.

- E. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated and fan has been test run under observation.

END OF SECTION