ATTENTION: This is not an order. Read all instructions, terms and conditions carefully.

IMPORTANT: RFP AND ADDENDUM MUST BE RECEIVED BY 04-25-2019 @ 3:00 P.M. LEXINGTON, KY TIME

Offeror must acknowledge receipt of this and any addendum as stated in the Request for Proposal.

1. This is to extend the Proposal Due date from 4/18/2019 until 4/25/2019.

2. In addition, please refer to and incorporate within the Offer the attached Addendum 3 dated 4/17/2019 from Champlin Architecture. Including changes to Specification 237328:

OFFICIAL APPROVAL
UNIVERSITY OF KENTUCKY

Mike Mudd / (859) 257-5409
Specification Changes:

237328 – Factory Fabricated Custom Air Handling Units

- Edited 2.4, G, 2. to remove requirement for housings to withstand pressure washing and steam cleaning.
SECTION 23-7328 FACTORY FABRICATED CUSTOM AIR HANDLING UNITS

PART 1 GENERAL

1.1 RELATED WORK

A. Section 20-0513 - Motors
B. Section 20-0529 - Mechanical Supporting Devices
C. Section 20-0700 - Mechanical Systems Insulation
D. Section 23-0550 - Vibration Isolation
E. Section 23-0902 - Control Valves and Dampers
F. Section 23-2116 - Pipe and Pipe Fittings
G. Section 23-2118 - Valves
H. Section 23-2120 - Piping Specialties
I. Section 23-3314 - Ductwork Specialties
J. Section 23-3400 - Fans
K. Section 23-4114 - Filters
L. Section 23-8216 - Coils
M. Section 23-8413 - Humidification Equipment
N. Section 26-0519 - Low-Voltage Electrical Power Conductors and Cables
O. Section 26-0533 - Raceway and Boxes for Electrical Systems
P. Section 26-2726 - Wiring Devices
Q. Section 26-2816 - Enclosed Switches and Circuit Breakers
R. Section 26-2913 - Enclosed Controllers

1.2 REFERENCE

A. The Work under this Section is subject to requirements of the Contract Documents including the General Conditions, Supplemental Conditions, and sections under Division 01 General Requirements.

B. This section specifies a system or a component of a system being commissioned as defined in Section 01 91 00 Commissioning. Testing of these systems is required, in cooperation with the Owner and the Commissioning Authority. Refer to Section 01 91 00 Commissioning for detailed commissioning requirements.
1.3 SUBMITTALS

A. Shop drawings for all equipment including, but not limited to, the following:
   1. Appropriate identification
   2. Complete drawings showing plans and sections including details of construction
   3. Overall unit dimensions and individual components and sections dimensions
   4. Shipping and operating weight of unit and/or sections
   5. Structural design load
   6. Details of component support
   7. Capacities/ratings
   8. Materials of construction
   9. Thermal and acoustical performance of wall, roof and floor panels
   10. Pressure ratings and leakage ratings
   11. Thermal break construction details and performance calculations or test data
   12. Each component manufacturer’s name, model number and data. (Refer to each component section for submittal requirements.)
   13. Air leakage rates and test data
   14. Wiring diagrams and terminal points for control panels provided with units
   15. Manufacturer’s installation instructions
   16. Air handling unit manufacturer’s local representative and phone number
   17. Structural capacity of units that are the bottom unit of stacked units (AHU-7).

1.4 DESIGN CRITERIA

A. For housings and floors operating under positive pressure (fan discharge side), maximum allowable deflection shall not exceed 1/200th of any span in any direction at + 10" WG.

B. For housings and floors operating under negative pressure (fan inlet side), maximum allowable deflections shall not exceed 1/200th of any span in any direction at - 10" WG.

C. Air handling unit manufacturer shall provide equipment as specified and install equipment furnished by others to result in complete and operational unit. Unit manufacturer shall assume single source responsibility for all air handling unit components and accessories.

D. Furnish units complete with fans, piping, valves, piping specialties, actuators, motors, coils, humidifiers, drain pans, filter sections, damper sections and interior lighting, meeting configuration and as shown on drawings, specified and as scheduled. All unit components shall meet this Section of specification and all requirements specified in each section and division listed under Related Work. Control dampers shall be provided by unit manufacturer. Control dampers actuators will be furnished by Control Contractor for factory mounting by unit manufacturer.
E. Unit performance shall be in accordance with ARI, Standard 430.

F. All materials shall meet NFPA 90A flame and smoke generation requirements.

G. All materials shall comply with FM Global insurance requirements.

H. Unless otherwise indicated, galvanized steel shall be G90 according to ASTM A924 (formerly ASTM A525), A653 and ASTM A-90 and aluminum sheet shall be 3003-H14 alloy, conforming ASTM B209.

I. Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure.

J. Motor furnished with fan shall not operate into motor service factor in any cases.

K. Where inlet and outlet ductwork at any fan is changed from that shown on drawings, submit scaled layout of the change and system effect factor calculations, indicating increased static pressure requirement as described in AMCA Publication 201. This Contractor shall be responsible for any motor drive and/or wiring changes required as result of duct configuration changes at fan.

L. Air handling unit static pressure to take into consideration actual static pressure loss of components furnished within unit and any system effects due to unit arrangement and inlet and discharge connections.

M. Wire brush all welds with solvent and wipe clean all bare metal before painting.

N. Unit dimensions shall reflect space provided on plans including access allowances for equipment maintenance and overhead clearance requirements for stacked units located on raised structural platforms. All access aisle clearances shall be maintained as indicated on drawings to allow future AHU installation and replacement. Shipping splits shall allow installation of units within constraints of available access space.

1.5 FINAL CLEANING

A. Outside and inside of each air handling unit shall be thoroughly cleaned. Use industrial grade cleaners to remove construction dust, sheet metal mil finish or grease. All proposed cleaning materials shall have contents identified and approved prior to use. Cover unit openings with sheet metal or other proper material until ductwork is connected to maintain unit cleanliness.

1.6 MANUFACTURER QUALIFICATIONS

A. Air handling units shall be manufactured by qualified unit manufacturer that has been making custom units for at least 10 years, and shall carry manufacturer's nameplate. Unit manufacturer shall be held responsible for specified performance of units.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Governair/Ventrol, Ingenia, TMI Climate Solutions, Air Enterprise, ClimateCraft or Trane Custom with operating characteristics as scheduled and physical dimensions as shown on drawings and/or detailed.
2.2 UNIT BASE

A. Unit base shall be fabricated from structural steel or galvanized formed steel.

B. Base shall be sized to provide sufficient height above floor to accommodate cooling coil drain trap height indicated on details. Additional steel base may be used as sub-base to provide the required trap height. Sub-base may be provided at factory by unit manufacturer or provided at field by installing contractor.

C. Weld steel solid at connection points to assure rigidity. Size perimeter steel to allow for rigging and handling.

D. Locate and size base cross supports to support internal components.

E. Provide lifting lugs to perimeter base steel. Incorporate means of attaching cable or chain into each lug.

F. Base shall be split in maximum size pieces to allow for economical shipment to jobsite and placement within building. Provide bolting structural steel on both sides of split for field joining.

G. Unit base shall be primed and finished with rust inhibiting epoxy paint. Galvanized dipped or powder coating may be used in lieu of epoxy paint. If base rail is not galvanized dipped, then the bottom of the base rails need to be painted to avoid rust issues.

2.3 UNIT FLOOR

A. Unit floor shall be constructed to meet the maximum allowable deflection, and constructed of no lighter than:
   1. 3/16” aluminum plate or 1/8” aluminum plate with an increase in floor supports for framing. Floor plate shall have diamond-tread.

B. Floor joints and seams shall be continuously welded water tight. Each section shall have turned up lip around section perimeter with welded corner to form drain pan type floor capable of retaining minimum 1-1/2” of water without leakage. Locate drain connection at lowest point of each pan type floor section. Connections shall extend through perimeter base channel and be welded water tight. Provide removable cap on each drain connection.

C. Weld flooring material to structural members below. Drive screw attachment is not acceptable.

D. Unit manufacturer shall field weld the unit floors as required to connect air handling unit shipping splits.

E. Entire floor including base drain pans shall be insulated on underside to have same thermal and acoustical performance specified for unit housing. Insulation shall be supported by minimum 20 ga galvanized steel liner with joints sealed to provide continuous vapor barrier.

F. Base Drain Pans:
   1. Provide recessed drain pans as integral part of unit floor in pre-heating coils, outside air sections and humidifier sections.
   2. Drain pans shall be constructed from minimum 16 ga 304 SS sheet, all seams continuously welded.
   3. Drain pan shall be double sloped; pitched down in direction of air flow and pitched sideways to drain connection.
4. Locate drain connections at lowest point of pan, one on either end. Connections shall extend through perimeter base channel and be continuously welded to insure air-tight seal as well as eliminate requirement for backup wrench during field piping. Provide removable cap on each drain connection.

5. Refer to Cooling Coil Section for cooling coil drain pan requirements.

2.4 UNIT HOUSING

A. Unit housing shall be constructed of 4” thick double wall panels meeting thermal, acoustical and structural requirements specified.

B. Panels shall utilize modular panel type construction. Panels may be self-supporting with internal support structure or supported by structural frame work.

C. Panel joints and seams shall be sealed with proper gasket and caulking to meet maximum allowable housing leakage rate specified.

D. Panel system, including service corridor where used, shall incorporate thermal break design at panel frames, joining mullions, supporting base, or corners. Thermal break is defined as prevention of condensation on outside surface of unit casing with 91°F dry bulb and 77°F wet bulb temperature in adjacent space and 50°F dry bulb temperature inside air handling unit.

E. Unit manufacturer shall submit, as part of shop drawings, details of thermal break construction and calculations or test data indicating that thermal break design will prevent condensation on outside surface of unit casing with specified air temperatures at outside of unit and specified air temperature at inside of unit.

F. Outer face of panels shall be constructed of no lighter than:
   1. 16 ga galvanized steel.

G. Solid inner face of panels shall be constructed of no lighter than
   1. 22 ga 304 SS sheet
   2. All interior panel joints shall be sealed water and air-tight and suitable for washing with pressure washer or steam cleaned wipe down and/or low pressure washing with a hose without wetting of the insulation.

3. Unit casing shall be insulated with minimum 3 pcf density glass fiber, 2.5 pcf density polyisocyanurate, or 3 pcf density urethane foam insulation. Composite panel shall have heat transfer factor not greater than 0.06 Btu/hr/sq ft/°F. All products as applied shall meet NFPA 90A possessing flame spread rating of not over 25, fuel contributed rating of not over 50 and smoke developed rating of not over 50.

H. Use solid inner surface for all sections.

I. Provide center vertical partition to divide units into modules, as detailed on drawings. Partition panels shall be same construction as housing wall panels except both faces be constructed of no lighter than 16 ga solid galvanized steel.

J. Provide blank-off panels with proper gaskets and sealants to prevent air bypass around equipment such as filters, coils, humidifiers and sound attenuators. Blank-off panels shall be constructed of galvanized steel no lighter than 16 ga unless otherwise noted. Blank-off panels at cooling coil sections shall be insulated with 3/4” thick insulation similar to AP Armaflex SA Duct Liner. Do not insulate blank-off panels between cooling coils located above drain pans.
K. Panel manufacturer shall have published literature available stating sound absorption coefficient of panel system obtained using ASTM method of Test for Sound Absorption of Acoustical materials in Reverberation Rooms (ASTM Designation C423-66), and sound transmission loss obtained using procedures conforming to ASTM Designation E90-70, E413-70T and other pertinent standards.

1. Sound Transmission Loss in accordance with ASTM E90 shall equal or exceed the following:

<table>
<thead>
<tr>
<th>Octave Band Center Frequency (Hz)</th>
<th>Transmission Loss (dB) of 4” Panels</th>
</tr>
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<tbody>
<tr>
<td>125</td>
<td>21</td>
</tr>
<tr>
<td>250</td>
<td>24</td>
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<tr>
<td>500</td>
<td>34</td>
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<tr>
<td>1000</td>
<td>44</td>
</tr>
<tr>
<td>2000</td>
<td>51</td>
</tr>
<tr>
<td>4000</td>
<td>53</td>
</tr>
</tbody>
</table>

2. Sound performance tests must be documented by independent laboratory (ETL, Riverbank Laboratories, Kideras Labs, etc.).

M. Manufacturer shall also have published literature available describing load-carrying capabilities and thermal characteristics of the panel system.

2.5 ACCESS DOORS

A. Each unit section shall have 24” x 72” access door, unless shown differently on drawings.

B. Fan section access door shall be sized to allow removal of fan wheel and motor through door, but not smaller than 30” x 72”. If access door needs to be wider than 36”, removable access panel may be provided.

C. Access doors and door frames shall have similar thermal break construction as specified under Unit Housing.

D. Access doors shall be same construction as housing panels.

E. Access doors located downstream of cooling coils shall be true thermal break design with no metal to metal contact.

F. Access doors shall be guaranteed tight closing through use of seals around entire periphery. Provide neoprene gasket between door frame and housing for air tight seal.

G. Each access door shall contain 1/4” thick wire glass or double glazed tempered glass window minimum size of 12” x 12” or 12” round. Window shall be double paned with vapor seal construction.

H. Each access door shall be furnished with corrosion resistant metal hinges or continuous piano hinge and shall have at least 2 stainless steel or aluminum alloy handles operable from either side.

I. Doors shall open against higher air pressure to affect seal.

2.6 ACCESS SECTIONS

A. Access sections shall allow minimum of 30” between adjoining equipment. Provide access doors as indicated on the plans.
2.7 REMOVABLE ACCESS PANELS
A. Removable access panels shall be provided as indicated on drawings and where equipment removal is not possible through access door. Removable panels shall be same construction as housing panels.

2.8 AIR MIXING SECTION
A. Provide air mixing devices as scheduled and per Section 23-3314 - Ductwork Specialties, with proper bulk needs and distances to dampers and coils per manufacturer’s recommendations.

2.9 FILTER SECTIONS
A. Filters shall be provided as specified and scheduled. Holding frames shall be installed by unit manufacturer to raise filters off floor and to prevent leakage as specified by unit manufacturer.
B. In AHU DT-11AE, provide space in prefilter section, downstream of prefilters, for installation of future carbon filters.

2.10 PREHEAT COIL SECTION
A. Provide preheat coils, piping and internal piping as specified and indicated on drawings.
B. Install coils, piping, and specialties not to block face area of coils. Terminate piping outside of unit casing for connection by Trade Contractor. Provide necessary pipe supports and hangers.
C. Coil pull access is not available on both sides of units, therefore coil flanges, mounting, and blank-off provisions shall be arranged for upstream or downstream face pull. Refer to drawings and coordinate with internal component arrangement. Coil sizes and quantities at each unit shall allow for coil pull through access space shown on plans.
D. Each coil shall be supported by galvanized steel frame which is independent of unit casing. Support frame shall allow individual coil removal. Blank-off panels shall be galvanized steel sheets with insulation as specified.

2.11 COOLING COIL SECTIONS
A. Provide cooling coils, piping and piping specialties specified, and indicated on drawings.
B. Install coils, internal piping, and specialties not to minimize blockage of face area of coils. Terminate piping outside of unit casing for connection by Trade Contractor. Provide pre-insulated pipe supports. Refer to spec 20 0529 for requirements.
C. Each coil shall be supported by 304 stainless steel frame which is independent of unit casing. Support frame shall allow individual coil removal without disturbing any other coil or piping to any other coil. Coils shall be removable through unit access doors or removable access panels. Blank-off panels shall be 304 stainless steel sheet with insulation as specified.
D. Coil pull access is not available on both sides of units, therefore coil flanges, mounting, and blank-off provisions shall be arranged for upstream or downstream face pull. Refer to drawings and coordinate with internal component arrangement. Coil sizes and quantities at each unit shall allow for coil pull through access space shown on plans.
E. Each coil support shall include minimum 16 ga 304 stainless steel all welded condensate drain pan extending min. 4", but no more than 12” downstream of coil face. Each drain pan shall have sufficient depth to hold condensate water but not less than 2”. Drain pan shall be sloped in 2 directions (pitched down in direction of airflow and pitched sideways to drain connection) for self-drainage at minimum 1/4” per foot slope. Drain pan shall be individually piped down to drain pan located below, and bottom drain pan to be piped to hub drain at exterior of unit. Drain connection opening shall be flush with bottom of pan. Side pan connection located at lowest point of pan may be used only where bottom pan connection cannot be used. Drain pipe shall be 304 stainless steel with sufficient size, but not less than 1-1/2”.

F. Instead of drain pan under bottom coil, recessed pan, integral with unit floor shall be used. It shall be constructed as specified above including thermal insulation and drain lines, and shall incorporate required drain trap height.

2.12 ENERGY RECOVERY COIL SECTION (AHU-2, 4, 7 & 8)

A. Energy recovery coils will be provided by energy recovery manufacturer. Install energy recovery coils, piping and internal piping as specified and indicated on drawings.

B. Install coils, piping, and specialties not to block face area of coils. Terminate piping outside of unit casing for connection by Mechanical Contractor. Provide necessary pipe supports and hangers.

C. Each coil shall be supported by 304 stainless steel frame, which is independent of unit casing. Support frame shall allow individual coil removal. Coils shall be removable through unit access doors. Blank-off panels shall be 304 stainless steel sheets with insulation as specified.

2.13 FAN SECTION

A. Fan and motor shall be provided as scheduled and meet requirements of appropriate Specification Sections.

B. Fan and motor shall be factory mounted on vibration isolation equipment meeting requirements of Section 23 0550 - Vibration Isolation. Vibration base shall include integral adjustable motor base. If inertia bases are required, provide required concrete in factory.

C. Motor Removal:
   1. For motors 5 hp and larger, provide motor removal rail sized for L/400 deflection when fully extended and subjected to weight of motor at furthest extreme position.
   2. Removal rail shall be mounted in fan section, centered with the fan section access door, perpendicular to side of AHU.
   3. Removal rail shall be designed with roller so motor can be fully removed from unit to distance equal to the motor diameter plus minimum of 6”, and lowered onto dolly with traversing arm able to freely move while carrying motor weight.
   4. Motor shall be able to be removed through access door or access panel.

D. Fan Array:
   1. Fan array system shall consist of multiple, direct driven, arrangement 4 plenum fans constructed per AMCA requirements for duty specified. Fans shall be selected to deliver scheduled airflow quantity at scheduled operating total static pressure and scheduled fan/motor speed. Fan array shall be selected to operate at system total static pressure that does not exceed 90% of scheduled fan’s peak static pressure producing capability at scheduled
fan/motor speed. Each fan/motor cube shall include 11 ga, A60 Galvanized steel intake wall, 14 ga spun steel fan inlet funnel, and 11 ga G90 Galvanized steel motor support plate and structure. Fan intake wall, inlet funnel, and motor support structure shall be powder coated for superior corrosion resistance. Motors shall be standard pedestal mounted type, T-frame motors selected at specified operating voltage, rpm, and efficiency as needed to meet performance requirements. Motors shall include isolated bearings or shaft grounding. Each fan/motor cartridge shall be dynamically balanced to meet AMCA standard 204-96, category BV-5, to meet or exceed Grade 2.5 residual unbalance. Maximum allowable Fan motor size shall be 15HP.

2. Fan array shall provide uniform air flow and velocity profile across entire air way tunnel cross section. Airflow and velocity shall not exceed scheduled cooling coil and/or filter bank face velocity when measured at a point 12” from intake side of fan wall array intake plenum wall, and distance of 48” from discharge side of fan wall intake plenum wall.

3. Provide partition between fans to minimize system effect.

4. Provide structural frame to support upper fans with solid floor panel partition between fans as shown on drawings to minimize system effect.

5. Each fan/motor cube shall be equipped with metal grating fan outlet guard.

6. Each fan in array shall be provided with back flow prevention means that produces less than 0.10” of static pressure drop and/or system effect when that fan is enabled. Any such system effects and/or pressure drops shall be submitted and included as component in determining fan system total static pressure as submitted. Manufacturer’s pressure drop ratings of any such equipment, developed from straight run test conditions will not be accepted.

7. Fan array shall be sized such that upon single fan failure, remaining fans could ramp up and provide same 100% design capacity.

8. Provide local electrical disconnect and overload protection for each fan.

9. Contractor shall provide all wiring to air handling unit components that require power.

2.14 HUMIDIFIER SECTION

A. Provide humidifiers, piping and supports as specified, and indicated on drawings. Terminate piping outside of unit casing for connection by Trade Contractor.

B. Size and locate humidifier distribution tubes to receive uniform air flow on entire tube.

C. Provide required absorption distance between humidifier and downstream equipment or housing wall.

2.15 BIPOLAR IONIZATION

A. Provide bipolar ionization, similar to Global Plasma Solutions needle point ionization system, upstream of cooling coils.

B. Provide ion detector, similar to Global Plasma Solutions iDetect, to provide BAS status of the ionization system.

2.16 DISCHARGE AIR SECTION

A. Provide with framed discharge opening or spun bellmouth fitting conforming to size and configuration of the ductwork.
2.17 CONTROL DAMPERS
   A. Refer to Section 23 0902 - Control Valves and Dampers for control dampers.

2.18 FLOOR OPENING PROTECTION
   A. Floor openings shall have safety grates using 1” x 1/8” steel bar stock on 1-1/4” center spacing. Grates shall have same finish as floor. Provide 1-1/2” lip of galvanized steel at entire perimeter of opening.

2.19 CONTROLS
   A. Control devices shall be by same manufacturer providing control devices for the remainder of the building.
   B. Control devices will be furnished by Control Contractor and shall be field installed by Trade Contractor and as described in control section of specifications.

2.20 TESTING (AHU-2, 4, 7 & 8)
   A. Owner and/or Owner’s representative may elect to witness tests. Notify Owner and/or Owner’s representative of test date at least 2 weeks in advance. Submit certified test data to Engineer for approval.
   B. Unit manufacturer shall provide factory tests to verify casing leakage after units are assembled.
   C. Unit manufacturer and installing contractor shall jointly provide field tests to verify casing leakage after units are installed at jobsite. Coordinate with Electrical Contractor for power to unit test fan.
   D. Casing leakage tests shall verify that unit casing leakage is less than 0.5% of design air flow at one and a half times design total static pressure (TSP).
      1. Seal duct openings in positive pressure section. Connect this section to fan developing 1-1/2 times the design positive static pressure and read air flow of this fan using approved air flow measuring device. Fan air flow measurement shall be considered casing leakage of this Section.
      2. Seal duct openings in suction side of unit. Connect this section to fan developing in 1-1/2 times the design negative static pressure and read fan air flow of this fan using approved air flow measuring device. Fan air flow shall be considered casing leakage of this Section.
      3. Conduct casing leakage test individually for each air handling unit. Total casing leakage shall be calculated as sum of positive pressure section leakage and negative pressure sections leakage. Total casing leakage shall not exceed the allowable rate specified above.
   E. Unit manufacturer shall provide factory and field panel deflection test. Conduct this test in conjunction with casing leakage testing.
      1. Panel deflection test for panels under positive pressure shall verify that unit casing deflection is less than 1/200 of the longest plane being measured at 1-1/2 times design static pressure or 10” WG positive, whichever is greater.
      2. Panel deflection test for panels under negative pressure shall verify that unit casing deflection is less than 1/200 of the longest plane being measured at 1-1/2 times design static pressure or 10” WG negative, whichever is more negative.
      3. Deflection shall be measured at 2 points for positive pressure sections and 2 points for negative pressure sections (total 4 points at panel seams) at mid-point of panel height.
2.21 TESTING (AHU-DT-11AE)

A. Unit manufacturer and installing contractor shall jointly provide field tests to verify casing leakage after units are installed at jobsite. Coordinate with Electrical Contractor for power to unit test fan.

B. Casing leakage tests shall verify that unit casing leakage is less than 1.0% of design air flow at one and a half times design total static pressure (TSP) for supply air section and 0.5% of design air flow at one and a half times design total static pressure (TSP) for return air section.

1. Seal duct openings in positive pressure section. Connect this section to fan developing 1-1/2 times the design positive static pressure and read air flow of this fan using approved air flow measuring device. Fan air flow measurement shall be considered casing leakage of this Section.

2. Seal duct openings in suction side of unit. Connect this section to fan developing in 1-1/2 times the design negative static pressure and read fan air flow of this fan using approved air flow measuring device. Fan air flow shall be considered casing leakage of this Section.

3. Conduct casing leakage test individually for each air handling unit. Total casing leakage shall be calculated as sum of positive pressure section leakage and negative pressure sections leakage. Total casing leakage shall not exceed the allowable rate specified above.

2.22 ELECTRICAL SERVICE

A. Provide adequate lighting and switching so equipment can be observed and maintained in safe manner. Each unit section shall contain a minimum of one light fixture. Sections wider than 12 ft shall have multiple light fixtures with maximum spacing of 6 ft.

1. Provide light switch with pilot light for each access section. Locate switch near access door.

2. Provide timer for light switch to automatically turn off lights after preset time. Timer shall be similar to Intermatic Model FF2H with 0-2 hour range and hold feature to override automatic shut-off function.

3. Light fixtures shall be: LED type. Provide bulbs for each fixture.

B. Lights, switches, convenience outlets, wiring and conduit shall meet requirements of appropriate specification sections of Division 26.

1. Provide minimum of two convenience outlets on each unit, spaced evenly over length of unit.

C. Wiring and conduit inside of unit shall be provided by unit manufacturer, shall be watertight to allow washdown of unit, and meet requirements of NEC and appropriate specification sections of Division 26. Provide junction box for each motor at outside of unit wall and provide single point of connection for both 480V, 3-phase and 120V, single-phase power for connection by Electrical Contractor.

D. Seal electrical penetrations through unit air-tight.

2.23 PIPED SERVICE

A. Interior piping and equipment installation shall be complete. Piping shall be installed and tested per appropriate specification section. Unit manufacturer shall be responsible for any leaks, which occur in unit during system testing which occurs before system startup.

B. Extend piping for each coil and humidifier if used through panel casing. Terminate piping with flange for pipe 2-1/2” and larger or threaded connection for pipe 2” and smaller with caps.
PART 3 EXECUTION

3.1 INSTALLATION

A. Scheduled Factory Fabricated Custom Air Handling Units to be installed under this project include: AHU-DT-11AE, AHU-2, AHU-4, AHU-7 and AHU-8.

B. Units shall be assembled in modules in unit manufacturer's plant to allow for testing of complete unit.

C. Unit manufacturer shall supervise and be responsible for all field joining of the modules, including sheet metal, electrical and piping. Local trades may provide labor for unit assembly and installation.

D. If a unit cannot be broken down in modules that fit the clearances in the existing mechanical rooms it shall be shipped knock-down and field assembled. Field assembly shall maintain the manufacturer’s warranty and at minimum be overseen by a manufacturer’s representative. The drawings have indicated those units recommended to be knock-down. The contractor and manufacturer shall review the mechanical room for space available and determine which units can and cannot be shipped as modules.

E. Joints in floor between modules shall be air and water tight.

F. Unit manufacturer shall provide and install all equipment within unit as specified and/or scheduled, including fans, motors, coils, humidifiers, dampers, sound attenuating devices, piping, piping specialties, ductwork specialties, lights, switches and all equipment necessary to complete air handling equipment contained within housings. Mechanical and electrical connections (i.e., piping and conduit) shall be stubbed through housing so that appropriate contractor may provide service to air handling unit. Electrical wiring and control wiring shall terminate in junction boxes on accessible side of unit.

G. Provide structural steel sub-base as required. Refer to Unit Base in Part 2.

H. Field mounting of any equipment on housing walls or roof is not allowed without prior approval of Engineer. No field mounting of any services that will restrict access to fan and coil sections is permitted.

I. Unit manufacturer and installing contractor shall coordinate with other trade Contractors, all necessary requirements to assure proper air handling unit installation including module sizes necessary for installation of units within space available and final housekeeping pad dimensions.

J. Piped services to units, including electrical conduits, shall not cover fan and coil access sections.

3.2 INSTRUMENT TEST HOLES

A. Provide instrument test holes at air entering and air leaving side of all internal air handling unit components for static pressure differential or temperature measurements. Refer to Section 23-3314 - Ductwork Specialties for instrument test holes.

3.3 PROTECTION OF OPENINGS

A. Protect openings on housings during construction against entry of foreign matter and construction dirt.
3.4 FIELD TESTING & COMMISSIONING

A. Unit manufacturer and installing contractor shall jointly perform field casing leakage and deflection tests on each completed housing assembly as previously specified and shall be responsible for repair of all leaks. Submit certified test data to Engineer for approval.

B. Unit manufacturer shall be present for air handling unit commissioning. Coordinate date and time of commissioning with construction manager.

C. Major equipment and system startup and operational tests shall be scheduled and documented in accordance with Section 01 91 00 Commissioning.

D. System functional performance testing is part of the Commissioning Process as specified in Section 01 91 00. Functional performance testing shall be performed by the contractor and witnessed and documented by the Commissioning Authority.

END OF SECTION