GENERAL:

1. This section provides criteria for the design and installation of custom air handling units.

DESIGN GUIDELINES:

Design General

1. Refer to *23 0000 Central Station Air-handling Units.* The same criteria apply to this section.

2. Custom units are required for one or more of the following:
   2.1. Dimensional requirements
   2.2. Special materials of construction
   2.3. Outdoor units with service vestibules
   2.4. No-thru-metal thermal break
   2.5. Assembled in place

3. Custom AHU manufacturers each have their own method of constructing the unit base, floors, frame, casing panels, and thermal break. Those items are not customizable by the Specifier. The Specifier can select options for materials offered by the respective manufacturer. Options for materials of construction vary by manufacturer (i.e. some manufacturers only offer foam panels, or don't offer aluminum bases, or don't offer washdown construction) Therefore, it is important to group and bid manufacturers that can build the features desired for the application.

4. For this section design features are categorized as:
   4.1. Type 1: Semi-custom variable aspect ratio with formed sheet metal base rails, caulked sheet metal floors, not wash down construction, gasket thermal break casing.
      4.1.1. Typical Manufacturers: Alliance Air Products SLC, Daikin Vision, Trane PSCA, York Solutions, Thermal Corporation TSX or F series
   4.2. Type 2: Gasket thermal break casing, structural steel base rails, caulked tread plate floors, not wash down construction, painted or galvanized steel construction with choice of inner and outer wall materials.
      4.2.1. Typical Manufacturers: Alliance Air Products, Climate Craft, Energy Lab, Huntair, Ingenia, Innovent, Governair, Marcraft, Seasons 4, Temtrol, Thermal Corporation TSX or F series, Trane – TCFS, York Custom
   4.3. Type 2W: Gasket thermal break casing, structural steel base rails, welded tread plate floors, wash down construction, painted or galvanized steel construction with choice of inner and outer wall materials.
      4.3.1. Typical Manufacturers: Alliance Air Products, Climate Craft, Innovent, Ingenia, Marcraft, Thermal Corporation TSX or F series, Trane – TCFS&TCPA, York Custom

4.4. Type 3S: No-thru-metal thermal break casing, structural steel base rails, caulked tread plate floors, not wash down construction, painted or galvanized steel construction with choice of inner and outer wall materials.
4.4.1. Typical Manufacturers: Air Enterprise, Buffalo, Energy Lab, Marlo, Seasons 4, Thermal Corporation TS series
4.5. Type 3A: No-thru-metal thermal break casing, caulked tread plate floors, not wash down construction, all aluminum construction for corrosion resistance and lighter for rooftop applications.
4.5.1. Typical Manufacturers: Air Enterprise, Buffalo, Energy Lab, Marlo, Seasons 4, Thermal Corporation TS series, Ventrol
4.6. Type 3SW: No-thru-metal thermal break casing, structural steel base rails, welded tread plate floors, wash down construction, painted or galvanized steel construction with choice of inner and outer wall materials.
4.6.1. Typical Manufacturers: Air Enterprise, Buffalo, Thermal Corporation TS series, Ventrol
4.7. Type 3AW: No-thru-metal thermal break casing, welded tread plate floors, wash down construction, all aluminum construction for corrosion resistance and lighter for rooftop applications.
4.7.1. Typical Manufacturers: Air Enterprise, Buffalo, Thermal Corporation TS series, Ventrol

5. Thermal break considerations
5.1. Gasketed thermal break
5.1.1. Indoor conditioned mechanical rooms
5.2. No-thru-metal
5.2.1. Outdoor units
5.2.2. Indoor mechanical rooms that have outdoor air introduced that are not dehumidified. This would be a non-typical case for new construction, but it could exist in a retrofit scenario.

6. Structural base considerations
6.1. Structural shaped member
6.1.1. Formed sheet metal only allowed on Type 1 semi-custom variable aspect units.
6.2. Material and finish to match exterior casing.
6.3. Minimum height as required for condensate trap, Note some manufacturers depress the drain pan into the floor with the drain connection coming out through the base rail. Specify minimum height to the drain connection.

7. Interior casing considerations, the air tunnel
7.1. G90 steel
7.1.1. Suitable for most sections, not for sections with cooling coils or humidifiers
7.2. Aluminum
7.2.1. As a minimum non-ferrous for sections with water/moister (i.e. cooling coils, humidifiers, etc.)
7.2.2. Improved corrosion resistance all sections

7.3. Stainless steel
7.3.1. Sections with water/moister (i.e. cooling coils, humidifiers, etc.)
7.3.2. Improved corrosion resistance all sections

8. Floor material considerations
8.1. Units less than 5’ interior height
8.1.1. Smooth sheet metal.
8.1.2. Match interior casing material
8.2. Units 5’ or greater interior height
8.2.1. Sheet metal only allowed on Type 1 semi-custom variable aspect units.
8.2.2. Tread plate.
8.2.2.1. Aluminum preferred.
8.2.2.2. Stainless steel where needed for corrosion resistance.
8.2.2.3. Steel prohibited.

9. Washdown construction for applications where increased hygiene is desired
9.1. Healthcare
9.2. Vivarium
9.3. Cleanroom
9.4. FDA/GMP

10. Exterior casing considerations
10.1. G90 steel
10.1.1. Indoor conditioned mechanical rooms
10.2. Aluminum
10.2.1. Outdoor units
10.3. Stainless steel
10.3.1. Outdoor units in proximity to corrosive air

11. Outdoor unit roof construction
11.1. Preference is for standing seam metal roofs of the same material as the exterior casing.
11.2. TPO roofing has 20-30 life requiring maintenance or replacement of the 40-50 year life of the AHU and is not preferred. Only to be used to meet the minimum of three manufacturers.
11.3. EPDM is prohibited.

12. Casing insulation considerations
12.1. Injected Foam has best R-value and panel stiffness
12.1.1. Exterior units
12.1.2. Interior units where casing breakout noise does not impact occupied space.
12.2. Fiberglass
12.2.1. Better STC

12.2.2. Interior units where casing breakout noise does impact occupied space. Other mitigation methods are preferred in lieu of using a Custom AHU such as HVAC unit location, mechanical room wall construction materials

12.3. Mineral Wool

12.3.1. Highest STC

12.3.2. Interior units where casing breakout noise does impact occupied space. Other mitigation methods are preferred in lieu of using a Custom AHU such as HVAC unit location, mechanical room wall construction materials

13. Floor insulation considerations

13.1. Indoor

13.1.1. Foam

13.2. Rooftop

13.2.1. Mineral wool is preferred, or Fiberglass for lower sound transmission. Additional sound/vibration measures may be required at the curb.

13.3. Exterior at grade

13.3.1. Foam

SPECIFICATION REQUIREMENTS:

The following statements shall be included in the contract specification:

1. Refer to *23 0000 Central Station Air-handling Units.* Include applicable sections.

2. The minimum height of the base rail shall allow trapping the cooling coil based on the unit sitting on 3-1/2" housekeeping pad at 125% of fan rated pressure.

3. Provide test ports on each side of any element that changes temperature or pressure of the airflow. Test ports shall have threaded caps/plugs.

4. Stacked coils shall have structural racks to allow independent coil removal.

5. Isolate dissimilar metals that are in contact to prevent galvanic action and corrosion.

6. Casing leakage shall be less than 0.5% at +10" w.c. in positive pressure sections and -10" w.c. in negative pressure sections. Leakage rate to be verified onsite after installation.

7. Internal walls between air tunnels, containing dampers and/or fans, shall have the same pressure rating as the casing. Separation walls shall be subject to pressure and leakage testing.

8. Unit Construction

8.1. Thermal break <Pick One>

8.1.1. Gasketed thermal break that separates the metal in the air tunnel to the base and outer casing panels. Fasteners are permitted to penetrate across the gasketed thermal break.

8.1.2. No-thru-metal construction shall have a minimum of ½" of separation between the metal in the air tunnel to the base and outer casing panels typically in the form of a structural insulation polyblock. Fasteners are not permitted to penetrate across the thermal break.

8.2. Base Rails <Pick One>

8.2.1. Formed sheet metal rails or structural members. <only applies to semi-custom>

8.2.2. Base rails shall be structural members. Formed sheet metal rails are not acceptable.

8.2.3.

8.3. Floor <Pick One>

8.3.1. Minimum 16 ga **[G90] [aluminum], [3xx stainless steel]**, gasketed and caulked.

8.3.2. 1/8" minimum **[aluminum], [3xx stainless steel]** tread plate floor, gasketed and caulked.

8.3.3. 1/8" minimum **[aluminum], [3xx stainless steel]** tread plate floor, 2" turned up lip on the air tunnel side of the wall, continuously welded floor, with floor drains.

8.4. Floor Insulation <Pick One>

8.4.1. Floor insulation shall be closed cell sprayed foam. The R-value shall be equal or greater than the casing R-value.

8.4.2. Floor insulation shall be **[mineral wool] [fiberglass]**. The R-value shall be meet or exceed the casing R-value, or greater as required for STC rating.

8.5. Unit casing

8.5.1. Exterior 16 gauge minimum **[insert material and finish]**

8.5.2. Interior 20 gauge minimum **[insert material and finish]**

8.5.3. Maximum deflection in the longest direction L/200 at rated pressure

8.6. Casing Insulation <Pick One>

8.6.1. Casing insulation shall be closed cell foam injection.

8.6.2. Casing insulation shall be **[mineral wool] [fiberglass]**.

8.7. Roof of exterior units

8.7.1. Roofs shall be sloped, concealed fastener, standing seam made of the same material and minimum thickness of the exterior wall panel. Membrane roofs are not permitted.

8.7.2. Perimeter gutter and down spouts.

9. Consultant to specify internal components in accordance with the other sections of the University of Missouri Design Guidelines.

SCHEDULE TO BE INCLUDED IN THE DRAWINGS

TAG NO.		
MANUFACTURER/MODEL #		
AHU TYPE		
FAN **TOTAL AIRFLOW**		
MINIMUM NUMBER OF FANS		
FAN REDUNDANCY (none, N+1, N-1)		
MINIMUM OUTSIDE AIRFLOW		
TOTAL/EXTERNAL SP		
HP/VOLTS/PHASE		
COOLING COIL **TYPE**		
CFM		
MAX FACE VEL. (FPM)		
AIR PRESS DROP		
MIN. CAPACITY, TOTAL (BTUH)		
MIN. CAPACITY, SENSIBLE (BTUH)		
ENT. AIR TEMP (DB/WB)		
LV. AIR TEMP (DB/WB)		
ENT WATER TEMP (F)		
LV WATER TEMP (F)		
WATER PRESS DROP (FT)		
WATER FLOW (GPM)		
HEATING COIL **TYPE**		
CFM		
MAX FACE VEL. (FPM)		
AIR PRESS DROP		
MIN. CAPACITY, TOTAL (BTUH)		
MIN. CAPACITY, SENSIBLE (BTUH)		
ENT. AIR TEMP (DB/WB)		
LV. AIR TEMP (DB/WB)		
ENT WATER TEMP (F)		

LV WATER TEMP (F)		
WATER PRESS DROP (FT)		
WATER FLOW (GPM)		
FILTER SECTION		
PRE-FILTER TYPE / DEPTH		
PRE-FILTER PRESS DROP - CLEAN/DIRTY		
PRE-FILTER EFFICIENCY/ARRESTANCE		
FINAL FILTER TYPE / DEPTH		
FINAL FILTER PRESS DROP - CLEAN/DIRTY		
FINAL FILTER EFFICIENCY/ARRESTANCE		

REFERENCES

237000 AHU Chilled Water Coil Piping Detail

237000 AHU Chilled Water Coil Piping Detail – Multiple

237000 AHU Hot Water Coil Piping Detail

237000 AHU Hot Water Coil Piping Detail – Multiple

237000 AHU Hot Water Preheat Coil Piping Detail

237000 AHU Hot Water Preheat Coil Piping Detail – Multiple

237000 AHU Hot Water Reheat Coil Piping Detail

AHU Preheat Coil Circulating Pump Detail and Control Valve Sequence of Operation (MS&T)