# Air System Sizing Summary for AUDITORIO

Project Name: UMI SAN RAFAEL TUNJA 01/10/2024
Prepared by: TERMICA 02:58p. m.

## Air System Information

| | | | | |
|---|---|---|---|---|
| Air System Name | **AUDITORIO** | | Number of zones | **1** |
| Equipment Class | **SPLT AHU** | | Floor Area | **703.7** ft² |
| Air System Type | **SZCAV** | | Location | **Tunja, Colombia** |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Sum of space airflow rates** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **2.5** | Tons | Load occurs at | **Jun 1500** | |
| Total coil load | **30.2** | MBH | OA DB / WB | **63.4 / 56.0** | °F |
| Sensible coil load | **23.8** | MBH | Entering DB / WB | **72.3 / 65.6** | °F |
| Coil CFM at Jun 1500 | **3404** | CFM | Leaving DB / WB | **63.2 / 62.6** | °F |
| Max block CFM | **3404** | CFM | Coil ADP | **62.2** | °F |
| Sum of peak zone CFM | **3404** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.789** | | Resulting RH | **73** | % |
| CFM/Ton | **1354.1** | | Design supply temp. | **62.0** | °F |
| ft²/Ton | **279.9** | | Zone T-stat Check | **1 of 1** | OK |
| BTU/(hr·ft²) | **42.9** | | Max zone temperature deviation | **0.0** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM | **3404** | CFM | Fan motor BHP | **0.00** | BHP |
| Standard CFM | **2423** | CFM | Fan motor kW | **0.00** | kW |
| Actual max CFM/ft² | **4.84** | CFM/ft² | Fan static | **0.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **262** | CFM | CFM/person | **5.96** | CFM/person |
| CFM/ft² | **0.37** | CFM/ft² | | | |

# Zone Sizing Summary for AUDITORIO

Project Name: UMI SAN RAFAEL TUNJA 01/10/2024
Prepared by: TERMICA 02:58p. m.

## Air System Information

Air System Name ..... **AUDITORIO**
Equipment Class ..... **SPLT AHU**
Air System Type ..... **SZCAV**

Number of zones ..... **1**
Floor Area ..... **703.7** ft²
Location ..... **Tunja, Colombia**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 3404 | 3404 | 4.84 | 0.0 | - | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 26.2 | Jun 1400 | 8.9 | 703.7 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| P1 AUDITORIO | 1 | 26.2 | Jun 1400 | 3404 | 8.9 | 703.7 | 4.84 |

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jun 1500<br>COOLING OA DB / WB 63.4 °F / 56.0 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 36.0 °F / 29.2 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 219 ft² | 8850 | - | 219 ft² | - | - |
| Wall Transmission | 221 ft² | -674 | - | 221 ft² | 1979 | - |
| Roof Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Window Transmission | 219 ft² | -2822 | - | 219 ft² | 6922 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 1407 W | 4802 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 1056 W | 3602 | - | 0 | 0 | - |
| People | 44 | 12320 | 11880 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **26077** | **11880** | **-** | **8901** | **0** |
| Zone Conditioning | - | 25756 | 11880 | - | -168 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 3404 CFM | 0 | - | 3404 CFM | 0 | - |
| Ventilation Load | 262 CFM | -1947 | -5525 | 262 CFM | 298 | 0 |
| Supply Fan Load | 3404 CFM | 0 | - | 3404 CFM | 0 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **23808** | **6355** | **-** | **130** | **0** |
| Central Cooling Coil | - | 23808 | 6358 | - | 0 | 0 |
| **>> Total Conditioning** | **-** | **23808** | **6358** | **-** | **0** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

| TABLE 1.1.A. Component Loads For Space "P1 AUDITORIO" In Zone "Zone 1" | | | | | | |
|---|---|---|---|---|---|---|
| | DESIGN COOLING | | | DESIGN HEATING | | |
| | COOLING DATA AT Jun 1400<br>COOLING OA DB / WB 62.9 °F / 55.8 °F<br>OCCUPIED T-STAT 72.0 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 36.0 °F / 29.2 °F<br>OCCUPIED T-STAT 65.0 °F | | |
| | | Sensible | Latent | | Sensible | Latent |
| **SPACE LOADS** | **Details** | **(BTU/hr)** | **(BTU/hr)** | **Details** | **(BTU/hr)** | **(BTU/hr)** |
| Window & Skylight Solar Loads | 219 ft² | 9108 | - | 219 ft² | - | - |
| Wall Transmission | 221 ft² | -697 | - | 221 ft² | 1979 | - |
| Roof Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Window Transmission | 219 ft² | -2961 | - | 219 ft² | 6922 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 1407 W | 4802 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 1056 W | 3602 | - | 0 | 0 | - |
| People | 44 | 12320 | 11880 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **26173** | **11880** | **-** | **8901** | **0** |

| TABLE 1.1.B. Envelope Loads For Space "P1 AUDITORIO" In Zone "Zone 1" | | | | | | |
|---|---|---|---|---|---|---|
| | | | | COOLING | COOLING | HEATING |
| | Area | U-Value | Shade | TRANS | SOLAR | TRANS |
| | (ft²) | (BTU/(hr·ft²·°F)) | Coeff. | (BTU/hr) | (BTU/hr) | (BTU/hr) |
| **NNE EXPOSURE** | | | | | | |
| WALL | 67 | 0.309 | - | -170 | - | 596 |
| WINDOW 1 | 192 | 1.093 | 0.733 | -2599 | 7874 | 6075 |
| **WNW EXPOSURE** | | | | | | |
| WALL | 154 | 0.309 | - | -527 | - | 1383 |
| WINDOW 1 | 27 | 1.077 | 0.622 | -363 | 1234 | 847 |

**June DESIGN COOLING DAY, 1500**

## TABLE 1: SYSTEM DATA

| Component | Location | Dry-Bulb Temp (°F) | Specific Humidity (lb/lb) | Airflow (CFM) | CO2 Level (ppm) | Sensible Heat (BTU/hr) | Latent Heat (BTU/hr) |
|---|---|---|---|---|---|---|---|
| Ventilation Air | Inlet | 63.4 | 0.01178 | 262 | 400 | -1947 | -5525 |
| Vent - Return Mixing | Outlet | 72.3 | 0.01753 | 3404 | 2294 | - | - |
| Central Cooling Coil | Outlet | 63.2 | 0.01698 | 3404 | 2294 | 23808 | 6358 |
| Supply Fan | Outlet | 63.2 | 0.01698 | 3404 | 2294 | 0 | - |
| Cold Supply Duct | Outlet | 63.2 | 0.01698 | 3404 | 2294 | - | - |
| Zone Air | - | 73.1 | 0.01801 | 3404 | 2453 | 25756 | 11880 |
| Return Plenum | Outlet | 73.1 | 0.01801 | 3404 | 2453 | 0 | - |

*Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 0.769 BTU/(hr-CFM-F)*
*Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 3379.3 BTU/(hr-CFM)*
*Site Altitude = 9104.3 ft*

## TABLE 2: ZONE DATA

| Zone Name | Zone Sensible Load (BTU/hr) | T-stat Mode | Zone Cond (BTU/hr) | Zone Temp (°F) | Zone Airflow (CFM) | CO2 Level (ppm) | Terminal Heating Coil (BTU/hr) | Zone Heating Unit (BTU/hr) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 26077 | Cooling | 25756 | 73.1 | 3404 | 2453 | 0 | 0 |

## WINTER DESIGN HEATING

### TABLE 1: SYSTEM DATA

| Component | Location | Dry-Bulb Temp (°F) | Specific Humidity (lb/lb) | Airflow (CFM) | CO2 Level (ppm) | Sensible Heat (BTU/hr) | Latent Heat (BTU/hr) |
|---|---|---|---|---|---|---|---|
| Ventilation Air | Inlet | 36.0 | 0.00314 | 262 | 400 | -298 | 0 |
| Vent - Return Mixing | Outlet | 37.4 | 0.00314 | 3404 | 511 | - | - |
| Central Cooling Coil | Outlet | 37.4 | 0.00314 | 3404 | 511 | 0 | 0 |
| Supply Fan | Outlet | 37.4 | 0.00314 | 3404 | 511 | 0 | - |
| Cold Supply Duct | Outlet | 37.4 | 0.00314 | 3404 | 511 | - | - |
| Zone Air | - | 37.5 | 0.00314 | 3404 | 520 | 168 | 0 |
| Return Plenum | Outlet | 37.5 | 0.00314 | 3404 | 520 | 0 | - |

*Air Density x Heat Capacity x Conversion Factor: At sea level = 1.080; At site altitude = 0.769 BTU/(hr-CFM-F)*
*Air Density x Heat of Vaporization x Conversion Factor: At sea level = 4746.6; At site altitude = 3379.3 BTU/(hr-CFM)*
*Site Altitude = 9104.3 ft*

### TABLE 2: ZONE DATA

| Zone Name | Zone Sensible Load (BTU/hr) | T-stat Mode | Zone Cond (BTU/hr) | Zone Temp (°F) | Zone Airflow (CFM) | CO2 Level (ppm) | Terminal Heating Coil (BTU/hr) | Zone Heating Unit (BTU/hr) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | -8901 | Deadband | 168 | 37.5 | 3404 | 520 | 0 | 0 |