MECHANICAL INFRASTRUCTURE ASSESSMENT

FOR

VICTOR VALLEY COLLEGE

18422 Bear Valley Road
Victorville, CA 92395

Date 25 September 2012
dHA Job No. 12155
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I. **Purpose:**

A. To evaluate if the existing Central Plant Building 40 have enough cooling and heating capacity to support three additional buildings besides supporting the existing facilities. The buildings that are considered included in the chilled water and hot water loop are:

1. New Science/Health Building
2. One Stop Center
3. Music Auxiliary Building

Victor Valley College 2012 Project map, (Appendix A), Campus Map (Appendix B), Mechanical Site Plan (Appendix C) and Calculations of the three New Buildings (Appendix D) are attached for reference.
II. Existing Condition:

A. Central Cooling Plant:

The Central Plant Building 40 is providing ground water and chilled water to the upper campus via underground trenches. There are two 500 ton Trane centrifugal water cooled chillers providing the chilled water. The condenser water is provided by one 1,000 ton Baltimore Air Coil induced draft counter flow cooling tower to the chillers.

B. Central Heating Plant:

The Central Plant Building 40 is providing heating hot water to the upper campus via underground trenches. There are two Bryant boilers providing the hot water. The output of each boiler is 4,565 MBH. These two boilers are flex tube water boilers.

C. Site Distribution Chilled Water Piping:

1. See Appendix C, Mechanical Site Plan from Central Utility Plant by Chevron Energy Solution Company dated September 11, 2006. This is provided by the Facility for the study of this Report.

2. The Central Cooling Plant Building 40 is providing the Upper Campus via three loops in underground trenches. They are the north loops and the south loop.
   

   b. The north loop east supplies Library, Learning Resource Center Building 41, Academic Commons Building 42 and Student Activities Center Building 44.

   c. The south loop supplies Art Building 22, Advanced Technology Building 21, Music Building 20, Counseling & Administration Building 55, Performing Art Center Building 54, Student Service 1 Building 52 and Student Service 2 Building 50.

D. Site Distribution Hot Water Piping:

1. The hot water piping is same as the chilled water piping via three loops in underground trenches. They are the north loops and the south loop.


   b. The north loop east supplies Library, Learning Resource Center Building 41, Academic Commons Building 42 and Student Activities Center Building 44.

   c. The south loop supplies Art Building 22, Advanced Technology Building 21 and Counseling & Administration Building 55.
III. Data:

A. North Loop - West

- **Building 30 Liberal Arts**
  This building air conditioning is provided by an Air Handling Unit AH-3. This unit is a triple deck multi-zone unit. It is supplying 24,550 cfm and returning 14,500 to the unit. So, the outside air is 10,000. From psychometric chart, the cooling load of the cooling coil is 858.6 MBH and the chilled water GPM is 171.7. There is an evaporative condenser, compressor that providing the cooling for this building in the original design but later this evaporative condenser has been demolished. The compressor is abandon in place and the boiler has been removed. This building is now provided with chilled water, ground water and hot water from central plant. Since, the information about the boiler is not available from the as-built drawing, the heating load will be based on 40 Btu/h/ft² times the area. The building area is 240'x90'. The estimated load is 864 MBH.

- **Building 31 Science**
  The building air conditioning is provided by four Air-Conditioning Units MZ-1, MZ-2, MZ-3 and MZ-4. The MBH and GPM of the well water is 973 and 195. The MBH and GPM of the chilled water is 973 and 195. The MBH of the hot water is 1,377 and 138.

- **Building 32 Allied Health**
  The building air conditioning is provided by an Air-Conditioning Units MZ-1. The original design in the building includes a 34 ton air-cooled condenser, a 378 MBH output boiler and 12,800 cfm Multi-zone unit. The MBH and GPM of the well water are not known. The MBH and GPM of the chilled water coil is 406 and 81.2. The MBH of the hot water is assumed to equal to the hot water boiler output 378 and 25.2.

<table>
<thead>
<tr>
<th>Table 1 – North Loop West</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bldg No.</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>30</td>
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<tr>
<td>31</td>
</tr>
<tr>
<td>32</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

B. North Loop - East

- **Building 41 Library and Learning Center**
  The building air conditioning is provided by two Air-Conditioning Units AH-1 and AH-2. The MBH and GPM of the well water is 690 and 139. The MBH and GPM of the chilled water is 690 and 139. The MBH of the hot water is 1,200 and 120.
- **Building 42 Academic Commons**
  The building air conditioning is provided by one Air-Conditioning Unit. The MBH and GPM of the well water is 441.5 and 85. The MBH and GPM of the chilled water is 445 and 85. The MBH and GPM of the hot water is 666 and 66.

- **Building 44 Student Activities Center**
  The building air conditioning is provided by an Air-Conditioning Units AH-1. This unit is a single duct VAV AH unit. The MBH and GPM of the well water is 838 and 165. The MBH and GPM of the chilled water is 760 and 150. The MBH of the hot water reheat coil is 415.3 and 43.2.

<table>
<thead>
<tr>
<th>Bldg No.</th>
<th>Bldg Name</th>
<th>Cooling MBH</th>
<th>Cooling Tons</th>
<th>Chilled water (45°/55°) GPM</th>
<th>Heating MBH</th>
<th>Hot Water GPM</th>
</tr>
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<tbody>
<tr>
<td>41</td>
<td>Library &amp; Learning Center</td>
<td>690</td>
<td>58</td>
<td>139</td>
<td>1,200</td>
<td>120</td>
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<tr>
<td>42</td>
<td>Academic Commons</td>
<td>445</td>
<td>37</td>
<td>85</td>
<td>666</td>
<td>66</td>
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<tr>
<td>44</td>
<td>Student Activities Center</td>
<td>760</td>
<td>63</td>
<td>150</td>
<td>415</td>
<td>43</td>
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<td><strong>Total</strong></td>
<td></td>
<td><strong>1,895</strong></td>
<td><strong>158</strong></td>
<td><strong>374</strong></td>
<td><strong>2,281</strong></td>
<td><strong>229</strong></td>
</tr>
</tbody>
</table>

C. **South Loop**

- **Building 22 Art**
  The building air conditioning is provided by an Air-Conditioning Units MZ-1. The original design in the building includes a 43 ton air-cooled chiller, an 840 MBH output boiler and 12,000 cfm Multi-zone unit. The MBH and GPM of the well water is not known but assumed to be equal to chilled water MBH and GPM which is 516 and 103. The MBH and GPM of the chilled water are assumed to be equal to the 516 and 103. The MBH of the hot water is assumed to be equal to 840 and 56.

- **Building 21 Advanced Technology**
  The building air conditioning is provided by five Air-Conditioning Units AH-1, AH-2, AH-3, AH-4 and AH-5. The MBH and GPM of the well water is 1,139 and 228. The MBH and GPM of the chilled water is 2,356 and 451. The MBH of the hot water boiler is 2,800 and 230.

- **Building 20 Music**
  The building air conditioning is provided by an Air-Conditioning Units MZ-1. The original design in the building includes air-cooled chiller, a boiler and 10,730 cfm Multi-zone unit. The MBH and GPM of the well water are not available. It is assumed to be equal to chilled water MBH and GPM which is 516 and 103. The MBH and GPM of the chilled water are assumed to be equal to the 516 and 103. The hot water will not be included since the building heating is provided by local gas furnaces.
- **Building 55 Counseling and Administration**  
The building air conditioning is provided by two an Air-Conditioning Units AC-1 and AH-1. The MBH and GPM of the well water of AH-1 & AC-1 is 479 and 76. The information about the chilled water is not available. It is assumed to be equal to the MBH and GPM of the well water 479 and 76. The MBH and GPM of the hot water is 520 and 35.

- **Building 54 Performing Arts Center**  
The building air conditioning is provided by four Air-Conditioning Units AH-1, AH-2, AH-3 and AH-4. The MBH and GPM of the well water is 692 and 138.4. The MBH and GPM of the chilled water are 692 and assumed to be 138.4. The hot water will not be included since the building hot water is provided by local boiler.

- **Building 52 Student Services 1**  
This building air conditioning is provided by an Air Handling Unit AH-1. This unit is a triple deck multi-zone unit. This unit is providing 13,520 cfm to the building. The original chilled water is provided by a York 68.6 ton chiller located in the transformer vault and cooling tower enclosure. This have been demolished and replaced by central plant piping. There is no ground water to this building. The MBH and GPM of the chilled water is 339 and 68. The hot water will not be included since the building hot water is provided by local boiler.

- **Building 50 Student Services 2**  
This building air conditioning is provided by an Air Handling Unit AH-1. This unit is a triple deck multi-zone unit. This unit is providing 13,050 cfm to the building. The original chilled water is provided by a York 68.6 ton chiller located in the transformer vault and cooling tower enclosure same as Building 52. This have been demolished and replaced by central plant piping. There is no ground water to this building. The MBH and GPM of the chilled water is 358.6 and 72. The hot water will not be included since the building hot water is provided by local boiler.
Table 3 – South Loop

<table>
<thead>
<tr>
<th>Bldg No.</th>
<th>Bldg Name</th>
<th>Cooling MBH</th>
<th>Cooling Tons</th>
<th>Chilled water (45°/55°)GPM</th>
<th>Heating MBH</th>
<th>Hot Water GPM</th>
</tr>
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<tbody>
<tr>
<td>22</td>
<td>Art</td>
<td>516</td>
<td>43</td>
<td>103</td>
<td>840</td>
<td>56</td>
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<td>21</td>
<td>Advanced Technology</td>
<td>2,356</td>
<td>196</td>
<td>451</td>
<td>2,800</td>
<td>230</td>
</tr>
<tr>
<td>20</td>
<td>Music</td>
<td>516</td>
<td>43</td>
<td>103</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
</tr>
<tr>
<td>55</td>
<td>Counseling and Administration</td>
<td>479</td>
<td>40</td>
<td>76</td>
<td>520</td>
<td>35</td>
</tr>
<tr>
<td>54</td>
<td>Performing Arts Center</td>
<td>692</td>
<td>58</td>
<td>138</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
</tr>
<tr>
<td>52</td>
<td>Student Service 1</td>
<td>339</td>
<td>28</td>
<td>68</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
</tr>
<tr>
<td>50</td>
<td>Student Service 2</td>
<td>359</td>
<td>30</td>
<td>72</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>5,257</td>
<td>438</td>
<td>1,011</td>
<td>4,160</td>
<td>321</td>
</tr>
</tbody>
</table>

D. Assumptions


This building is approximately 350 ft x 70 ft. The gross square feet is 25,671 and the actual square feet are 17,970. In this building, the College is planning to have three science labs: Microbiology, Anatomy includes Cadaver Room, and Chemistry. The total area of these three labs and the storage room is 3,800 ft². These labs require 100% exhaust from these spaces. The rest of the building include (1) 1,200 ft² Digital Physical Science Lab, (4) Major Nursing Labs total 7,980 ft², (1) 2,700 ft² Lecture Hall, and 1,400 ft² Miscellaneous areas. These areas will be provided with Air-Conditioning and the air will be re-circulated. Using 200 ft²/ton for the three laboratories (20 tons), 200 ft²/ton for Digital Physical Science Lab (6 tons), 400 ft²/ton for nursing lab (20 ton), 250 ft²/ton for lecture hall (11 tons), and 350 ft²/ton for office and miscellaneous area (7 tons). The tonnage of the New Science Building is 63 tons. Say 65 tons which is 780 MBH.

For heating load of 100% outside air (lab) unit, use 80 Btuh/ft², the required load is 304 MBH. For heating load of Digital Physical Science Lab unit use 20 Btuh/ft², the required load is 24 MBH. For heating load of (4) Major Nursing lab unit, use 20 Btuh/ft², the required load is 160 MBH. For heating load of the lecture hall unit, use 20 Btuh/ft², the required load is 54 MBH. For heating load of the office and miscellaneous area unit, use 15 Btuh/ft², the required load is 35 MBH. The total heating load for this building is summation of 304, 24, 160, 54, 35 MBH which is 577 MBH.
2. New One Stop Center adjacent to existing Student Services Buildings 50 and 52.

The new building is approximately 7,051 gross square feet. This new building will match the existing adjacent building with slab on grade, CMU walls and steel roof framing. Using 380 ft² per ton for retail space, the new building tonnage is about 18.6 ton. Say 20 tons which is 240 MBH.

For heating load, use 15 Btuh/ft², the required load will be 106 MBH. The new additional will utilize the localized boiler for heating as existing Building 50 and 52.

3. New Music Auxiliary Building adjacent to existing Music Building 20.

This new building is approximately 40'x70'. This building is located on the footprint of an existing toilet/service. It will extend no further west than existing building being replaced. Construction will match existing with slab on grade, CMU walls, steel roof framing. Using 270 ft² per ton for the school classroom, the tonnage of this building will be 10.4 tons. Say 15 tons which is 180 MBH.

For heating load, use 15 Btuh/ft², the required load will be 42 MBH. The New Music Auxiliary Building will utilize the localized boiler for heating.

Table 4 – New Buildings

<table>
<thead>
<tr>
<th>Bldg No.</th>
<th>Bldg Name</th>
<th>Cooling MBH</th>
<th>Cooling Tons</th>
<th>Chilled water (42°/55°)GPM</th>
<th>Heating MBH</th>
<th>Hot Water GPM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>New Science Lab Building</td>
<td>780</td>
<td>65</td>
<td>120</td>
<td>577</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>New One Stop Center</td>
<td>240</td>
<td>20</td>
<td>37</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
</tr>
<tr>
<td></td>
<td>New Music Auxiliary</td>
<td>180</td>
<td>15</td>
<td>28</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
</tr>
<tr>
<td></td>
<td>Building</td>
<td>1,200</td>
<td>100</td>
<td>185</td>
<td>577</td>
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<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
IV. Analysis

A. The chilled water from Chiller 1 and Chiller 2 in the Central Plant is 918.5 GPM each. The total available chilled water flow is 918.5 x 2 = 1,837 gpm. This flow rate is based on 42°F leaving and 55°F entering which is 13°FΔT.

The total MBH and GPM of the North loop West is 2,238 and 448. The total MBH and GPM of the North loop East is 1,895 and 374. The total MBH and GPM of the South Loop is 5,257 and 1011. The total MBH and GPM of the entire Upper Campus is 9,390 and 1,833. The flow rate of the north loop and the south loop chilled water is based on 55°F leaving and 45°F entering which is 10°FΔT. The diversity factor of the Upper Campus is 1,833/1,837 = 99.8%.

Table 5 – Cooling & Heating Load Summary of Existing Loops

<table>
<thead>
<tr>
<th>Loop No.</th>
<th>Loop Name</th>
<th>Cooling MBH</th>
<th>Cooling Tons</th>
<th>Chilled water (45°/55°)GPM</th>
<th>Heating MBH</th>
<th>Hot Water GPM</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>N Loop West</td>
<td>2,238</td>
<td>186</td>
<td>448</td>
<td>2,619</td>
<td>221</td>
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<tr>
<td>2</td>
<td>N Loop East</td>
<td>1,895</td>
<td>158</td>
<td>374</td>
<td>2,281</td>
<td>229</td>
</tr>
<tr>
<td>3</td>
<td>South Loop</td>
<td>5,257</td>
<td>438</td>
<td>1,011</td>
<td>4,160</td>
<td>321</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>9,390</td>
<td>782</td>
<td>1,833</td>
<td>9,060</td>
<td>771</td>
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</table>
V. Conclusion:

As seen from Table 5, the total tonnage of the Upper Campus is 782. **The total chiller tonnage is 1,000.** The Existing Central Plant has enough cooling capacity to provide cooling for the three additional buildings. The additional 100 ton for the three new buildings will require 185 GPM of chilled water. The Maintenance Facility has to reduce the flow rate in the North Loop West, North Loop East and South Loop to each building. In addition, the facility have to adjust the flow rate to each Air Handling Unit in each building so that there will be extra chilled water available for the new building.

For heating water side, the total MBH of the Upper Campus is 9,637. **The total output of Boiler 1 and Boiler 2 is 9,130 MBH.** The boilers do not have enough capacities for the New Science Lab Building. The New Science Lab Building will have to be provided with individual boilers for the hot water.

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Cooling MBH</th>
<th>Cooling Tons</th>
<th>Revised Chilled water (42°/55°) GPM</th>
<th>Heating MBH</th>
<th>Hot Water GPM</th>
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<td>N Loop West</td>
<td>2,238</td>
<td>186</td>
<td>344</td>
<td>2,619</td>
<td>221</td>
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<tr>
<td></td>
<td>New Science Lab Building</td>
<td>780</td>
<td>65</td>
<td>120</td>
<td>577</td>
<td>29</td>
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<tr>
<td>2</td>
<td>N Loop East</td>
<td>1,895</td>
<td>158</td>
<td>374</td>
<td>2,281</td>
<td>229</td>
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<tr>
<td>3</td>
<td>South Loop</td>
<td>5,257</td>
<td>438</td>
<td>809</td>
<td>4,160</td>
<td>321</td>
</tr>
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<td></td>
<td>New One Stop Center</td>
<td>240</td>
<td>20</td>
<td>37</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
</tr>
<tr>
<td></td>
<td>New Music Auxiliary Building</td>
<td>180</td>
<td>15</td>
<td>28</td>
<td>Local Boiler</td>
<td>Local Boiler</td>
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<tr>
<td></td>
<td>Total MBH</td>
<td>10,590</td>
<td>882</td>
<td>1,712</td>
<td>9,637</td>
<td>800</td>
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Appendix A
Victor Valley College 2012 Project Map
New 350' x 70' single story Science/Health Lab Building (set approx. 20' northwest of the existing Science Building); to match construction of existing science building (slab on grade, CMU walls, steel roof framing); new building to align with and center on the existing building west wall.

New building = 21,357 GSF / 14,950 ASF

Remodel Existing Science Building 20 – 10,002 GSF / 8,308 ASF

New 30' x 50' one story Welding Lab Building (set approximately 2' east of the existing 50' wide Welding Building); new building to align with the existing building east wall. Construction: slab on grade, steel wall and roof framing, corrugated steel walls and roof.

Remodel Existing Welding Lab to correct ventilation. 3,720 GSF / 2,462 ASF

Remodel Existing Music Building 20 – 10,002 GSF / 8,308 ASF

New 40' x 70' one story Music Auxiliary Building (on the footprint of an existing toilet/service); building area approx. 2,800 GSF; new building to extend no further west than existing building being replaced. Construction to match existing: slab on grade, CMU walls, steel roof framing.

Victor Valley College, 2012 Project
Appendix B

Campus Map
Appendix C
Mechanical Site Plan from Central Utility Plant
Appendix D
Calculations
**Air System Information**

<table>
<thead>
<tr>
<th>Air System Name</th>
<th>AHU-1 Science Lab 100% OA</th>
<th>Number of zones</th>
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<tbody>
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<td>Equipment Class</td>
<td>CW AHU</td>
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<td></td>
</tr>
<tr>
<td>Air System Type</td>
<td>SZCAV</td>
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<td></td>
</tr>
<tr>
<td>Floor Area</td>
<td>14950.0 ft²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Barstow/Daggett, California</td>
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**Sizing Calculation Information**

<table>
<thead>
<tr>
<th>Zone and Space Sizing Method:</th>
<th>Calculation Months</th>
<th>Sizing Data</th>
</tr>
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<tbody>
<tr>
<td>Zone CFM</td>
<td>Sum of space airflow rates</td>
<td></td>
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<tr>
<td>Space CFM</td>
<td>Individual peak space loads</td>
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<tr>
<td>Calculation Months</td>
<td>Jan to Dec</td>
<td>Calculated</td>
</tr>
</tbody>
</table>

**Central Cooling Coil Sizing Data**

| Total coil load | 91.3 Tons | Load occurs at Aug 1500 |
| Total coil load | 1095.1 MBH | OA DB / WB 107.0 / 68.0 °F |
| Sensible coil load | 1095.1 MBH | Entering DB / WB 107.0 / 68.0 °F |
| Coil CFM at Aug 1500 | 20396 CFM | Leaving DB / WB 53.7 / 49.0 °F |
| Max block CFM | 20396 CFM | Coil ADP 47.8 °F |
| Sum of peak zone CFM | 20396 CFM | Bypass Factor 0.100 |
| Sensible heat ratio | 1.000 | Resulting RH 42 % |
| ft²/Ton | 163.8 | Design supply temp. 55.0 °F |
| BTU/(hr-ft²) | 73.3 | Zone T-stat Check 1 of 1 OK |
| Water flow @ 13.0 °F rise | 168.57 gpm | Max zone temperature deviation 0.0 °F |

**Central Heating Coil Sizing Data**

| Max coil load | 890.6 MBH | Load occurs at Des Htg |
| Coil CFM at Des Htg | 20396 CFM | BTU/(hr-ft²) 59.6 |
| Max coil CFM | 20396 CFM | Ent. DB / Lvg DB 28.0 / 71.4 °F |
| Water flow @ 40.0 °F drop | 44.56 gpm |

**Supply Fan Sizing Data**

| Actual max CFM | 20396 CFM | Fan motor BHP 23.77 BHP |
| Standard CFM | 19016 CFM | Fan motor kW 17.72 kW |
| Actual max CFM/ft² | 1.36 CFM/ft² | Fan static 4.00 in wg |

**Outdoor Ventilation Air Data**

| Design airflow CFM | 20396 CFM | CFM/person 54.57 CFM/person |
| CFM/ft² | 1.36 CFM/ft² |            |
### Air System Information

<table>
<thead>
<tr>
<th>Air System Name</th>
<th>AHU-1 One Stop Center</th>
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<td>Equipment Class</td>
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<td>Air System Type</td>
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### Sizing Calculation Information

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<th>Zone and Space Sizing Method:</th>
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<tr>
<td>Zone CFM</td>
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<td>Space CFM</td>
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<table>
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<td>Calculated</td>
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</tbody>
</table>

### Central Cooling Coil Sizing Data

- **Total coil load** 18.6 Tons
- **Total coil load** 223.0 MBH
- **Sensible coil load** 215.7 MBH
- **Coil CFM at Aug 1500** 8093 CFM
- **Max block CFM** 8093 CFM
- **Sum of peak zone CFM** 8093 CFM
- **Sensible heat ratio** 0.967
- **BTU/(hr-ft²)** 31.6
- **Water flow @ 13.0 °F rise** 34.33 gpm

- **Load occurs at** Aug 1500
- **OA DB / WB** 107.0 / 68.0 °F
- **Entering DB / WB** 80.0 / 62.0 °F
- **Leaving DB / WB** 53.6 / 51.9 °F
- **Coil ADP** 50.6 °F
- **Bypass Factor** 0.100
- **Resulting RH** 49%
- **Design supply temp.** 55.0 °F
- **Zone T-stat Check** 1 of 1 OK
- **Max zone temperature deviation** 0.0 °F

### Central Heating Coil Sizing Data

- **Max coil load** 80.6 MBH
- **Coil CFM at Des Htg** 8093 CFM
- **Max coil CFM** 8093 CFM
- **Water flow @ 40.0 °F drop** 4.03 gpm

- **Load occurs at** Des Htg
- **BTU/(hr-ft²)** 11.4
- **Ent. DB / Lvg DB** 61.5 / 71.4 °F

### Supply Fan Sizing Data

- **Actual max CFM** 8093 CFM
- **Standard CFM** 7546 CFM
- **Actual max CFM/ft²** 1.15 CFM/ft²

- **Fan motor BHP** 9.43 BHP
- **Fan motor kW** 7.03 kW
- **Fan static** 4.00 in wg

### Outdoor Ventilation Air Data

- **Design airflow CFM** 1635 CFM
- **CFM/ft²** 0.23 CFM/ft²
- **CFM/person** 15.54 CFM/person
### Air System Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air System Name</td>
<td>AHU-1 Music</td>
</tr>
<tr>
<td>Equipment Class</td>
<td>CW AHU</td>
</tr>
<tr>
<td>Air System Type</td>
<td>SZCAV</td>
</tr>
<tr>
<td>Number of zones</td>
<td>1</td>
</tr>
<tr>
<td>Floor Area</td>
<td>2800.0 ft²</td>
</tr>
<tr>
<td>Location</td>
<td>Barstow/Daggett, California</td>
</tr>
</tbody>
</table>

### Sizing Calculation Information

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

### Central Cooling Coil Sizing Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total coil load</td>
<td>10.4 Tons</td>
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<tr>
<td>Total coil load</td>
<td>124.5 MBH</td>
</tr>
<tr>
<td>Sensible coil load</td>
<td>119.6 MBH</td>
</tr>
<tr>
<td>Coil CFM at Jul 1500</td>
<td>4841 CFM</td>
</tr>
<tr>
<td>Max block CFM</td>
<td>4841 CFM</td>
</tr>
<tr>
<td>Sum of peak zone CFM</td>
<td>4841 CFM</td>
</tr>
<tr>
<td>Sensible heat ratio</td>
<td>0.961</td>
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<tr>
<td>ft³/Ton</td>
<td>269.9</td>
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<tr>
<td>BTU/(hr-ft²)</td>
<td>44.5</td>
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<tr>
<td>Water flow @ 13.0 °F rise</td>
<td>19.16 gpm</td>
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<tr>
<td>Load occurs at</td>
<td>Jul 1500</td>
</tr>
<tr>
<td>OA DB / WB</td>
<td>107.0 / 68.0 °F</td>
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<tr>
<td>Entering DB / WB</td>
<td>78.5 / 61.9 °F</td>
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<tr>
<td>Leaving DB / WB</td>
<td>54.0 / 52.4 °F</td>
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<tr>
<td>Coil ADP</td>
<td>51.3 °F</td>
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<tr>
<td>Bypass Factor</td>
<td>0.100</td>
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<tr>
<td>Resulting RH</td>
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<tr>
<td>Design supply temp.</td>
<td>55.0 °F</td>
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<tr>
<td>Zone T-stat Check</td>
<td>1 of 1 OK</td>
</tr>
<tr>
<td>Max zone temperature deviation</td>
<td>0.0 °F</td>
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<tr>
<td>Coil ADP</td>
<td>51.3 °F</td>
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<tr>
<td>Bypass Factor</td>
<td>0.100</td>
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<tr>
<td>Resulting RH</td>
<td>49%</td>
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<tr>
<td>Design supply temp.</td>
<td>55.0 °F</td>
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<tr>
<td>Zone T-stat Check</td>
<td>1 of 1 OK</td>
</tr>
<tr>
<td>Max zone temperature deviation</td>
<td>0.0 °F</td>
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### Central Heating Coil Sizing Data

<table>
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<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Max coil load</td>
<td>43.7 MBH</td>
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<tr>
<td>Coil CFM at Des Htg</td>
<td>4841 CFM</td>
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<tr>
<td>Max coil CFM</td>
<td>4841 CFM</td>
</tr>
<tr>
<td>Water flow @ 40.0 °F drop</td>
<td>2.19 gpm</td>
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<tr>
<td>Load occurs at</td>
<td>Des Htg</td>
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<tr>
<td>BTU/(hr-ft²)</td>
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<tr>
<td>Ent. DB / Lvg DB</td>
<td>63.6 / 72.5 °F</td>
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### Supply Fan Sizing Data

<table>
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<th>Parameter</th>
<th>Value</th>
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<tr>
<td>Actual max CFM</td>
<td>4841 CFM</td>
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<tr>
<td>Standard CFM</td>
<td>4513 CFM</td>
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<td>Actual max CFM/ft²</td>
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<td>Fan motor BHP</td>
<td>5.64 BHP</td>
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<td>Fan motor kW</td>
<td>4.21 kW</td>
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<tr>
<td>Fan static</td>
<td>4.00 in wg</td>
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### Outdoor Ventilation Air Data

<table>
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<tr>
<th>Parameter</th>
<th>Value</th>
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<tr>
<td>Design airflow CFM</td>
<td>728 CFM</td>
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<tr>
<td>CFM/ft²</td>
<td>0.26 CFM/ft²</td>
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<tr>
<td>CFM/person</td>
<td>13.0 CFM/person</td>
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