Santa Barbara City College
BCM Building
Supply Airflow Testing Report REV 1

Presented to:

SBCC
721 Cliff Drive
Santa Barbara, CA 93109

Testing Date: Feb./ March 2021
Re-tested: July 2021

Presented by:
Palt & Associates, Inc.
Sarah Palt

This is to certify that Palt and Associates, Inc., a California Corporation, has inspected and tested the systems described herein as to the state of performance, conditions and capabilities. The testing has been performed in accordance with ISO Norm 14644-1:2015 and the standard requirements and procedures of the Associated Air Balance Council. Palt and Associates is a California State Licensed air and water balance contractor and a carries a D-62 license. We certify the results of this testing to be true and accurate.

Certification Number: P21-012.3-1

Sarah Palt, CEO
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1. Overview

The following is the report for the airflow test study conducted at the Santa Barbara City College beginning of 2021. The scope of work was to test supply airflows for all indicated classrooms, lecture halls and offices to determine Air Change Rates for each room / area. Outside airflows were calculated for each room using building DDC information.

The following report lists the result for the BCM Building on the Main Campus.

1.1. Definitions

SA = Supply Airflow
OSA = Outside Airflow = fresh air
Air Change Rate: How many times the air in a defined space is changed out per hour; ACR is calculated as follows: ACR = Total SA (CFM) * 60 / Room Volume (CFT)
ASHRAE Standard 62.1-2019: Standard listing supply and OSA amounts to calculated new design buildings. The Standard also includes a table (Table L-1) providing check values for ventilation rates for existing buildings. This table and calculated outside airflows are check values ONLY and based on assumed and standardized default settings. In no way can these values determine a PASS/FAIL criteria for any rooms. It is only to provide check values, assuming default values for occupancy and a multi-zone HVAC system to simplify calculations.

2. HVAC System

Each tested HVAC system was set to maximum airflow capacity at the time of testing. The numbers listed in this report give the maximum possible supply airflow for each area with the current HVAC system (exceptions are noted in the attached data sheets).

The HVAC system for all three floors of the BCM Building (BCM = Business Communications) consist of individual Fan Coil Units, with a fixed outside airflow of 20%.

2.1. Room Data

Room areas (in square feet) were given to Palt and Associates by SBCC and were NOT measured or verified on site. Room height of each individual room was measured by Palt and Associates on site.

All data taken are listed in the attached data sheets, organized by building and floor. Each data sheet lists room area, room height, calculated room volume, testes Supply Airflow and Supply Air Change Rates.
Outside Air amounts (OSA) were NOT tested. OSA was calculated by using the DDC systems information (provided by SBCC) for each individual system and are noted in the data sheets. These numbers are used to calculate the Outside Air Change Rate, which differs from the Supply Air Change Rate (less), unless the system provides 100% outside air.

The subject of this report is to report tested airflows only. Assumptions based on these data regarding health and safety of occupants are in no way the responsibility of Palt and Associates Inc. This airflow study can only report test data at one point in time (at the time of testing) and help evaluate the condition and performance of the mechanical HVAC system tested.

Note: HVAC design calculations in California are based on minimum energy consumption. Conditioning of outside air requires energy and is set to the minimum amount.

3. Supply Airflow Testing

Airflow measurements were obtained using a Shortridge Instruments ADM860 Air Data Multimeter with a Flowhood adapter (tent) wherever possible. If the use of the Flowhood was not feasible due to ceiling height (lecture halls, theatres, gym) the main supply air duct for the specific area was traversed using a Shortridge Multimeter with Airfoil adapter. Small holes were drilled into the ductwork and velocity readings were taken across the entire opening of the duct. The average velocity was multiplied by the open area of the duct to calculate the supply airflow.

4. Data Analysis

Required air change rates (ACR) and outside airflow depends on multiple factors: Size and volume of room, usage of room, and occupancy. A minimum Outside Air Amount of ACR = 4-6 for classrooms can be used as a guideline ONLY. Correct requirements per ASHRAE Standard have to be calculated for each room specifically.

To verify and check ventilation rates, ASHRAE Standard 62.1-2019 includes a table listing “Combined Outdoor Air Rate” in CFM/SQFT for different Occupancy Categories. This list is NOT intended for design purpose and is used to provide check values ONLY, with assumed default values to simplify calculations.

Using this table, outdoor airflow rates were calculated for each room and compared to the current, tested outdoor airflow rates.
5. Test Data Summary

The following table shows a summary of the main tested data compiled during the airflow study. More detailed information for each area tested are arranged at the end of this report.

**BCM Building First Floor:**

<table>
<thead>
<tr>
<th>Room #</th>
<th>Category</th>
<th>Total SA Airflow</th>
<th>Calculated OSA Airflow</th>
<th>Min. required OSA Airflow</th>
<th>Within ASHRAE Requirements</th>
<th>Recommendation</th>
<th>Re-tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Classroom</td>
<td>856 CFM</td>
<td>171.2 CFM</td>
<td>507 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>102</td>
<td>Spec Class Lab</td>
<td>1,021 CFM</td>
<td>204.2 CFM</td>
<td>1,115 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>102E</td>
<td>Spec Class Lab</td>
<td>109 CFM</td>
<td>21.8 CFM</td>
<td>153 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>102F</td>
<td>Spec Class Lab</td>
<td>113 CFM</td>
<td>22.6 CFM</td>
<td>153 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>105</td>
<td>Spec Class Lab</td>
<td>162 CFM</td>
<td>32.4 CFM</td>
<td>242 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>Spec Class Lab</td>
<td>0 CFM</td>
<td>0.0 CFM</td>
<td>173 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>107</td>
<td>Spec Class Lab</td>
<td>99 CFM</td>
<td>19.8 CFM</td>
<td>177 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
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</tr>
<tr>
<td>108</td>
<td>Spec Class Lab</td>
<td>243 CFM</td>
<td>48.6 CFM</td>
<td>185 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>109</td>
<td>Spec Class Lab</td>
<td>0 CFM</td>
<td>0.0 CFM</td>
<td>9 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>115</td>
<td>Office</td>
<td>216 CFM</td>
<td>43.2 CFM</td>
<td>9 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>116</td>
<td>Office</td>
<td>270 CFM</td>
<td>54.0 CFM</td>
<td>9 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>117</td>
<td>Office</td>
<td>165 CFM</td>
<td>33.0 CFM</td>
<td>1,513 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>Café</td>
<td>875 CFM</td>
<td>175.0 CFM</td>
<td>8 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
</tbody>
</table>

REV 1: Rooms highlighted in grey were re-tested on 7/7/2021 after all filters were changed and general HVAC maintenance was completed. Airflows only increased slightly.
### BCM Building Second Floor:

<table>
<thead>
<tr>
<th>Room #</th>
<th>Category</th>
<th>Total SA Airflow</th>
<th>Calculated OSA Airflow</th>
<th>Min. required OSA Airflow</th>
<th>Within ASHRAE Requirements</th>
<th>Recommendation</th>
<th>Re-tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>201</td>
<td>Read / Study Room</td>
<td>155 CFM</td>
<td>31.0 CFM</td>
<td>252 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>203</td>
<td>Office Service</td>
<td>111 CFM</td>
<td>22.2 CFM</td>
<td>41 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>203</td>
<td>Office Service</td>
<td>128 CFM</td>
<td>25.6 CFM</td>
<td>41 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>204</td>
<td>Read / Study Room</td>
<td>160 CFM</td>
<td>32.0 CFM</td>
<td>239 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>214</td>
<td>Meeting Room</td>
<td>0 CFM</td>
<td>0.0 CFM</td>
<td>61 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>215</td>
<td>Office</td>
<td>129 CFM</td>
<td>25.8 CFM</td>
<td>13 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>216</td>
<td>Office</td>
<td>198 CFM</td>
<td>39.6 CFM</td>
<td>19 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>217</td>
<td>Office</td>
<td>218 CFM</td>
<td>43.6 CFM</td>
<td>19 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>218</td>
<td>Office</td>
<td>142 CFM</td>
<td>28.4 CFM</td>
<td>13 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>219</td>
<td>Office</td>
<td>147 CFM</td>
<td>29.4 CFM</td>
<td>13 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>220</td>
<td>Office</td>
<td>0 CFM</td>
<td>0.0 CFM</td>
<td>23 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>222</td>
<td>Classroom</td>
<td>923 CFM</td>
<td>184.6 CFM</td>
<td>566 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>224</td>
<td>Classroom</td>
<td>531 CFM</td>
<td>106.2 CFM</td>
<td>423 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>224</td>
<td>Classroom</td>
<td>578 CFM</td>
<td>115.6 CFM</td>
<td>423 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>226</td>
<td>Classroom</td>
<td>661 CFM</td>
<td>132.2 CFM</td>
<td>409 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>228</td>
<td>Classroom</td>
<td>621 CFM</td>
<td>124.2 CFM</td>
<td>420 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>230</td>
<td>Classroom</td>
<td>803 CFM</td>
<td>160.6 CFM</td>
<td>553 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>237</td>
<td>Classroom</td>
<td>628 CFM</td>
<td>125.6 CFM</td>
<td>509 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>245</td>
<td>Classroom Auditorium</td>
<td>4,394 CFM</td>
<td>1,098.4 CFM</td>
<td>5,151 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
</tbody>
</table>

**REV 1:** Rooms highlighted in grey were re-tested on 7/7/2021 after all filters were changed and general HVAC maintenance was completed. Airflows only increased slightly.

### BCM Building Third Floor:

<table>
<thead>
<tr>
<th>Room #</th>
<th>Category</th>
<th>Total SA Airflow</th>
<th>Calculated OSA Airflow</th>
<th>Min. required OSA Airflow</th>
<th>Within ASHRAE Requirements</th>
<th>Recommendation</th>
<th>Re-tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>301</td>
<td>Classroom</td>
<td>1,543 CFM</td>
<td>308.6 CFM</td>
<td>362 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>302</td>
<td>Class Lab</td>
<td>1,685 CFM</td>
<td>337.0 CFM</td>
<td>433 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>313</td>
<td>Class Lab</td>
<td>2,377 CFM</td>
<td>475.4 CFM</td>
<td>429 CFM</td>
<td>YES</td>
<td>See section 5.1, 1 thru 3</td>
<td></td>
</tr>
<tr>
<td>314</td>
<td>Class Lab</td>
<td>1,779 CFM</td>
<td>355.8 CFM</td>
<td>425 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
<tr>
<td>315</td>
<td>Class Lab</td>
<td>1,423 CFM</td>
<td>284.6 CFM</td>
<td>425 CFM</td>
<td>NO</td>
<td>See section 5.1, 1 thru 4</td>
<td></td>
</tr>
</tbody>
</table>

**REV 1:** No areas were re-tested at this point in time.
5.1. Recommendations:

The following list are recommendations applicable for all areas - especially for the areas with outside airflows below minimum ASHRAE recommendations:

1. Increase mechanical outside airflow from current minimum setting to maximum setting wherever possible; re-calculate calculated outside airflows for new OSA settings and reevaluate outside airflows.

2. Open windows to increase outside air amount and fresh air circulation throughout the room; this method cannot be “tested”, as airflow testing can only be performed for mechanical systems (airflow amount through an open window will change depending on outside air conditions, wind, temperature etc.); however, it will increase the outside airflow in the classroom. Strategically placed fans in front of windows will help outside air circulation throughout the room. If necessary, smoke studies can be performed to help visualize airflow pattern and currents throughout the classroom.

3. Minimize class density; above listed recommended outside airflows per ASHRAE Table L-1 assume standard occupancy

4. Place portable HEPA filter air purifiers in classrooms of concern. These units recirculate room air at a specified rate (can be tested) through a system of pre- and HEPA filters and help provide clean filtered air to the area.
5.2. Portable HEPA Filters:

As listed in 5.1 Recommendations #4; portable HEPA filter units can be added to the rooms that did not pass ASHRAE requirements. SBCC recently purchased a large number of these portable filters that have been distributed throughout the campus. If placed in a room, these units recirculate room air constantly throughout their HEPA filters and internal UV light system, providing filtered cleaned air to the room.

Airflow readings were taken of multiple units throughout the campus (at full speed). Average airflow of the small units MA-50 are 400 CFM, the medium units MA-112 are 537 CFM and the large OCA-1200 are specified w/ 1,200 CFM.

The following table shows the results of the above listed rooms that did not pass ASHRAE requirements with OSA provided from the HVAC system only. With additional portable HEPA filter(s) placed in each room, the results are as follows:

<table>
<thead>
<tr>
<th>Room #</th>
<th>Category</th>
<th>Added HEPA Filter</th>
<th>OSA (HVAC + HEPA)</th>
<th>ASHRAE Requ.</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Size</td>
<td>CFM</td>
<td>CFM</td>
<td>%</td>
</tr>
<tr>
<td>101</td>
<td>Classroom</td>
<td>MA-50</td>
<td>400</td>
<td>580</td>
<td>507</td>
</tr>
<tr>
<td>102</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>606</td>
<td>115</td>
</tr>
<tr>
<td>102E</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>424</td>
<td>153</td>
</tr>
<tr>
<td>102F</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>426</td>
<td>153</td>
</tr>
<tr>
<td>105</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>432</td>
<td>242</td>
</tr>
<tr>
<td>106</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>400</td>
<td>242</td>
</tr>
<tr>
<td>107</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>420</td>
<td>173</td>
</tr>
<tr>
<td>108</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>449</td>
<td>177</td>
</tr>
<tr>
<td>109</td>
<td>Spec Class Lab</td>
<td>MA-50</td>
<td>400</td>
<td>400</td>
<td>185</td>
</tr>
<tr>
<td>130</td>
<td>Café</td>
<td>MA-112</td>
<td>537</td>
<td>1,912</td>
<td>1,513</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OCA-1200</td>
<td>1200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Room #</th>
<th>Category</th>
<th>Added HEPA Filter</th>
<th>OSA (HVAC + HEPA)</th>
<th>ASHRAE Requ.</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Size</td>
<td>CFM</td>
<td>CFM</td>
<td>%</td>
</tr>
<tr>
<td>201</td>
<td>Read / Study Room</td>
<td>MA-50</td>
<td>400</td>
<td>431</td>
<td>252</td>
</tr>
<tr>
<td>203</td>
<td>Office Services</td>
<td>MA-50</td>
<td>400</td>
<td>426</td>
<td>41</td>
</tr>
<tr>
<td>204</td>
<td>Read / Study Room</td>
<td>MA-50</td>
<td>400</td>
<td>432</td>
<td>239</td>
</tr>
<tr>
<td>214</td>
<td>Meeting Room</td>
<td>MA-50</td>
<td>400</td>
<td>400</td>
<td>61</td>
</tr>
<tr>
<td>220</td>
<td>Office</td>
<td>MA-50</td>
<td>400</td>
<td>400</td>
<td>23</td>
</tr>
<tr>
<td>222</td>
<td>Classroom</td>
<td>MA-50</td>
<td>400</td>
<td>585</td>
<td>566</td>
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<tr>
<td>224</td>
<td>Classroom</td>
<td>MA-50</td>
<td>400</td>
<td>516</td>
<td>423</td>
</tr>
<tr>
<td>226</td>
<td>Classroom</td>
<td>MA-50</td>
<td>400</td>
<td>532</td>
<td>409</td>
</tr>
<tr>
<td>228</td>
<td>Classroom</td>
<td>MA-50</td>
<td>400</td>
<td>524</td>
<td>420</td>
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<tr>
<td>230</td>
<td>Classroom</td>
<td>MA-50</td>
<td>400</td>
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<td>Classroom</td>
<td>MA-50</td>
<td>400</td>
<td>526</td>
<td>509</td>
</tr>
<tr>
<td>245</td>
<td>Classroom Auditorium</td>
<td>MA-50</td>
<td>400</td>
<td>709</td>
<td>362</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OCA-1200</td>
<td>1200</td>
<td>5,235</td>
<td>5,151</td>
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<tr>
<td></td>
<td></td>
<td>OCA-1200</td>
<td>1200</td>
<td></td>
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</tr>
</tbody>
</table>

Rooms 130 would need 2 portables and Room 245 four (4) additional portable units placed within the area to meet ASHREA requirements.
6. Conclusion and Discussion:

All tested airflows listed in this report can only be used to evaluate the condition of the HVAC system. The original design parameters for the rooms and buildings are currently unknown. All comparison values are recommendations only, using comparison tables and current mechanical standards as references. These standards are meant to evaluate the HVAC systems only and cannot in any way be used in regard to health and safety recommendations. Recommendations listed in this report are based on current CDC, NEBB and similar organizations knowledge, recommendations, and suggestions.

Common best practice recommendations for all areas:

- Run HVAC system continuously; at a minimum perform building flush-outs by running mechanical airflows two hour prior and two hours past building occupancy
- Continue to use MERV 13 Filters in all HVAC Systems with monthly check up on filter loading / change out
- Continue to clean and sanitize all areas in use
- Continue to request face covering to be worn on campus at all times
- Continue to minimize close contact and maintain a safe distance
- Increase total Supply Airflow if Supply Airflow Rate is low
- Increase OSA airflow to maximum possible amount
- Open windows in all areas possible and whenever spaces are occupied
- Place portable HEPA filter units in areas of concern

Further options of upgrading the mechanical systems are currently available, for example installation of UV lights inside HVAC units or Ionization units in supply air ducts. However, these methods are costly and are not short term / fast options as they require major changes to the mechanical systems. Their effectiveness has to be evaluated in regard to their costs (installation and maintenance) and installation duration.
# Appendix

## Detailed Building Summary

### BCM Building First Floor

<table>
<thead>
<tr>
<th>Room #</th>
<th>Category</th>
<th>Room Volume</th>
<th>Total SA Airflow</th>
<th>Total SA Air Change Rate</th>
<th>Calculated OSA</th>
<th>Calculated OSA Air Change Rate</th>
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<tbody>
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<td>4.2</td>
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<tr>
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### BCM Building Second Floor

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<th>Calculated OSA Air Change Rate</th>
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<td>0.0</td>
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### ASHREA STANDARD 62.1-2019 Table L-1 Ventilation Check Table

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<th>Occupancy Category</th>
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<th>Required</th>
<th>Difference</th>
</tr>
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<table>
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<th>Difference</th>
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### 7.1.3. BCM – Third Floor

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<th>Room Volume</th>
<th>Total SA Airflow</th>
<th>Total SA Change Rate</th>
<th>Calculated OSA</th>
<th>Calculated OSA Air Change Rate</th>
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<th>Room Area</th>
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7.2. Equipment Calibration Certificates

Allometrics

1425 B Atlantis Dr, Webster, TX 77598
(800) 528-2246 Fax (281) 474-5482
www.allometrics.com

Calibration Certificate
001102024

Customer: PALT AND ASSOC INC
6110 WILD HORSE PL
PASO ROBLES, CA, 93446-8408
Work Order: 00121424

Serial Number: M95752RF5
Asset ID: M95752RF5
Manufacturer: SHORTRIDGE INSTRUMENTS
Model Number: ADM-860
Location:

Test Result: PASS
Cal Date: 08/17/2020
Next Cal Date: 08/17/2021
Date of Issue: 08/17/2020
Performed At: ALLOMETRICS LABORATORY
Performed By: TFIREBAUGH

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The standards listed under the Test Equipment section and used in this calibration are traceable through NIST (National Institute for Standards and Technology) to the SI (International System of Units).

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TEST ENVIRONMENT

Temperature: 20.58°C
Humidity: 45.8%

UUT CONFORMITY TEST DATA

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TEST EQUIPMENT

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<tr>
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<td>2/8/2021</td>
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PROCEDURE

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</table>

COMMENTS

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Calibration Certificate

001102026

Customer: PALT AND ASSOC INC
6110 WILD HORSE PL
PASO ROBLES, CA, 93446-8408

Serial Number: MB91011RFS
Asset ID: MB91011RFS
Manufacturer: SHORTRIDGE INSTRUMENTS
Model Number: ADM-860

Date of Issue: 8/17/2020
Date of Issue: 8/17/2020
Performed By: ALLOMETRICS LABORATORY
Performed By: TFIREBAUGH

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The standards listed under the Test Equipment section and used in this calibration are traceable through NIST (National Institute for Standards and Technology) to the SI (International System of Units).

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## TEST ENVIRONMENT

| Temperature: 20.58°C | Humidity: 45.8% |

## UUT CONFORMITY TEST DATA

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<thead>
<tr>
<th>#</th>
<th>Description</th>
<th>Test Point</th>
<th>Unit</th>
<th>Minimum</th>
<th>Maximum</th>
<th>As Found</th>
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<th>As Left</th>
<th>P/F</th>
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## TEST EQUIPMENT

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<td>2/8/2021</td>
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<td>ADDITELL/ADT155-DP30-760/Pressure Module</td>
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<td>2/8/2021</td>
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## PROCEDURE

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<td>C</td>
<td>CALIBRATION PROCEDURE FOR PRESSURE DEVICES</td>
<td>11/4/2019</td>
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## COMMENTS

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04.ISO9001.01
7.3. Building Floor Layout
7.4.  Detailed room data sheets
Building: BCM-01
Room: 101 Classroom
Tested 02/24/2021

Room Area: 695 SQFT
Room Height: 8.3 FT
Room Volume: 5,768.5 CFT

Tested Supply Airflow = 856.0 CFM

Tested SA Air Change Rate = 8.9 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 171.2 CFM

Calc. OSA Air Change Rate = 1.8 AC/hr

Testing Method: Flow Hood

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<tr>
<th>Register</th>
<th>CFM</th>
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<tbody>
<tr>
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<td>SA#2</td>
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<td>SA#3</td>
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<td>SA#4</td>
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<td>856</td>
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</table>

Building: BCM-01
Room: 101 Classroom
Re-Tested 07/07/2021

Room Area: 695 SQFT
Room Height: 8.3 FT
Room Volume: 5,768.5 CFT

Tested Supply Airflow = 899.0 CFM

Tested SA Air Change Rate = 9.4 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 179.8 CFM

Calc. OSA Air Change Rate = 1.9 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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</thead>
<tbody>
<tr>
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<td>SA#2</td>
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<td>Total</td>
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</table>
Building: BCM-01
Room: 102  Spec Class Lab  Tested 02/24/2021

Room Area: 1,528 SQFT
Room Height: 9.4 FT
Room Volume: 14,363.2 CFT

Tested Supply Airflow = 1,021.0 CFM
Tested SA Air Change Rate = 4.3 AC/hr

OSA % (DDC): 0.2  20%
OSA calculated = 204.2 CFM

Calc. OSA Air Change Rate = 0.9 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
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<td>SA#2</td>
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<td><strong>Total</strong></td>
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Building: BCM-01
Room: 102  Spec Class Lab  Re-Tested 07/07/2021

Room Area: 1,528 SQFT
Room Height: 9.4 FT
Room Volume: 14,363.2 CFT

Tested Supply Airflow = 1,032.0 CFM
Tested SA Air Change Rate = 4.3 AC/hr

OSA % (DDC): 0.2  20%
OSA calculated = 206.4 CFM

Calc. OSA Air Change Rate = 0.9 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
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### BCM-01

**Room:** 102E  Spec Class Service  
Tested 02/24/2021

<table>
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<tr>
<th>Room Area:</th>
<th>209 SQFT</th>
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<tbody>
<tr>
<td>Room Height:</td>
<td>7.9 FT</td>
</tr>
<tr>
<td>Room Volume:</td>
<td>1,651.1 CFT</td>
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</table>

**Tested Supply Airflow =** 109.0 CFM

**Tested SA Air Change Rate =** 4.0 AC/hr

OSA % (DDC): 0.2  20%

OSA calculated = 21.8 CFM

**Calc. OSA Air Change Rate =** 0.8 AC/hr

**Testing Method:** Flow Hood

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### BCM-01

**Room:** 102E  Spec Class Service  
Re-Tested 07/07/2021

<table>
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<th>Room Area:</th>
<th>209 SQFT</th>
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<tbody>
<tr>
<td>Room Height:</td>
<td>7.9 FT</td>
</tr>
<tr>
<td>Room Volume:</td>
<td>1,651.1 CFT</td>
</tr>
</tbody>
</table>

**Tested Supply Airflow =** 121.0 CFM

**Tested SA Air Change Rate =** 4.4 AC/hr

OSA % (DDC): 0.2  20%

OSA calculated = 24.2 CFM

**Calc. OSA Air Change Rate =** 0.9 AC/hr

**Testing Method:** Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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<td><strong>Total</strong></td>
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</tbody>
</table>
Building: BCM-01
Room: 102-F  Class Spec Service  Tested 02/24/2021

Room Area: 209 SQFT
Room Height: 7.9 FT
Room Volume: 1,651.1 CFT

Tested Supply Airflow = 113.0 CFM
Tested SA Air Change Rate = 4.1 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 22.6 CFM

Calc. OSA Air Change Rate = 0.8 AC/hr

Testing Method: Flow Hood

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Building: BCM-01
Room: 102-F  Class Spec Service  Re-Tested 07/07/2021

Room Area: 209 SQFT
Room Height: 7.9 FT
Room Volume: 1,651.1 CFT

Tested Supply Airflow = 132.0 CFM
Tested SA Air Change Rate = 4.8 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 26.4 CFM

Calc. OSA Air Change Rate = 1.0 AC/hr

Testing Method: Flow Hood

<table>
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<tr>
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<th>CFM</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Total</td>
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Building: BCM-01  
Room: 105  Spec Class Lab

Room Area: 331 SQFT  
Room Height: 7.8 FT  
Room Volume: 2,581.8 CFT

Tested Supply Airflow = 162.0 CFM  
Tested SA Air Change Rate = 3.8 AC/hr

OSA % (DDC): 0.2  20%  
OSA calculated = 32.4 CFM

Calc. OSA Air Change Rate = 0.8 AC/hr

Testing Method: Flow Hood

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Building: BCM-01  
Room: 106  Spec Class Lab

Room Area: 331 SQFT  
Room Height: 7.8 FT  
Room Volume: 2,581.8 CFT

Tested Supply Airflow = 0.0 CFM  
Tested SA Air Change Rate = 0.0 AC/hr

OSA % (DDC): 0.2  20%  
OSA calculated = 0.0 CFM

Calc. OSA Air Change Rate = 0.0 AC/hr

Testing Method: Flow Hood

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Closed for repair
### BCM-01

**Building:** BCM-01  
**Room:** 107  Spec Class Lab

Room Area: 237 SQFT  
Room Height: 7.8 FT  
Room Volume: 1,848.6 CFT

Tested Supply Airflow = **99.0** CFM  
Tested SA Air Change Rate = **3.2** AC/hr

OSA % (DDC): 0.2 20%  
OSA calculated = 19.8 CFM  
Calc. OSA Air Change Rate = 0.6 AC/hr

Testing Method: Flow Hood

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### BCM-01

**Building:** BCM-01  
**Room:** 108  Spec Class Lab

Room Area: 243 SQFT  
Room Height: 8.0 FT  
Room Volume: 1,944.0 CFT

Tested Supply Airflow = **243.0** CFM  
Tested SA Air Change Rate = **7.5** AC/hr

OSA % (DDC): 0.2 20%  
OSA calculated = 48.6 CFM  
Calc. OSA Air Change Rate = 1.5 AC/hr

Testing Method: Flow Hood

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Building: BCM-01
Room: Spec Class Lab

Room Area: 253 SQFT
Room Height: 8.0 FT
Room Volume: 2,024.0 CFT

Tested Supply Airflow = 0.0 CFM
Tested SA Air Change Rate = 0.0 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 0.0 CFM

Calc. OSA Air Change Rate = 0.0 AC/hr

Testing Method: Flow Hood

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Building: BCM-01
Room: Office

Room Area: 79 SQFT
Room Height: 7.9 FT
Room Volume: 624.1 CFT

Tested Supply Airflow = 216.0 CFM
Tested SA Air Change Rate = 20.8 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 43.2 CFM

Calc. OSA Air Change Rate = 4.2 AC/hr

Testing Method: Flow Hood

<table>
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<th>CFM</th>
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<td>Total</td>
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</table>
Building: BCM-01
Room: 116 Office

Room Area: 79 SQFT
Room Height: 7.9 FT
Room Volume: 624.1 CFT

Tested Supply Airflow = 270.0 CFM

Tested SA Air Change Rate = 26.0 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 54.0 CFM

Calc. OSA Air Change Rate = 5.2 AC/hr

Testing Method: Flow Hood

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<th>CFM</th>
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</table>

Building: BCM-01
Room: 117 Office

Room Area: 83 SQFT
Room Height: 7.9 FT
Room Volume: 655.7 CFT

Tested Supply Airflow = 165.0 CFM

Tested SA Air Change Rate = 15.1 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 33.0 CFM

Calc. OSA Air Change Rate = 3.0 AC/hr

Testing Method: Flow Hood

<table>
<thead>
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<th>Register</th>
<th>CFM</th>
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</thead>
<tbody>
<tr>
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<td>Total</td>
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</tbody>
</table>
Building: BCM-01
Room: 130 Café / Food Facilities

Room Area: 1,220 SQFT
Room Height: 10.2 FT
Room Volume: 12,444.0 CFT

Tested Supply Airflow = 875.0 CFM
Tested SA Air Change Rate = 4.2 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 175.0 CFM

Calc. OSA Air Change Rate = 0.8 AC/hr

Testing Method: Flow Hood

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<td>SA#7</td>
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<td>SA#8</td>
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<td>SA#9</td>
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<td><strong>Total</strong></td>
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Building: BCM-01
Room: 139 Office

Room Area: 75 SQFT
Room Height: 7.9 FT
Room Volume: 592.5 CFT

Tested Supply Airflow = 232.0 CFM
Tested SA Air Change Rate = 23.5 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 46.4 CFM

Calc. OSA Air Change Rate = 4.7 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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</thead>
<tbody>
<tr>
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Building: BCM-02  
Room: 201  Read / Study Room

Room Area: 400 SQFT  
Room Height: 13.9 FT  
Room Volume: 5,560.0 CFT

Tested Supply Airflow = 155.0 CFM  
**Tested SA Air Change Rate = 1.7 AC/hr**

OSA % (DDC): 0.2 20%  
OSA calculated = 31.0 CFM  
**Calc. OSA Air Change Rate = 0.3 AC/hr**

Testing Method: Flow Hood

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<td><strong>155</strong></td>
</tr>
</tbody>
</table>
Building: BCM-02  
Room: 203 Office Service  
Tested 02/24/2021

Room Area: 373 SQFT  
Room Height: 8.9 FT  
Room Volume: 3,319.7 CFT

Tested Supply Airflow = 111.0 CFM  
**Tested SA Air Change Rate = 2.0 AC/hr**

OSA % (DDC): 0.2 20%  
OSA calculated = 22.2 CFM

**Calc. OSA Air Change Rate = 0.4 AC/hr**

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
<td>52</td>
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<tr>
<td>SA#2</td>
<td>59</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>111</strong></td>
</tr>
</tbody>
</table>

Building: BCM-02  
Room: 203 Office Service  
Re-Tested 07/07/2021

Room Area: 373 SQFT  
Room Height: 8.9 FT  
Room Volume: 3,319.7 CFT

Tested Supply Airflow = 128.0 CFM  
**Tested SA Air Change Rate = 2.3 AC/hr**

OSA % (DDC): 0.2 20%  
OSA calculated = 25.6 CFM

**Calc. OSA Air Change Rate = 0.5 AC/hr**

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
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<tbody>
<tr>
<td>SA#1</td>
<td>62</td>
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<tr>
<td>SA#2</td>
<td>66</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>128</strong></td>
</tr>
</tbody>
</table>
Building: BCM-02
Room: 204  Read / Study Room

Room Area: 380 SQFT
Room Height: 9.9 FT
Room Volume: 3,762.0 CFT

Tested Supply Airflow = 160.0 CFM

| Tested SA Air Change Rate = 2.6 AC/hr |

OSA % (DDC): 0.2 20%
OSA calculated = 32.0 CFM

Calc. OSA Air Change Rate = 0.5 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
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<th>CFM</th>
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<tbody>
<tr>
<td>SA#1</td>
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<tr>
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<td>77</td>
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<tr>
<td>Total</td>
<td>160</td>
</tr>
</tbody>
</table>

Building: BCM-02
Room: 214  Meeting Room

Room Area: 553 SQFT
Room Height: 9.9 FT
Room Volume: 5,474.7 CFT

Tested Supply Airflow = 0.0 CFM

| Tested SA Air Change Rate = 0.0 AC/hr |

OSA % (DDC): 0.2 20%
OSA calculated = 0.0 CFM

Calc. OSA Air Change Rate = 0.0 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>SA#2</td>
<td>0</td>
</tr>
<tr>
<td>SA#3</td>
<td>0</td>
</tr>
<tr>
<td>SA#4</td>
<td>0</td>
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<tr>
<td>Total</td>
<td>0</td>
</tr>
</tbody>
</table>
Building: BCM-02
Room: 215 OFFICE

Room Area: 119 SQFT
Room Height: 9.9 FT
Room Volume: 1,178.1 CFT

Tested Supply Airflow = 129.0 CFM
Tested SA Air Change Rate = 6.6 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 25.8 CFM

Calc. OSA Air Change Rate = 1.3 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
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<tr>
<td>Total</td>
<td>129</td>
</tr>
</tbody>
</table>

Building: BCM-02
Room: 216 OFFICE

Room Area: 174 SQFT
Room Height: 9.9 FT
Room Volume: 1,722.6 CFT

Tested Supply Airflow = 198.0 CFM
Tested SA Air Change Rate = 6.9 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 39.6 CFM

Calc. OSA Air Change Rate = 1.4 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
<td>198</td>
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<tr>
<td>Total</td>
<td>198</td>
</tr>
</tbody>
</table>
Building: BCM-02
Room: 217 OFFICE

Room Area: 174 SQFT
Room Height: 9.9 FT
Room Volume: 1,722.6 CFT

Tested Supply Airflow = 218.0 CFM
Tested SA Air Change Rate = 7.6 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 43.6 CFM

Calc. OSA Air Change Rate = 1.5 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Total</td>
<td>218</td>
</tr>
</tbody>
</table>

Building: BCM-02
Room: 218 OFFICE

Room Area: 119 SQFT
Room Height: 9.9 FT
Room Volume: 1,178.1 CFT

Tested Supply Airflow = 142.0 CFM
Tested SA Air Change Rate = 7.2 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 28.4 CFM

Calc. OSA Air Change Rate = 1.4 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
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<th>CFM</th>
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</thead>
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<tr>
<td>Total</td>
<td>142</td>
</tr>
</tbody>
</table>
Building: BCM-02
Room: 219 OFFICE

Room Area: 119 SQFT
Room Height: 9.9 FT
Room Volume: 1,178.1 CFT

Tested Supply Airflow = 147.0 CFM

Tested SA Air Change Rate = 7.5 AC/hr

OSA % (DDC): 0.2
OSA calculated = 29.4 CFM

Calc. OSA Air Change Rate = 1.5 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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</thead>
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<tr>
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<tr>
<td><strong>Total</strong></td>
<td><strong>147</strong></td>
</tr>
</tbody>
</table>

Building: BCM-02
Room: 220 OFFICE

Room Area: 208 SQFT
Room Height: 9.9 FT
Room Volume: 2,059.2 CFT

Tested Supply Airflow = 0.0 CFM

Tested SA Air Change Rate = 0.0 AC/hr

OSA % (DDC): 0.2
OSA calculated = 0.0 CFM

Calc. OSA Air Change Rate = 0.0 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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<td>SA#1</td>
<td>0</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

Register coverd; unable to test
Building:  BCM-02  
Room:  222  Classroom  

Room Area:  776 SQFT  
Room Height:  9.2 FT  
Room Volume:  7,139.2 CFT  

Tested Supply Airflow =  923.0  CFM  

Tested SA Air Change Rate =  7.8  AC/hr  

OSA % (DDC):  0.2  20%  
OSA calculated =  184.6  CFM  

Calc. OSA Air Change Rate =  1.6  AC/hr  

Testing Method:  Flow Hood  

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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</thead>
<tbody>
<tr>
<td>SA#1</td>
<td>133</td>
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<tr>
<td>SA#2</td>
<td>270</td>
</tr>
<tr>
<td>SA#3</td>
<td>318</td>
</tr>
<tr>
<td>SA#4</td>
<td>202</td>
</tr>
<tr>
<td>Total</td>
<td>923</td>
</tr>
</tbody>
</table>
### 224 Classroom Tested 02/24/2021

- **579 SQFT**
- **9.7 FT**
- **5,616.3 CFT**

**Tested Supply Airflow = 531.0 CFM**

**Tested SA Air Change Rate = 5.7 AC/hr**

**OSA % (DDC): 0.2 20%**

**OSA calculated = 106.2 CFM**

**Calc. OSA Air Change Rate = 1.1 AC/hr**

**Testing Method: Flow Hood**

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
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<tr>
<td>SA#2</td>
<td>135</td>
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<tr>
<td>SA#3</td>
<td>107</td>
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<td>SA#4</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>531</strong></td>
</tr>
</tbody>
</table>

### 224 Classroom Re-Tested 07/07/2021

- **579 SQFT**
- **9.7 FT**
- **5,616.3 CFT**

**Tested Supply Airflow = 578.0 CFM**

**Tested SA Air Change Rate = 6.2 AC/hr**

**OSA % (DDC): 0.2 20%**

**OSA calculated = 115.6 CFM**

**Calc. OSA Air Change Rate = 1.2 AC/hr**

**Testing Method: Flow Hood**

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
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<tr>
<td>SA#2</td>
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<tr>
<td>SA#3</td>
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<td>SA#4</td>
<td>149</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>578</strong></td>
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</tbody>
</table>
Building: BCM-02
Room: 226 Classroom

Room Area: 560 SQFT
Room Height: 9.7 FT
Room Volume: 5,432.0 CFT

Tested Supply Airflow = 661.0 CFM
Tested SA Air Change Rate = 7.3 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 132.2 CFM

Calc. OSA Air Change Rate = 1.5 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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<tr>
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<td>174</td>
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<td>SA#4</td>
<td>178</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>661</strong></td>
</tr>
</tbody>
</table>

Building: BCM-02
Room: 228 Classroom

Room Area: 575 SQFT
Room Height: 9.7 FT
Room Volume: 5,577.5 CFT

Tested Supply Airflow = 621.0 CFM
Tested SA Air Change Rate = 6.7 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 124.2 CFM

Calc. OSA Air Change Rate = 1.3 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
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<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
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<tr>
<td>SA#2</td>
<td>159</td>
</tr>
<tr>
<td>SA#3</td>
<td>176</td>
</tr>
<tr>
<td>SA#4</td>
<td>136</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>621</strong></td>
</tr>
</tbody>
</table>
Building: BCM-02
Room: 230 Classroom

Room Area: 758 SQFT
Room Height: 9.7 FT
Room Volume: 7,352.6 CFT

Tested Supply Airflow = 803.0 CFM

| Tested SA Air Change Rate | 6.6 AC/hr |

OSA % (DDC): 0.2 20%
OSA calculated = 160.6 CFM

Calc. OSA Air Change Rate = 1.3 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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<tr>
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<td>SA#2</td>
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<tr>
<td>SA#3</td>
<td>192</td>
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<tr>
<td>SA#4</td>
<td>216</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>803</strong></td>
</tr>
</tbody>
</table>

Building: BCM-02
Room: 237 Classroom

Room Area: 697 SQFT
Room Height: 9.7 FT
Room Volume: 6,760.9 CFT

Tested Supply Airflow = 628.0 CFM

| Tested SA Air Change Rate | 5.6 AC/hr |

OSA % (DDC): 0.2 20%
OSA calculated = 125.6 CFM

Calc. OSA Air Change Rate = 1.1 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
<td>163</td>
</tr>
<tr>
<td>SA#2</td>
<td>179</td>
</tr>
<tr>
<td>SA#3</td>
<td>161</td>
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<tr>
<td>SA#4</td>
<td>125</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>628</strong></td>
</tr>
</tbody>
</table>
Building:  BCM-02
Room:  245  Classroom / Auditorium

Room Area:  3,260 SQFT
Room Height:  16.0 FT
Room Volume:  52,160.0 CFT

Tested Supply Airflow = 4,393.6 CFM

Tested SA Air Change Rate = 5.1 AC/hr

OSA % (DDC):  0.25  25%
OSA calculated = 1,098.4 CFM

Calc. OSA Air Change Rate = 1.3 AC/hr

Testing Method:  Duct Traverse / Airfoil

Ins. Duct Diameter 26" x 26"
Duct Area = 4.7 SQFT

<table>
<thead>
<tr>
<th></th>
<th>1,285</th>
<th>1,430</th>
<th>1,250</th>
<th>1,162</th>
<th>1,177</th>
<th>1,145</th>
<th>1,095</th>
<th>962</th>
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</thead>
<tbody>
<tr>
<td>Moved</td>
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<td>960</td>
<td>797</td>
<td>405</td>
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<td>1,256</td>
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<td>1,105</td>
<td>1,069</td>
<td>813</td>
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<tr>
<td></td>
<td>1,518</td>
<td>1,150</td>
<td>973</td>
<td>919</td>
<td>553</td>
<td>823</td>
<td>617</td>
<td>489</td>
</tr>
</tbody>
</table>

Average Velocity = 936 FPM
Supply Airflow = 4,393.6 CFM

AH-2; tested at 60HZ, maximum fan speed; normal operations @ 42Hz
Fan speed controlled by room CO2 sensor
Building: BCM-03
Room: 301 Classroom

Room Area: 738 SQFT
Room Height: 8.9 FT
Room Volume: 6,568.2 CFT

Tested Supply Airflow = 1,543.0 CFM

Tested SA Air Change Rate = 14.1 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 308.6 CFM

Calc. OSA Air Change Rate = 2.8 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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</thead>
<tbody>
<tr>
<td>SA#1</td>
<td>219</td>
</tr>
<tr>
<td>SA#2</td>
<td>402</td>
</tr>
<tr>
<td>SA#3</td>
<td>364</td>
</tr>
<tr>
<td>SA#4</td>
<td>558</td>
</tr>
<tr>
<td>Total</td>
<td>1,543</td>
</tr>
</tbody>
</table>

Building: BCM-03
Room: 302 Class Lab

Room Area: 884 SQFT
Room Height: 8.9 FT
Room Volume: 7,867.6 CFT

Tested Supply Airflow = 1,685.0 CFM

Tested SA Air Change Rate = 12.9 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 337.0 CFM

Calc. OSA Air Change Rate = 2.6 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA#1</td>
<td>370</td>
</tr>
<tr>
<td>SA#2</td>
<td>467</td>
</tr>
<tr>
<td>SA#3</td>
<td>407</td>
</tr>
<tr>
<td>SA#4</td>
<td>441</td>
</tr>
<tr>
<td>Total</td>
<td>1,685</td>
</tr>
</tbody>
</table>
Building: BCM-03  
Room: 313  Class Lab

Room Area: 875 SQFT  
Room Height: 8.6 FT  
Room Volume: 7,525.0 CFT

Tested Supply Airflow = 2,377.0 CFM  
Tested SA Air Change Rate = 19.0 AC/hr

OSA % (DDC): 0.2  20%  
OSA calculated = 475.4 CFM

Calc. OSA Air Change Rate = 3.8 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
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<tbody>
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</tr>
<tr>
<td>SA#3</td>
<td>389</td>
</tr>
<tr>
<td>SA#4</td>
<td>374</td>
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<tr>
<td>SA#5</td>
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<tr>
<td>SA#6</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>2,377</strong></td>
</tr>
</tbody>
</table>

Building: BCM-03  
Room: 314  Class Lab

Room Area: 867 SQFT  
Room Height: 8.6 FT  
Room Volume: 7,456.2 CFT

Tested Supply Airflow = 1,779.0 CFM  
Tested SA Air Change Rate = 14.3 AC/hr

OSA % (DDC): 0.2  20%  
OSA calculated = 355.8 CFM

Calc. OSA Air Change Rate = 2.9 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
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</tr>
<tr>
<td>SA#2</td>
<td>456</td>
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<tr>
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<td>SA#4</td>
<td>409</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,779</strong></td>
</tr>
</tbody>
</table>
Building: BCM-03
Room: 315 Class Lab

Room Area: 867 SQFT
Room Height: 8.6 FT
Room Volume: 7,456.2 CFT

Tested Supply Airflow = 1,423.0 CFM
Tested SA Air Change Rate = 11.5 AC/hr

OSA % (DDC): 0.2 20%
OSA calculated = 284.6 CFM

Calc. OSA Air Change Rate = 2.3 AC/hr

Testing Method: Flow Hood

<table>
<thead>
<tr>
<th>Register</th>
<th>CFM</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>SA#2</td>
<td>329</td>
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<td>SA#3</td>
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<td>SA#4</td>
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<tr>
<td>Total</td>
<td>1,423</td>
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</table>