

## **CASLE REPORT ON MAY 3, 2016, SITE VISIT AND CONSEQUENT PLANS FOR A WAY AHEAD**

At a recent CASLE meeting, team member Jennifer Hawkins identified Big Ass Solutions as a reliable company that her clients contracted to solve heat stress problems within their buildings. Member Pontes researched the company's website and found that they have had success in providing cooling solutions within classrooms (<http://www.bigassfans.com/for-business/education/k-12/>) around the country. Member Pontes then contacted the company and proposed one of their reps visit our island campuses to determine if we would be candidates for the type of solutions their products could provide. On Tuesday, May 3, 2016, at 2 p.m. Paul Santos, a manufacturer's rep from Big Ass Solutions, met with Members Pontes and Smith along with CASLE team members Tom Calhoun and Jennifer Hawkins at the CUSD offices. The following events were scheduled.

- 2:30 p.m. Arrive at Coronado High School and preceded to CHS CASLE rep Brad Couture's classroom in 600 building. Lynn Hanson-Rowe and Jon Zimmer (also CHS CASLE reps) were to meet us there to lead the group to problem areas in 400 and 700 buildings.
- 3:05 p.m. Arrive in Room 203 at Coronado Middle School to be met by CMS CASLE reps Laura Byington and Katie Leontieff. Laura and Katie would show us to heat stress areas at CMS as applicable.
- 3:35 p.m. Arrive at Village Elementary where Village CASLE rep Steve Slassen would meet us and take us to Village's worst heat stress areas.
- 4:05 p.m. Visits complete. Return to CUSD offices to review findings.

We ended up running about 20 minutes late but the above schedule was accomplished. The following are the observations from the visits:

### **Coronado High School**

- Classroom 602. It was not a particularly warm day so the classroom was not uncomfortable. Noted in the room were 3 ceiling fans mounted very close to the high ceiling. They were operating during the visit but Couture reports that they do not move much air. A couple floor fans were also in use as well as a single free standing AC unit that literally dumped exhaust air out an open window when in operation. Last fall Couture recorded classroom temperatures as high as 88 degrees. The first day his classroom did not record a reading of at least 80 degrees was October 5. Couture reported that either the ventilation system in his room was not working or he did not have proper knowledge of how to operate it. Thus it is not currently used to increase circulation within the classroom. The south wall of this classroom has no windows and is likely a heat sink. Also air cannot circulate into the classroom as the prevailing wind is from the SW. The large east facing windows get the morning sun so the room heats up early. Pulling shades down prohibits any outside air flow from entering. We also visited Room 602 lab but due to its high ceiling and more modern fans that have a much higher volume of output, Couture reports he is satisfied with conditions in the lab.

- Classroom 413. Zimmer's south-facing classroom also had operable fans but a much lower ceiling. He also reported papers would blow off desks at other than low settings. Portable AC units were evident in his classroom. One issue with this classroom is that the prevailing SW wind is blocked by the gymnasium. The southerly oriented windows get a lot of radiated heat in the afternoon. Zimmer also noted that his ventilation system was not operating or at least he did not have knowledge on how to operate it. Last fall Zimmer recorded classroom temperatures as high as 91 degrees. Between school start on August 26 and through October 16, Zimmer only recorded two days when his classroom temperature did not reach at least 80 degrees. Zimmer also reported that last month he used a meter to measure CO2 levels in his room. He recorded readings between 1328 ppm and 1630 ppm indicating his room is not being adequately vented even on days that are not excessively hot. Currently the meter is recording CO2 readings in room 305 where the teacher reports to Zimmer readings occasionally above 1800 ppm. Here are the commonly accepted standards for CO2 levels:

<u>250-350 ppm</u>	<u>Normal background concentration in outdoor ambient air</u>
<u>350-1,000 ppm</u>	<u>Concentrations typical of occupied indoor spaces with good air exchange</u>
<u>1,000-2,000 ppm</u>	<u>Complaints of drowsiness and poor air.</u>
<u>2,000-5,000 ppm</u>	<u>Headaches, sleepiness and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.</u>

- Classroom 407. A classroom similar to Zimmer's however on the north side of the building. Heat problems are reported in this classroom but as it is located above the first floor boys' restroom, foul odors have been reported as a concern in this classroom although work was done to alleviate the problem. The teacher was unavailable to provide current observations.
- Classroom 306. This classroom is also reported as having major heat problems. It has ceiling fans but again at other than low speeds they blow paper from the desks and do not reach into the front and back of the room. There is one small south facing window so any prevailing breeze is negligible. The teacher runs a portable AC unit when possible but students cannot hear when the unit is on. The main windows face east and are recessed under the walkway outside the classroom. Little circulation was noted. Fall temps for this classroom were not recorded.

(At this time, please note that CASLE rep Jim Richmond loaned the District small, thumb-drive sized temperature recorders which CASLE rep Brad Couture has distributed and are currently in place in many classrooms at sites throughout the District. If it turns out they are effective they will be used in the fall to record classroom temps in a much more comprehensive group of classrooms.)

- Lynn Hanson-Rowe's Special Education Classroom 706 above the breezeway at the high school entrance. Little circulation is available in this classroom. The room itself is odd-shaped and windows do not permit cross ventilation. Lynn is unable to operate the ventilation system and there are no ceiling fans installed. Santos expressed to me in an aside that he was particularly concerned by his observations of the ventilation deficiencies within this classroom. In the Draft Pilot Program below Santos offers a dedicated plan to improve conditions in this room.
- Engineering classroom on second floor above CHS front office. Again this classroom has no cross ventilation and either the ventilation system in the room is inoperable or the teacher has not been given instructions in how to use it. All windows face east or northeast. The door is westerly facing and if left open, would be the only way to capture the prevailing breeze.

### **Coronado Middle School**

- Ms. Byington's classroom. Second floor, NW corner of CMS Building A. Most windows at CMS are not able to open. They are simply fixed panes of glass. The ones that do open get covered when shades are down so ventilation suffers. Again, teachers here at CMS report that either ventilating systems are not working or they have not been given instructions in how to operate them. Ceiling fans are evident and operable but often spin in the wrong direction. Reversing the spin requires contacting an M&O person. These issues are common throughout CMS classrooms visited.
- Classroom above CMS library. See above issues with Ms. Byington's classroom however this is a south facing room that gets the direct afternoon sunlight without any available cross breeze. Another issue noted at this time was teachers at CMS have been instructed to close all windows before departing their classrooms for the day. With no operating ventilation systems there is no way to "cool soak" the classrooms overnight. Thus each day classrooms are likely to start the day at a warmer temperature than necessary.
- Ms. Leontieff's Special Ed classroom on the first floor of CMS Building B. This classroom faces the quad but is somewhat recessed. Very few windows in this classroom. Ventilation is reported as not operating but again this might just require better informing teachers in use of these systems. Fans turn in wrong direction or random directions as in previously visited CMS classrooms.

### **Village Elementary School/Early Childhood Development Center**

- Classroom 706. On the NE corner of the 700 block quad this room only has north facing windows, no cross ventilation and the installed ventilation system has not been operating and the teachers do not know how to operate them. Ceiling fans provide some relief but again at other than low speed they blow papers from desks, a particularly bothersome issue for first graders.
- We also visited two second floor classrooms above the school's office. One had only north facing windows but the other was on the building's SW corner. Again both reported insufficient circulation and ventilation systems that they did not know how to operate. Ceiling fans worked but were bothersome at other than low speeds.

- Due to time constraints, the company representative did not visit the ECDC. However, a future visit can determine if there are any shortfalls at the site and appropriate corrective actions considered at that time.

### **Strand Elementary School**

- Again to due to time constraints and the more remote location of SES, a visit to the site by the rep was not possible. However, CASLE team member Lance Rodgers is a contractor with a student at that site. He has investigated Strand classrooms in the recent past and notes that many of them are currently configured with heat pumps. It is possible these heat pumps may be convertible to include a cooling mode. Although we do not have direct observations, these heat pumps and any other ventilation systems will need inspection to ensure optimal operability. Also, teachers will need instruction in their capabilities, usage, and proper care.

### **Outcomes**

The group returned to the District Offices to debrief the visit.

Here are the consistent items noted by CASLE team member Tom Calhoun, an engineer that has worked at SDUSD to help them with their engineering needs. Consequently, he has a lot of experience in schools and classrooms:

1. Need operational review of HVAC system to get optimum ventilation effectiveness.
2. Windows should be open early and late to take advantage of OAT. (Outside Air Temperature)
3. Maximize window opening cross sectional area for maximum OA ventilation.
4. Pilot should be run in worst classroom after ensuring operating systems work properly.
5. Potential for displacement ventilation to cool classrooms. Consider installation of EMS (Environmental Management Systems) to optimize environmental conditions.
6. Optimize fans for circulation and Venturi effect to draw in OA.
7. Desired relief in worst classrooms by August start of school.
8. O&M tech manuals should be reviewed prior to doing anything else.
9. In buildings with attic space above classrooms (such as CMS Building A), considerations should be given to installation of attic fans, possibly solar powered.

Big Ass Solutions rep Paul Santos also emphasized the need to repair and return to operation all installed ventilation systems and educate teachers in how to use them. A high priority for him was to also have the teachers make all available attempts to cool soak their rooms overnight. He noted many fans were less than optimally designed and configured. In most cases his observations were that there are usually not enough fans per classroom and do not move a sufficient volume of air for their speed. He can provide more efficient fans that will circulate 5 to 10 times the volume of air pushed by fans that are currently in place. Also, in most cases, he recommends increasing the number of fans to four fans per room. They will not need to spin as fast and will reach all corners. He is researching other ideas with engineers at his disposal within his company.

## **Courses of Action**

1. If the expertise is available within our M&O department, have them test the currently installed ventilation systems within buildings at all sites, CHS, CMS, VES/ECDC, and SES. Ensure they are operating to design specifications. If the required expertise is unavailable, this work should be contracted out.
2. Once the systems are operating correctly and efficiently, all teachers should receive training in the system's use, the results they can expect from the systems, and how to report malfunctions.
3. Investigate the administrative changes that would be needed to enable teachers to leave windows open at night. This will require ensuring screens are available and in place. Also, security concerns would need to be addressed. Directions should be given to leave fans and ventilation systems on overnight to draw in as much cool (or cooler) air as possible.
4. Continue use of the data loggers for recording classroom temps into the fall of this year. The results will be used to further prioritize which classrooms have the greatest need for relief. Until such hard data can be collected, the committee will rely upon qualitative observations by CASLE teacher reps and site administrators to determine which rooms should receive immediate relief.
5. The group decided to recommend the District undertake a pilot program by configuring a couple classrooms at each of the three visited sites (CHS, CMS, VES) to test the effectiveness of the above courses of action along with introduction of more efficient fans that, per Santos, have five to ten times the circulation capacity of current fans yet their design permits them to do so at much slower speeds that will not blow papers all over the room. "Big Ass Fans" have seven operating speeds while currently installed fans have only three.

## **Draft Plan for Pilot Program**

On Wednesday, May 11, Santos informed me that his company is prepared to provide at no cost to the District enough fans for two "pilot rooms." He would give us three fans to replace the current fans in CHS Room 602. As mentioned above, Paul has great concern about Lynn Hanson-Rowe's Special Ed room. He will also provide at no cost the equipment necessary to improve the environment in that classroom once his folks determine its exact needs.

CASLE member, Jennifer Hawkins, mentioned at the beginning of this report, believes she can convince a couple of her reliable contractors to do these installs at no cost. If she can arrange that, we can have two pilot classrooms in place before the beginning of next school year at little or no cost to the District. (Big Ass Fans are also more efficient and have an LED light on the bottom, so there actually could be savings on utility bills.)

To determine the effectiveness of the solution that includes higher volume fans, the CASLE committee would also recommend at least one, if not two pilot rooms at Village and CMS. Paul Santos can provide cost estimates once we give him classroom numbers. But based upon what he has done in similar classrooms at other schools, Paul estimates the uninstalled total product cost per classroom will be less than \$2,500. Estimates for installs would conservatively double that price. Both the CASLE committee and Santos realize that it would be necessary to compete these prices and in no way are we agreeing on a purchase at this time.

### **Required Immediate Action for Pilot Program**

1. CBO coordinate/contract the investigation into operation of in-place ventilation systems.
2. CBO coordinate with site administrators to develop a training program that instructs all teachers into the proper use and care of ventilation systems within their respective classrooms.
3. Site administrators determine any needs that would be required before directing teachers to leave windows open, fans spinning and ventilation systems turned on during times when warmer days are expected.
4. CBO determine any restrictions that would prohibit or roadblocks that would have to be lifted before the District could accept gratis fans from Big Ass Solutions or “free labor” from contractors.
5. Member Pontes obtain in writing from Santos the precise package of gifts being offered by Big Ass Solutions and the fair market value of those items. Beyond that Pontes will work with Santos and CBO to obtain bids for additional pilot program rooms should the Board decide to proceed with them.
6. CASLE team member Jennifer Hawkins obtain written agreements from any contractors willing to perform gratis work installing fans. These should include wages, if any, that these contractors will pay employees for their time on this project. CBO can provide examples and insight into exactly what would be legally needed before the work could be completed.

Beyond the short term pilot programs, CASLE team continue to search for mid to long term solutions to improve the classroom environment. Also, determine and seek agreement upon temperature and ventilation standards acceptable to teachers, administrators and District personnel that are achievable within dollars available for such projects. In their letter of January 15, 2016 presented to the board by Teacher Brad Couture, the ACT pointed to studies indicating the optimal temperature range for learning to be between 68 and 74 degrees. This is an unachievable goal for us in the near term. What the CASLE team’s short term responses and pilot program are attempting to accomplish is to reduce the apparent classroom temperature (perceived combination of air temperature, relative humidity and wind effect) to 5 to 10 degrees below current observations and see if that provides some immediate relief at very little costs and within the limits of our budget. The CASLE team will continue to meet and develop further, longer ranging solutions.

## **Summary**

Teachers are already expressing deep appreciation for the interest the Board is showing in resolving this problem. By moving ahead with plans for not less than two pilot rooms each at CHS, CMS and VES, to be installed prior to the 2016-2017 school year start date of August 25, 2016, we will earn a tremendous amount of goodwill among our staffs for relatively little expense. Exact figures will be provided within the next few weeks, but a good ball park estimate for the cost of a pilot room is about \$5,000, making the cost for six pilot rooms around \$30,000. Although no pilot rooms are planned at Strand ES and ECDC, these sites are not to be ignored and will also benefit from the planned inspections and necessary repairs to currently installed ventilation and heat pump systems, as well as the previously described training that will be provided to teachers and other users.

While the additional fans provided in a pilot program will impact only a few classrooms, we can be hopeful that any District-wide repairs made to ventilation systems, the education of all CUSD teachers in the proper use and maintenance of these systems, as well as more logical choices for overnight classroom configurations WOULD impact all teachers, students and classroom throughout the board District at very little cost.

In making this report, the CASLE committee hopes to attain from the Board as a whole a sense that we are moving in the right direction. This would enable us to bring the necessary action items before the board prior to the summer recess and provide teachers with at least a ray of hope for near term improvements.