



## **Improving Indoor Environmental Quality and Energy Performance of California K-12 Schools**



**California Energy Commission  
Contract # 500-03-003**

### ***D3.3d – Sample Non-Disclosure and Confidentiality Forms***

*February 7, 2006*

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Submitted To:  
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[School District]

**Letterhead/Logo**

*Note: Please use your letterhead and have an authorized agent sign the letter.*

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Month Day, Date

Mr. Pete Lewis, Consultant

RLW Analytics, Inc.

1055 Broadway, Suite G

Sonoma, CA 95476

*Re: PIER Advanced HVAC Systems for Improving Indoor Environmental Quality and Energy Performance of California K-12 Schools*

Dear Mr. Lewis,

[School District] wishes to participate in the work of RLW Analytics, Inc. on their project, *Effectiveness of UVC Light for Improving School Performance* that is part of the *Advanced HVAC Systems for Improving Indoor Environmental Quality and Energy Performance of California K-12 Schools* program for the California Energy Commission. The widespread application of this technology has the potential to result in energy savings and improved indoor environmental quality of schools and California as a whole. [School District] understands that the project will produce valuable information in validating the technology for appropriate applications.

### ***Technology Description***

UVC lamps are designed to be mounted in the HVAC system supply duct, usually right above the evaporator coil. Manufacturers of these products claim that the UVC lights kill mold and bacteria that grows on the evaporator coil and in the drain pan, resulting in increased efficiency of the HVAC unit through better heat exchange and reduced friction on the air side of the coil. Ultraviolet germicidal irradiation (UVGI) is another name for UVC and has been used for more than 70 years to kill harmful microorganisms of all types in a great many applications such as food processing, water sanitation, and hospital disinfection. The germicidal wavelength of 253.7 nm within the UVC segment is most effective at inactivating microorganisms, mold spores, and contaminants and is the wavelength claimed to be produced in the UVC lamps by the manufacturers.

## **Study Plan**

The energy efficiency evaluation plan is a comparative study of a test sample and an identical control group. Approximately 20-21 HVAC units will be included at [School District] will be included in this study, with 66% of the units receiving UVC installations, for a total of 13-14 UVC lamps. The test sample will consist of air conditioning units with newly installed UVC lamps located adjacent to the evaporator coil. The control group will consist of identical units serving a similar load. The study groupings consist of two units with Manufacturer A and two units with Manufacturer B UVC devices installed, and two untreated control units; all located in the same campus. The data collection phase of work will commence in August and approximately two months later will be concluded with the post field measurements.

The selected sites will have the following characteristics:

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- Located at year-round schools in 3 warm-weather districts throughout California
  - Minimal changes to load during study period (i.e. no changes to lighting, computers, etc. during study period).
  - No fundamental changes to room served (i.e. no teacher changes, or class size changes).
  - Packaged rooftop or exterior wall mount a/c units serving single or several rooms.

## **Analysis**

The results of the study will be based on pre and post field measurement data of treated and untreated HVAC units, biological field samples taken on the surface of the coils, and average daily attendance data. The analysis tasks will have three distinct components:

- Energy efficiency and consumption analysis
- Changes in the microbiological concentrations at the cooling coil
- Average daily attendance (ADA) regression analysis

## **Energy Efficiency and Consumption Analysis**

We will quantify any efficiency changes that may occur during the study period and determine if they are attributable to either reduced airflow restrictions or improved heat transfer. Assuming that we find efficiency, attendance, or airborne concentration benefits, we will perform a cost benefit analysis of the technologies.

## **Contaminant Analysis**

The sample counts will be used to compare the surface microbial concentrations before and after the lamps are installed. In a study recently published in The Lancet medical journal, scientists assessed whether ultraviolet germicidal irradiation (UVGI) of drip pans and cooling coils within ventilation systems of office buildings would reduce microbial contamination, and

thus occupants' work-related symptoms. Specifically, the operation of UVGI resulted in 99% reduction of microbial and endotoxin concentrations on irradiated surfaces within the ventilation systems. Airborne bacteria were reduced by 25-30% with UVGI. This study will test for similar surface microbes using the Lancet study as a guide.

### **ADA Regression Analysis**

In this task we will specify the ADA regression model. We will run a cross-sectional model on monthly ADA for the classrooms, using data from the months before and after the installation of the lights, and include an indicator variable when the lights were installed and functional. The results will provide a quantification of the association between the lamps and ADA.

### ***District Tasks***

By participating in the study, [School District] agrees to provide the following assistance to RLW:

1. A district contact person for this study that will be available to help RLW to identify appropriate units for the study and obtain access to the units.
2. Assistance with obtaining the appropriate attendance data for the study.
3. Permission to conduct very short teacher and facility manager surveys to understand if they are aware of any comfort changes. We will work very hard to have minimal impact on educational functions.
4. New filters for each of the units before each of the test sessions.

### ***District Benefits***

*[School District] will receive thirteen to fourteen UVC systems (lamps, ballasts and associated controls) at three schools within the district. Qualified contractors will conduct the installation work at no cost to the school district. The lamps and ballasts alone typically cost upwards of \$400-\$500 depending on the type of HVAC systems being treated. RLW will provide a summary report on what impact the lamps had on the HVAC systems on the units in each district, specifically addressing any efficiency improvements.*

### ***Confidentiality***

In the final study report, we will treat school district names with the amount of confidentiality as required by the district. We prefer the names to be included for ease of reporting and better understanding of the results, but we will take into account the district's requirements. Please specify how you prefer the name of your district to be treated in the report:

Included or Excluded

We understand the objectives of the study and the effort and data that will be required of our school district and appreciate the opportunity to participate in this project.

Sincerely,

[Name of Authorized Agent]

[Title]

[School District]