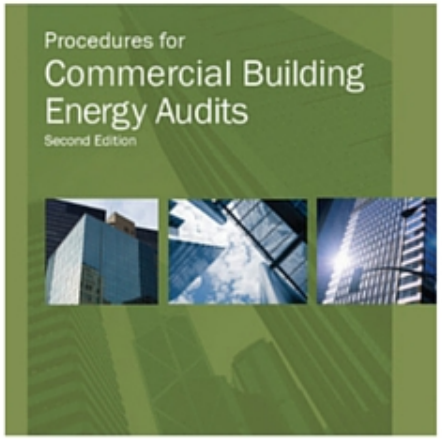
UCDAVIS
ENERGY EFFICIENCY CENTER

BUILDING AUDIT TRAINING AND TOOLS

BEST CENTER VISIT - JAN 2016

Presented By: Siva Gunda
Research Director, Energy Efficiency Center
January 7th 2016



OVERVIEW

- Background
- Development of preliminary Tools
- Where we are and next steps
- Market Transformation Efforts

UCDAVIS ENERGY EFFICIENCY CENTER

UCDAVIS
ENERGY EFFICIENCY CENTER

BACKGROUND

CCC ENERGY CORPS

WORKFORCE DEVELOPMENT

MARKET NEEDS DEFINITION

- Addressing Small & Medium Commercial Bldgs.
- Prop 39 – California Conservation Corps
- Addressing Legislation and mandates

UCDAVIS
ENERGY EFFICIENCY CENTER

SMB Audits with CCC

CCC ENERGY CORPS

WORKFORCE DEVELOPMENT

MARKET NEEDS DEFINITION

UCDAVIS
ENERGY EFFICIENCY CENTER

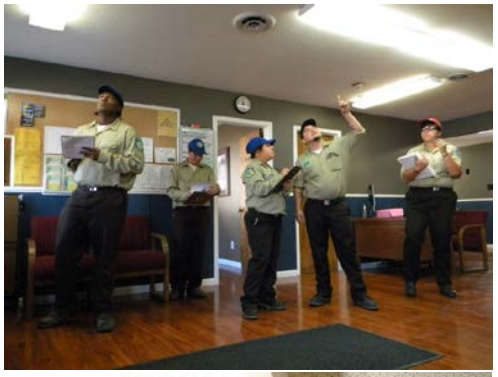
Prop 39: Energy Corps

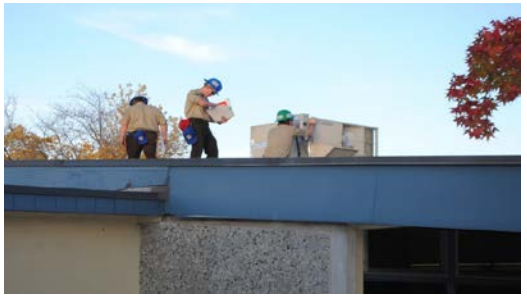
CCC ENERGY CORPS

WORKFORCE DEVELOPMENT

MARKET NEEDS DEFINITION

- Interagency agreement with CCC
  - Specifically CCC's Energy Corps Program
    - Energy Efficiency ("EE") and Renewable Energy ("RE") industry projects and programs
- SCOPE OF PARTNERSHIP
  - Provide overall coordination and administration of the
  - statewide Energy Corps
  - Establish an advisory board to include a collaboration of program partners
  - Develop and evolve a viable Energy Corps Program Design

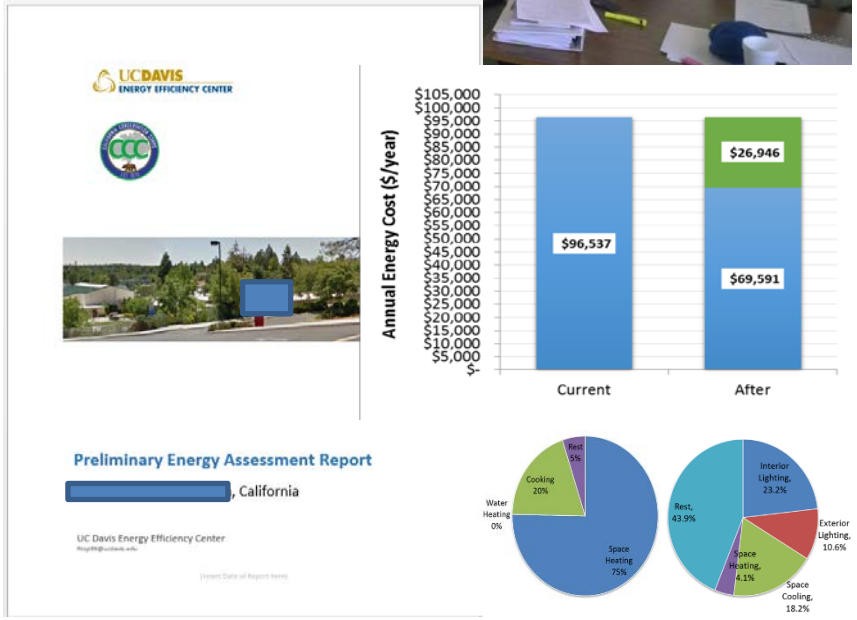




UCDAVIS ENERGY EFFICIENCY CENTER

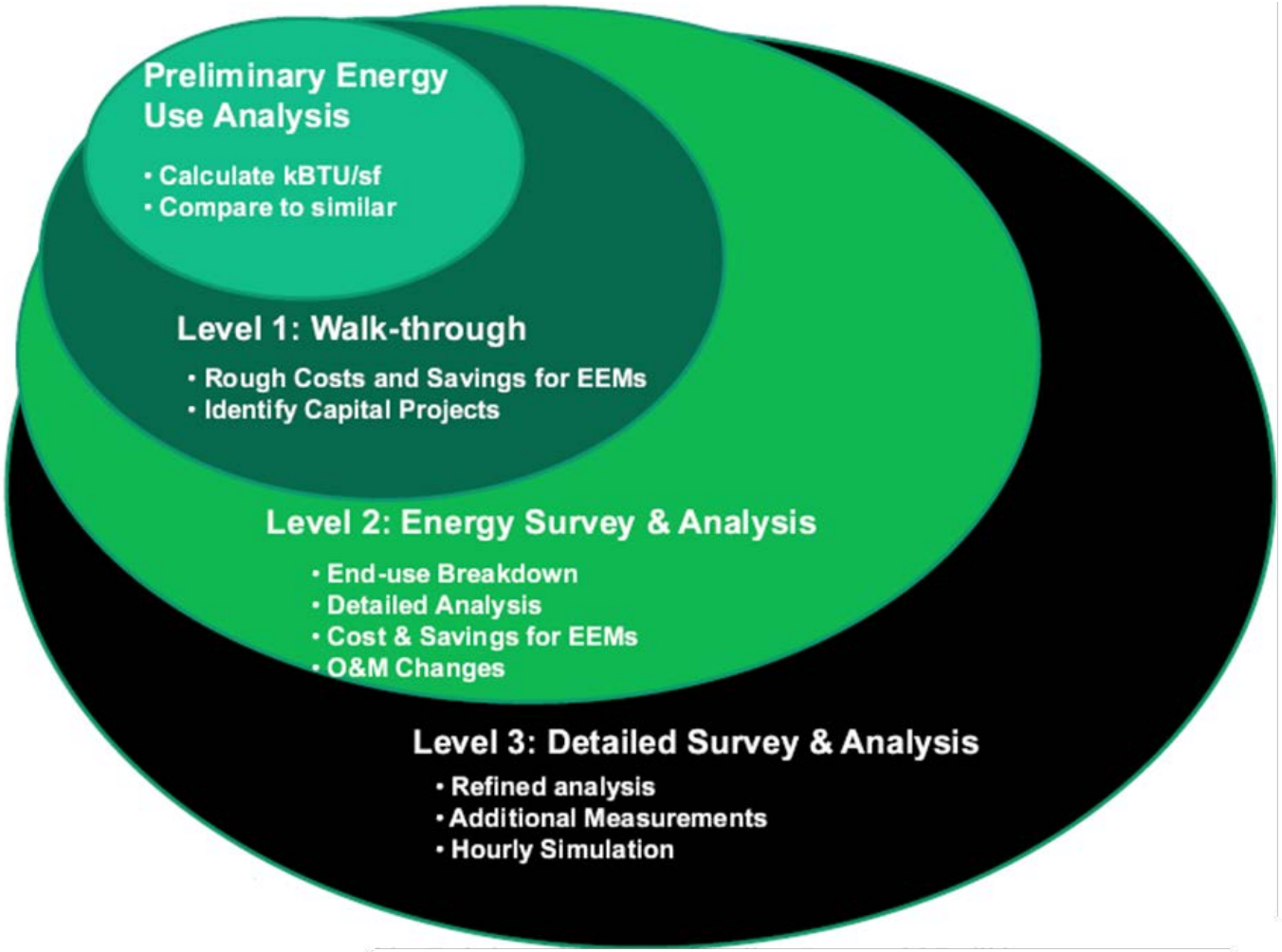
Energy Corps Outcomes

- Four Key Roles
  - Curriculum Development
    - 10 day and 5 day versions
    - Will be publically available
  - Training
    - 180 corpsmembers trained
  - **Paper based Audit forms** and procedure
  - Analysis and Reporting
    - Analysis and automation tools
    - Report
    - Pre-filled CEC calculator
    - Inventory



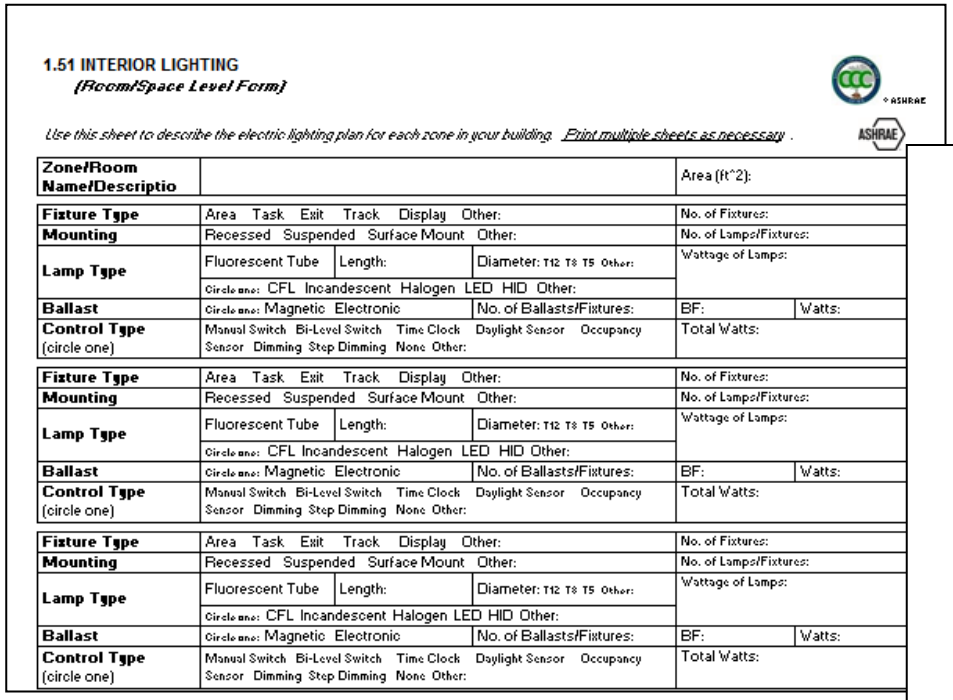
UCDAVIS
ENERGY EFFICIENCY CENTER

Training for ASHRAE 1+ Audits



UCDAVIS
ENERGY EFFICIENCY CENTER

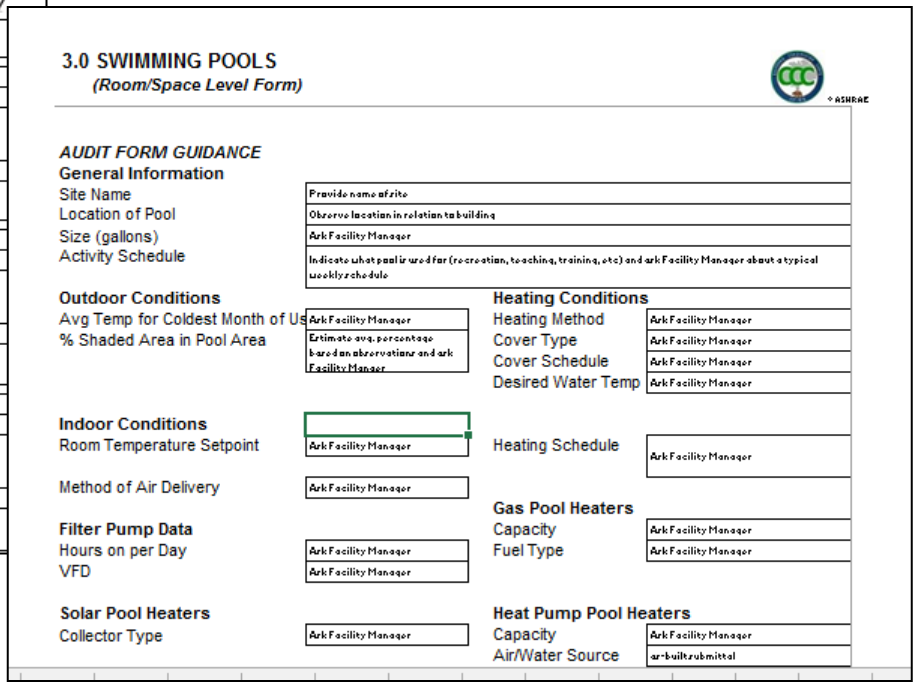
Training for ASHRAE 1+ Audits



1.51 INTERIOR LIGHTING
(Room/Space Level Form)

Use this sheet to describe the electric lighting plan for each zone in your building. Print multiple sheets as necessary.

Zone/Room Name/Descriptio				Area (ft^2):	
Fixture Type	Area Task Exit Track Display Other:			No. of Fixtures:	
Mounting	Recessed Suspended Surface Mount Other:			No. of Lamps/Fixtures:	
Lamp Type	Fluorescent Tube	Length:	Diameter: T12 T8 T5 Other:	Wattage of Lamps:	
	Circle one: CFL Incandescent Halogen LED HID Other:				
Ballast	Circle one: Magnetic Electronic		No. of Ballasts/Fixtures:	BF:	Watts:
Control Type (circle one)	Manual Switch Bi-Level Switch Time Clock Daylight Sensor Occupancy Sensor Dimming Step Dimming None Other:			Total Watts:	
Fixture Type	Area Task Exit Track Display Other:			No. of Fixtures:	
Mounting	Recessed Suspended Surface Mount Other:			No. of Lamps/Fixtures:	
Lamp Type	Fluorescent Tube	Length:	Diameter: T12 T8 T5 Other:	Wattage of Lamps:	
	Circle one: CFL Incandescent Halogen LED HID Other:				
Ballast	Circle one: Magnetic Electronic		No. of Ballasts/Fixtures:	BF:	Watts:
Control Type (circle one)	Manual Switch Bi-Level Switch Time Clock Daylight Sensor Occupancy Sensor Dimming Step Dimming None Other:			Total Watts:	
Fixture Type	Area Task Exit Track Display Other:			No. of Fixtures:	
Mounting	Recessed Suspended Surface Mount Other:			No. of Lamps/Fixtures:	
Lamp Type	Fluorescent Tube	Length:	Diameter: T12 T8 T5 Other:	Wattage of Lamps:	
	Circle one: CFL Incandescent Halogen LED HID Other:				
Ballast	Circle one: Magnetic Electronic		No. of Ballasts/Fixtures:	BF:	Watts:
Control Type (circle one)	Manual Switch Bi-Level Switch Time Clock Daylight Sensor Occupancy Sensor Dimming Step Dimming None Other:			Total Watts:	



3.0 SWIMMING POOLS
(Room/Space Level Form)

AUDIT FORM GUIDANCE

General Information

Site Name	Provide name of site
Location of Pool	Observe location in relation to building
Size (gallons)	Ask Facility Manager
Activity Schedule	Indicate what pool is used for (re-creation, teaching, training, etc) and ask Facility Manager about a typical weekly schedule

Outdoor Conditions

Avg Temp for Coldest Month of Us	Ask Facility Manager
% Shaded Area in Pool Area	Estimate avg. percentage based on observations and ask Facility Manager

Indoor Conditions

Room Temperature Setpoint	Ask Facility Manager
Method of Air Delivery	Ask Facility Manager

Filter Pump Data

Hours on per Day	Ask Facility Manager
VFD	Ask Facility Manager

Solar Pool Heaters

Collector Type	Ask Facility Manager

Heating Conditions

Heating Method	Ask Facility Manager
Cover Type	Ask Facility Manager
Cover Schedule	Ask Facility Manager
Desired Water Temp	Ask Facility Manager
Heating Schedule	Ask Facility Manager

Gas Pool Heaters

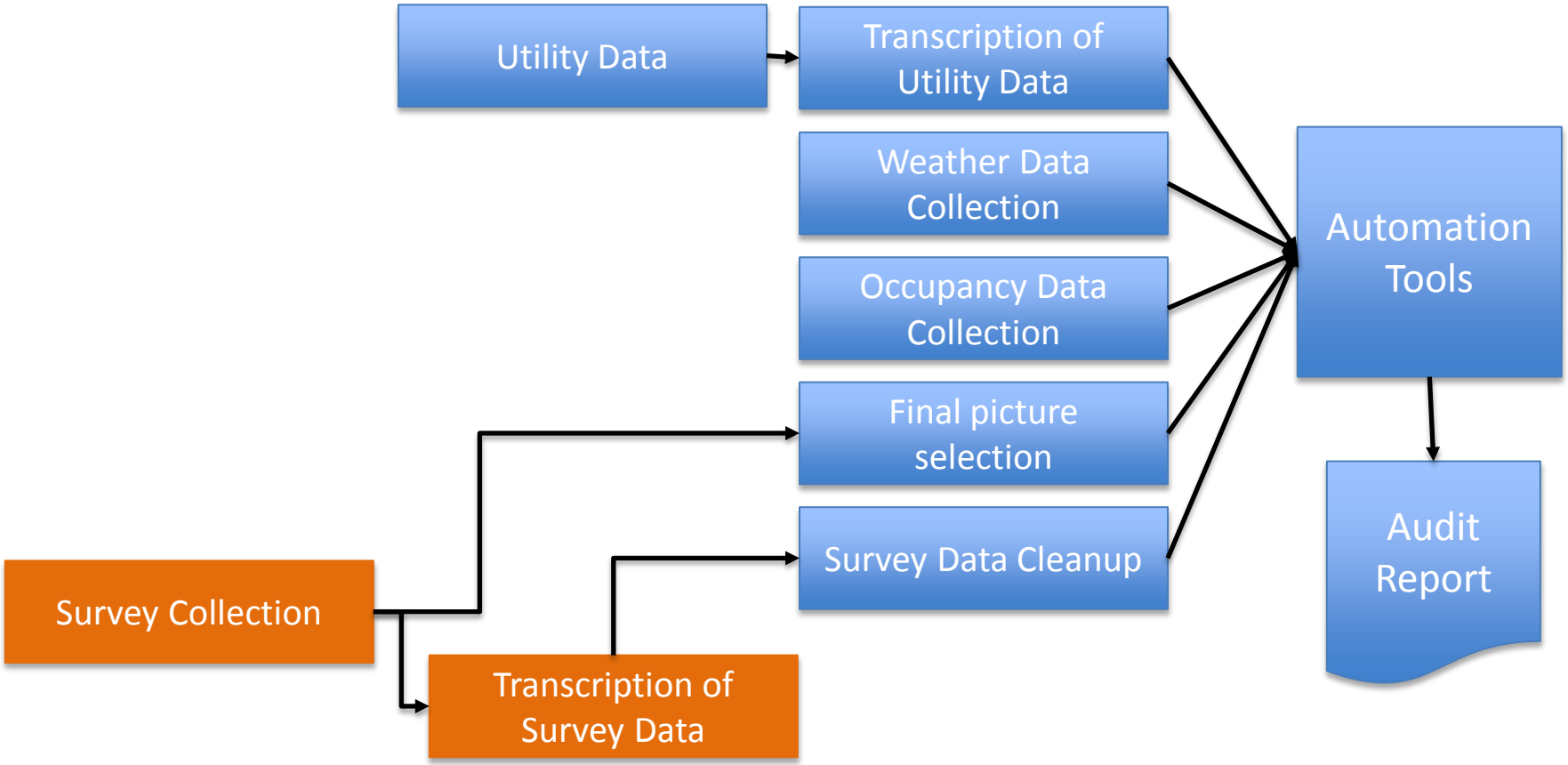
Capacity	Ask Facility Manager
Fuel Type	Ask Facility Manager

Heat Pump Pool Heaters

Capacity	Ask Facility Manager
Air/Water Source	as-built submittal

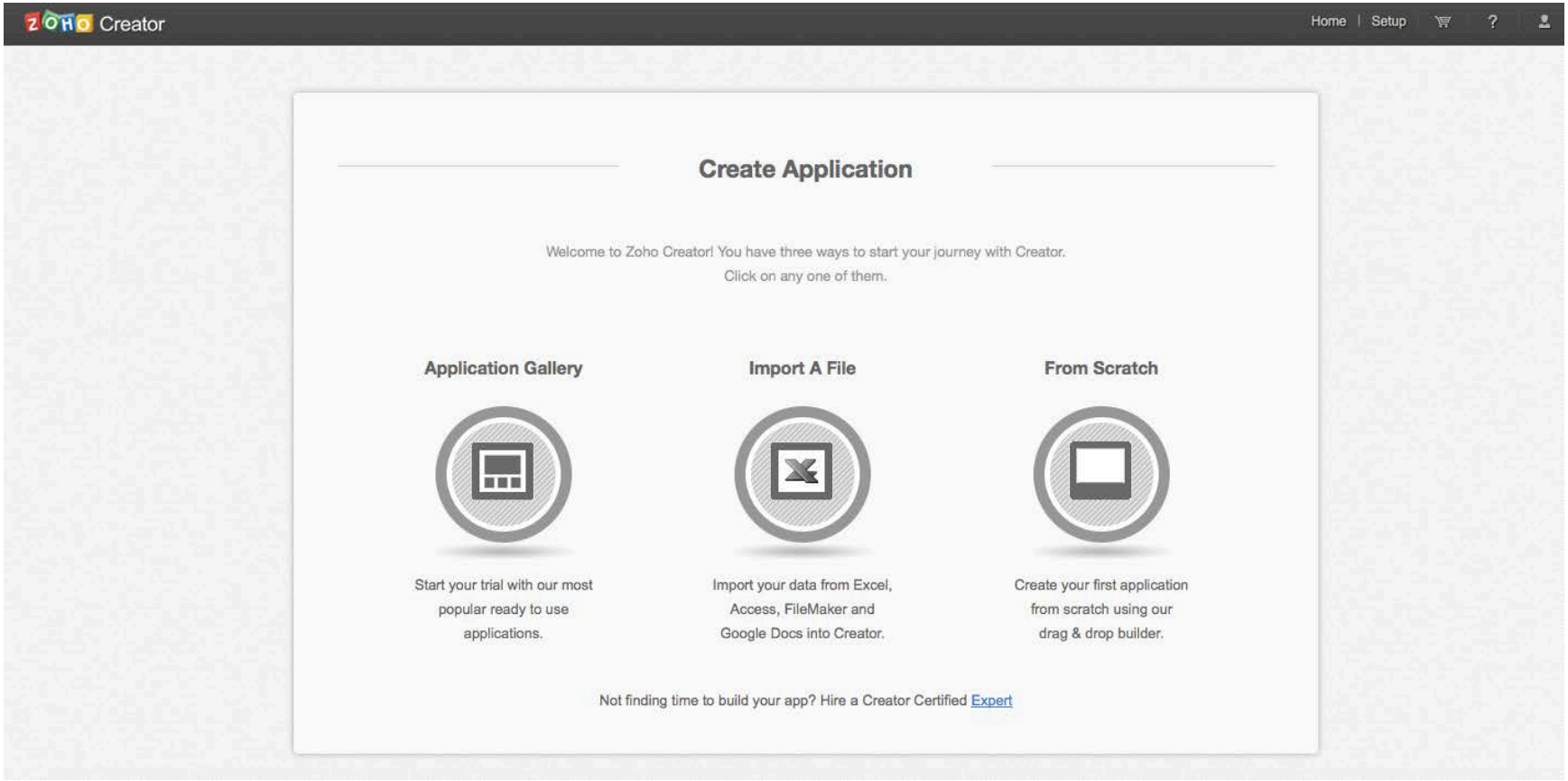
UCDAVIS
ENERGY EFFICIENCY CENTER

Process



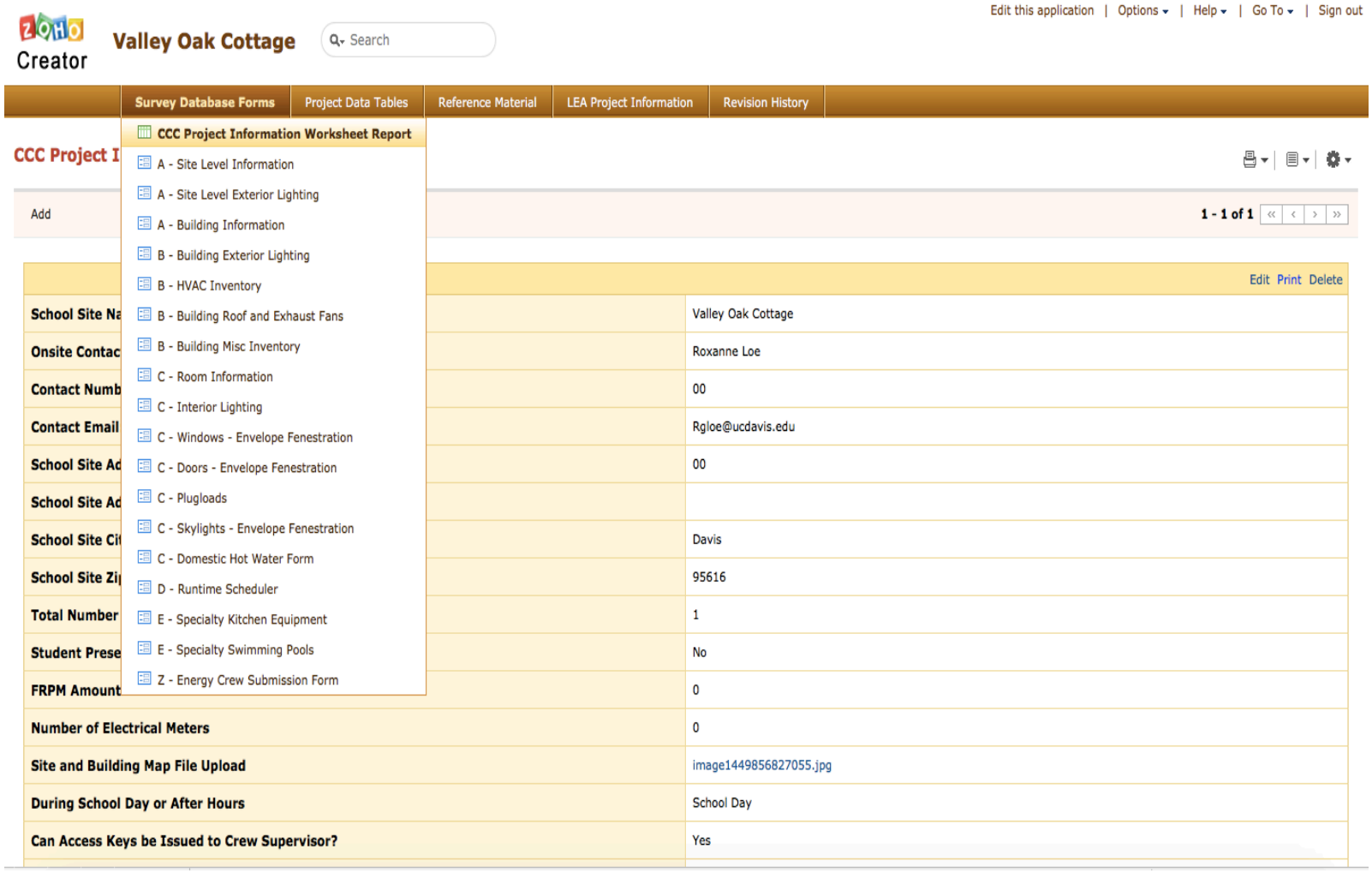
UCDAVIS
ENERGY EFFICIENCY CENTER

Migration to ZOHO



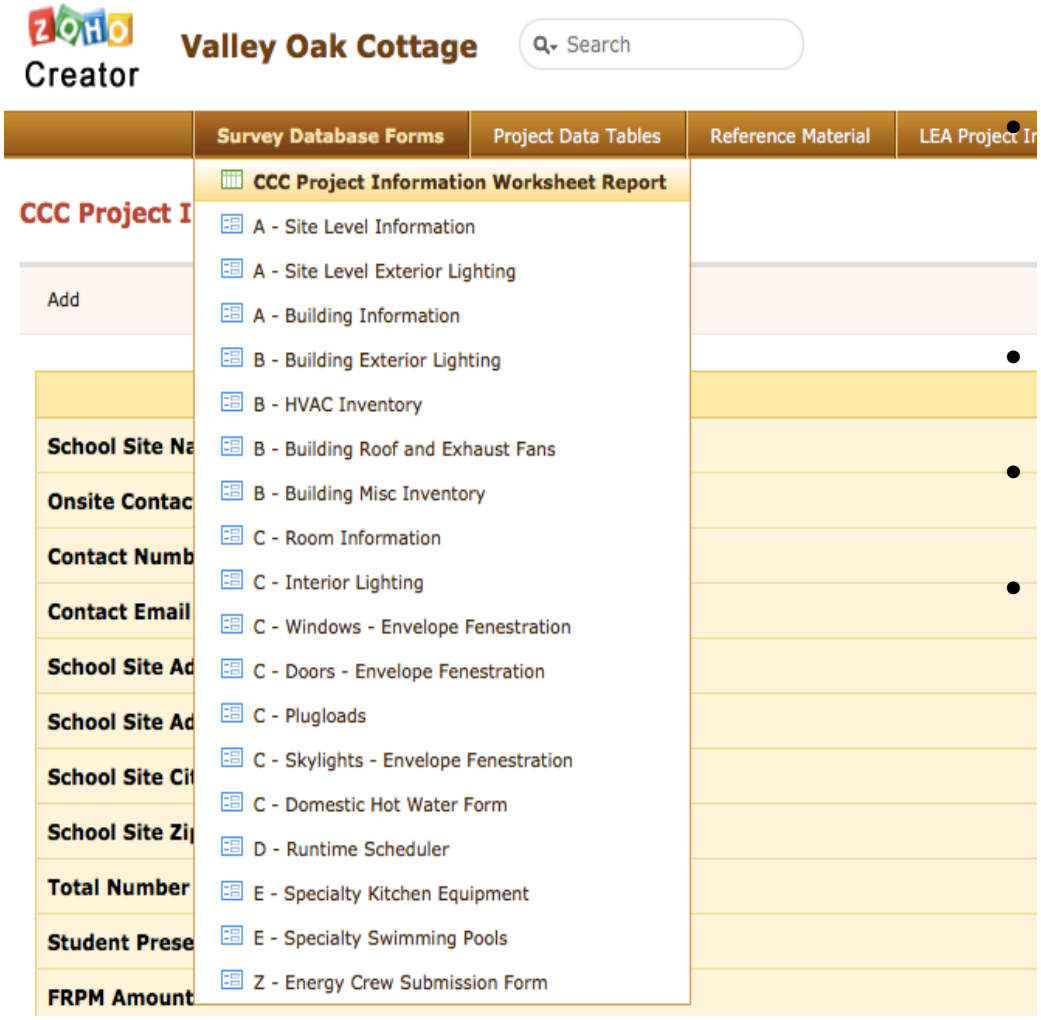
UCDAVIS
ENERGY EFFICIENCY CENTER

ZOHO Audit Tool



UCDAVIS
ENERGY EFFICIENCY CENTER

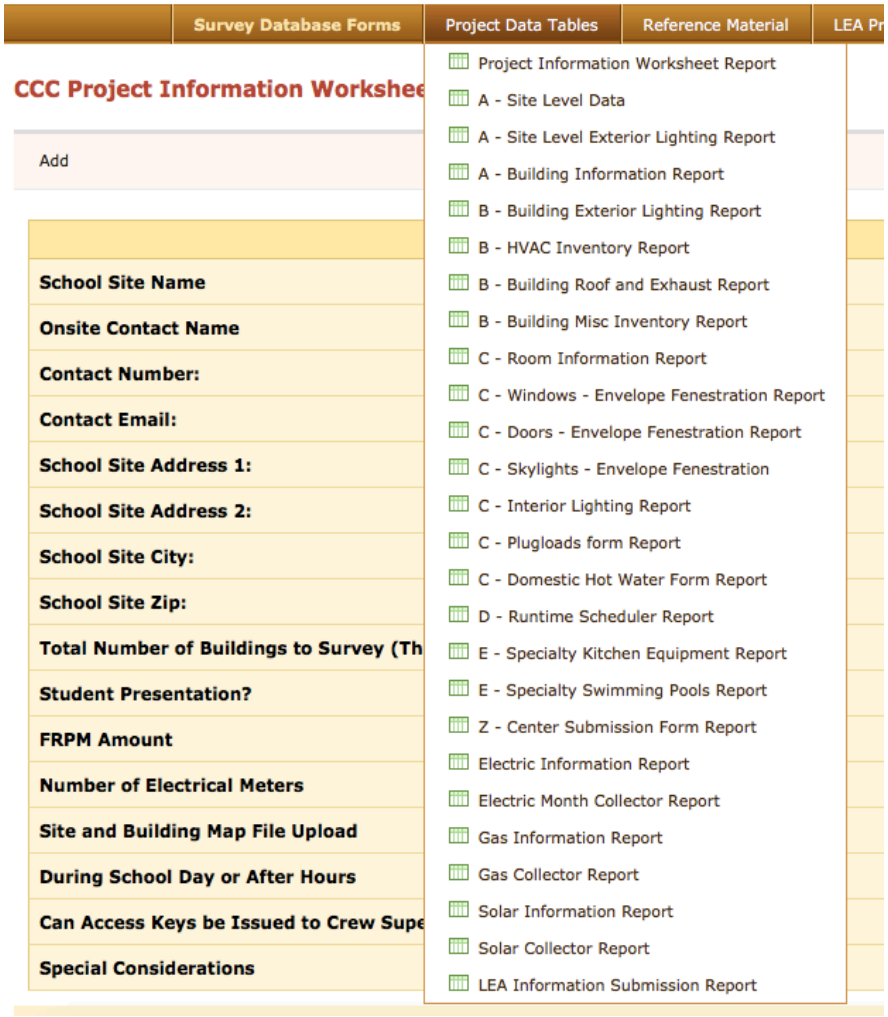
ZOHO Audit Tool



- Once logged into, user can go the ‘Survey database forms” tab and click on any of the options to start adding information.
- Zoho allows users to edit that information incase of any mistakes.
- Users can also add building, lighting and plug load pictures.
- Zoho allows multiple users to work on one single site.

UCDAVIS
ENERGY EFFICIENCY CENTER

ZOHO Audit Tool

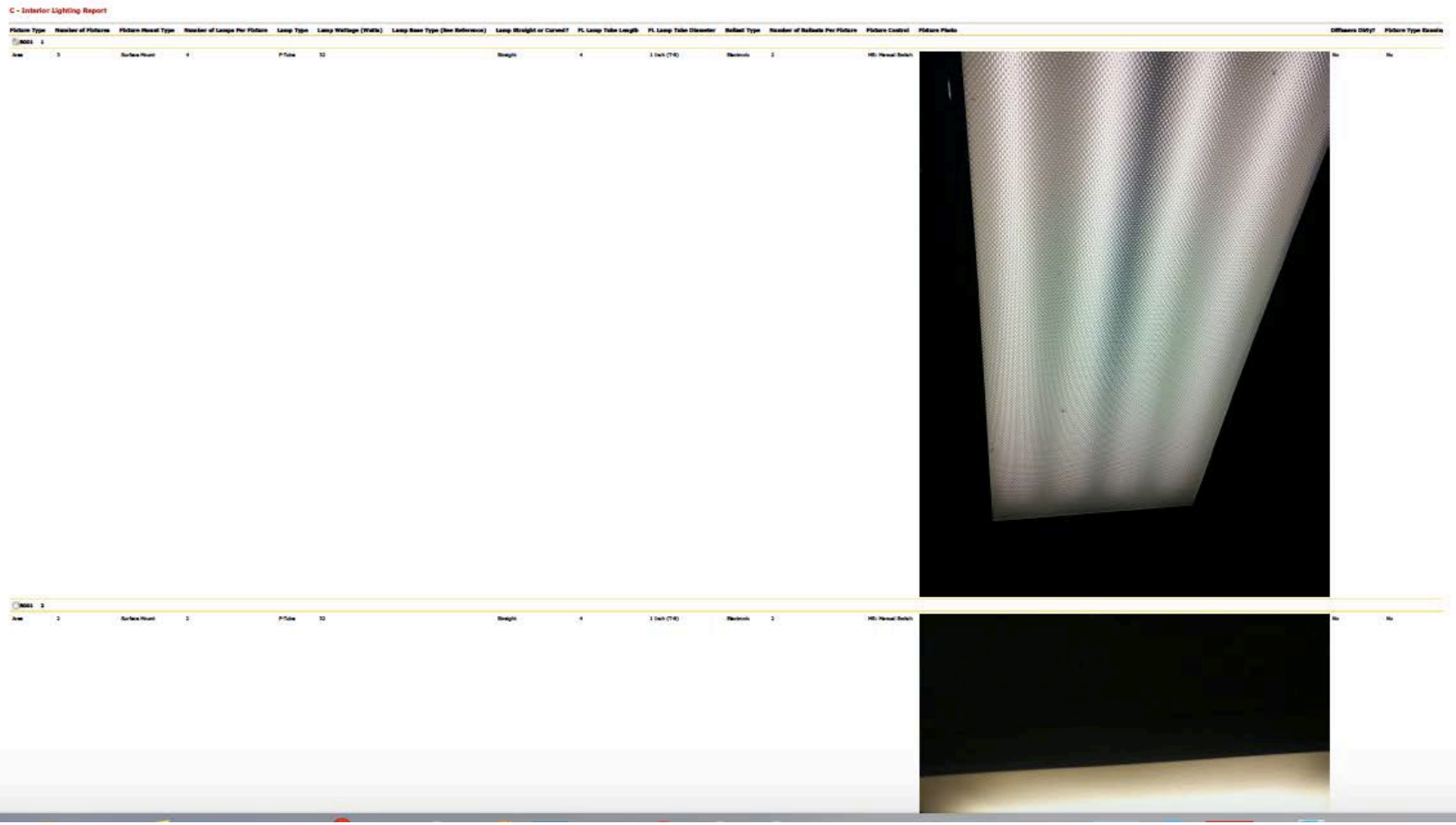


- 'Project Data Tables' tab allows user to check all the collected data.
- User can click on any option to check if the data has been added correctly or if there is any missing data.

UCDAVIS
ENERGY EFFICIENCY CENTER

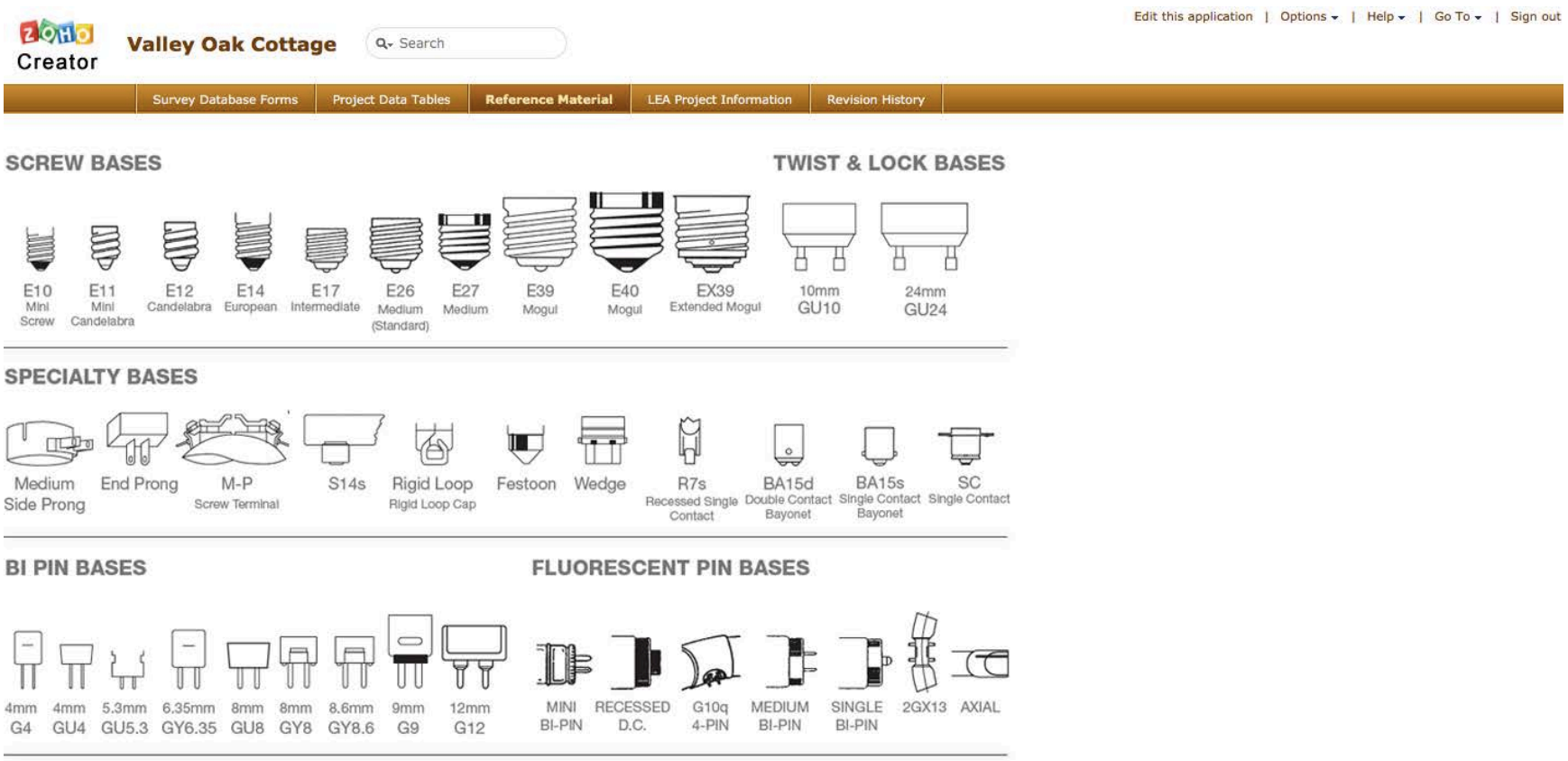
ZOHO Audit Tool

Zoho Creator - C - Interior Lighting Report https://creatorexport.zoho.com/energyefficiencycenter/copy-of-...



UCDAVIS
ENERGY EFFICIENCY CENTER

ZOHO Audit Tool



UCDAVIS
ENERGY EFFICIENCY CENTER

ZOHO Audit Tool

ZOHO Creator

Heitman Staff Learning Center

Search

Edit this application | Options | Help | Go To | Sign ou

Survey Database Forms | Project Data Tables | **Reference Material** | LEA Project Information | Revision History

HVAC information lookup database:

www.ahridirectory.org/ahridirectory/pages/ac/defaultSearch.aspx

---

HVAC Tonnage Tip

Up near the top of the label, you see the model number (M/N) and serial number (S/N). The model number is where you can find the number you're looking for. Not all manufacturers do this, but most will give you a 2 or 3 digit section that tells you how many thousands of BTU/hour the air conditioner can move out of the space.

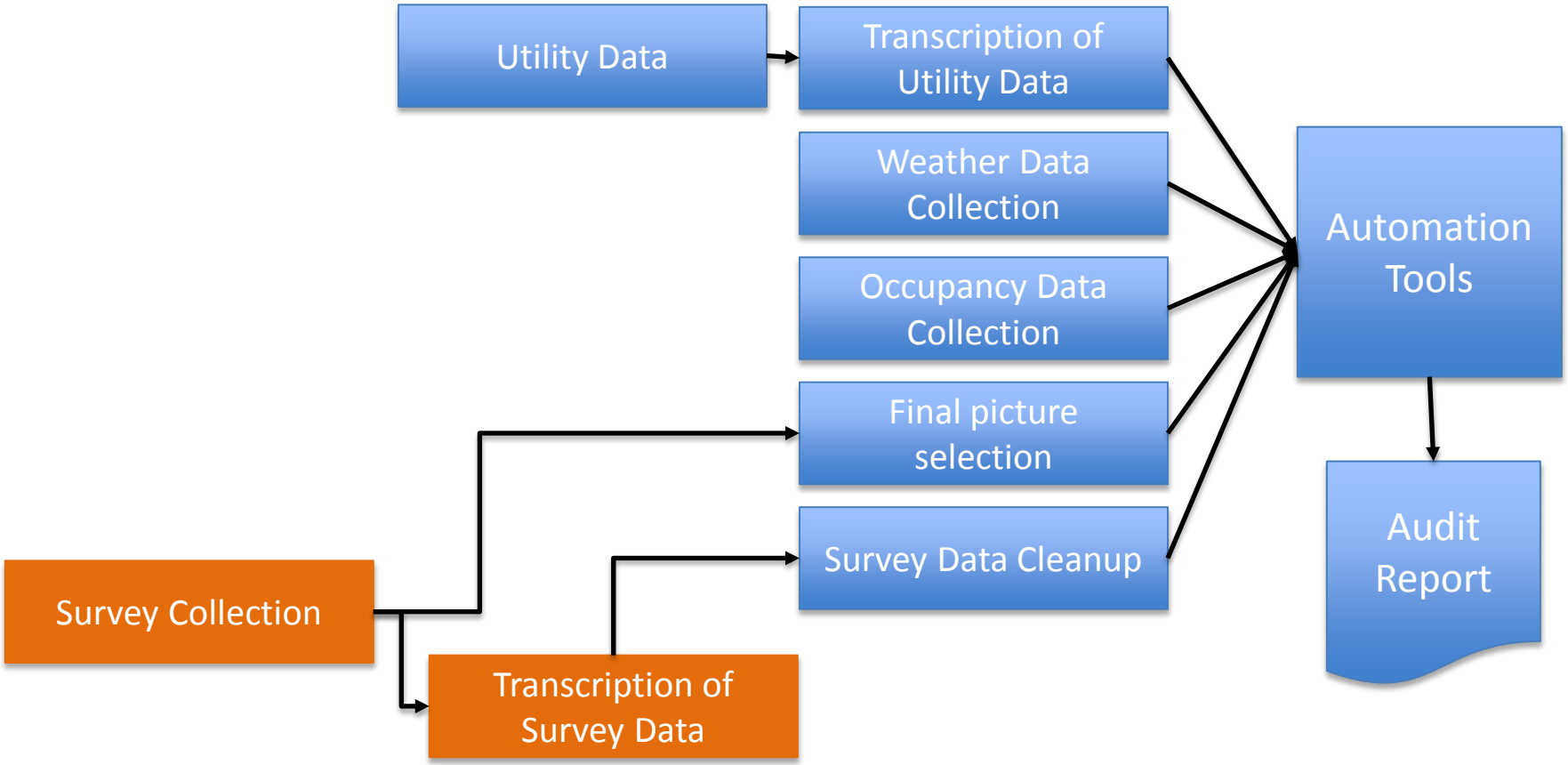
Just past the first string of 5 characters is the part that tells you the nominal size: 048. That means the air conditioner—or heat pump in cooling mode in this case—has a nominal capacity of 48,000 BTU/hour.

The numbers you'll see on residential air conditioners and heat pumps are:

M/N	Tons
018	1.5
024	2
030	2.5
036	3
042	3.5
048	4
060	5

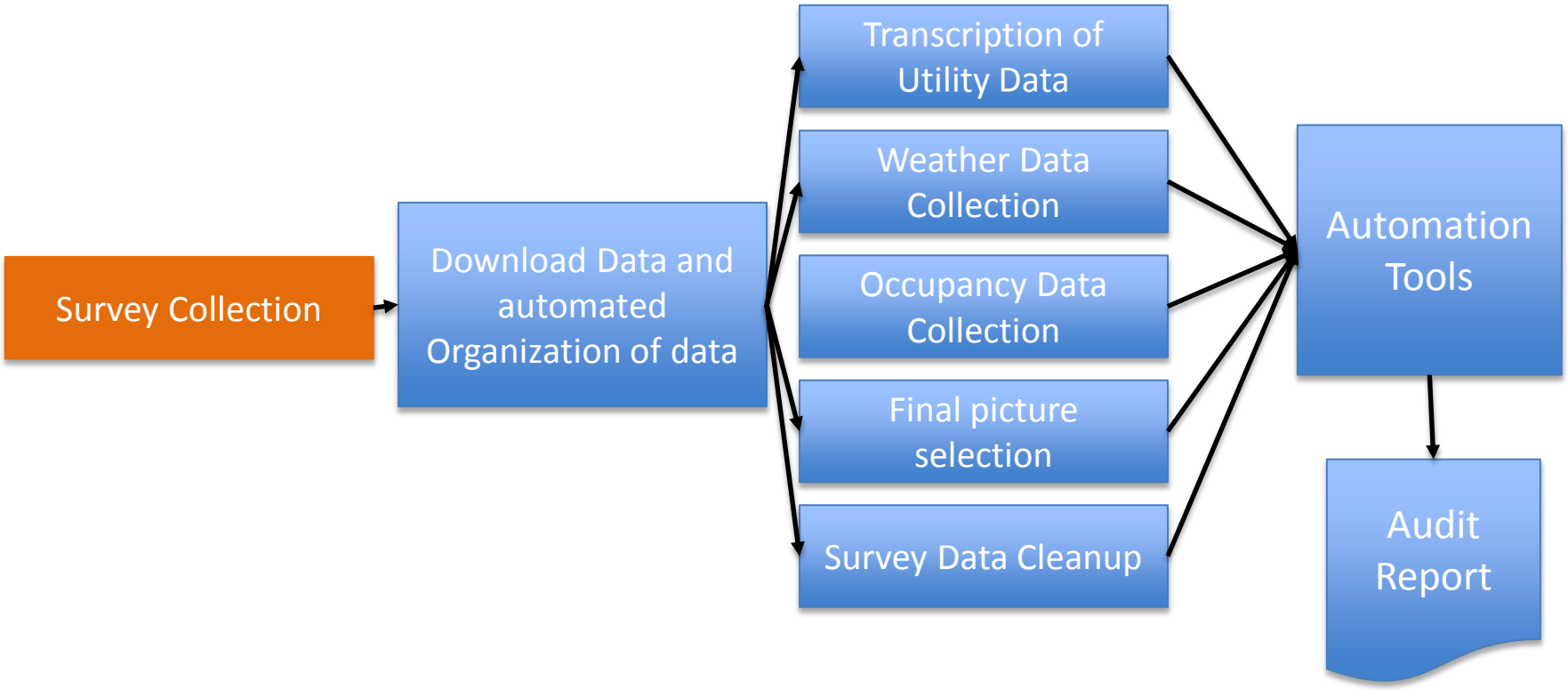
UCDAVIS
ENERGY EFFICIENCY CENTER

Process



UCDAVIS ENERGY EFFICIENCY CENTER

Process with Zoho



UCDAVIS ENERGY EFFICIENCY CENTER

BEPAS (Building Energy Performance Audit System)

Objective

Enhance the efficiency of the energy audit process, and provide an one-stop service solution that is accessible 24/7 from anywhere on any device.

Key characteristics of BEPAS

- A single system for data entry and output
- Centrally managed data in a secure environment
- Ensuring data integrity by establishing structured data hierarchy
- Accessible on any device (PC, Tablet, Smartphone, Any web browser)
- No EEC intervention during the audit - Faster and more efficient audit process

UCDAVIS ENERGY EFFICIENCY CENTER

User group and role matrix

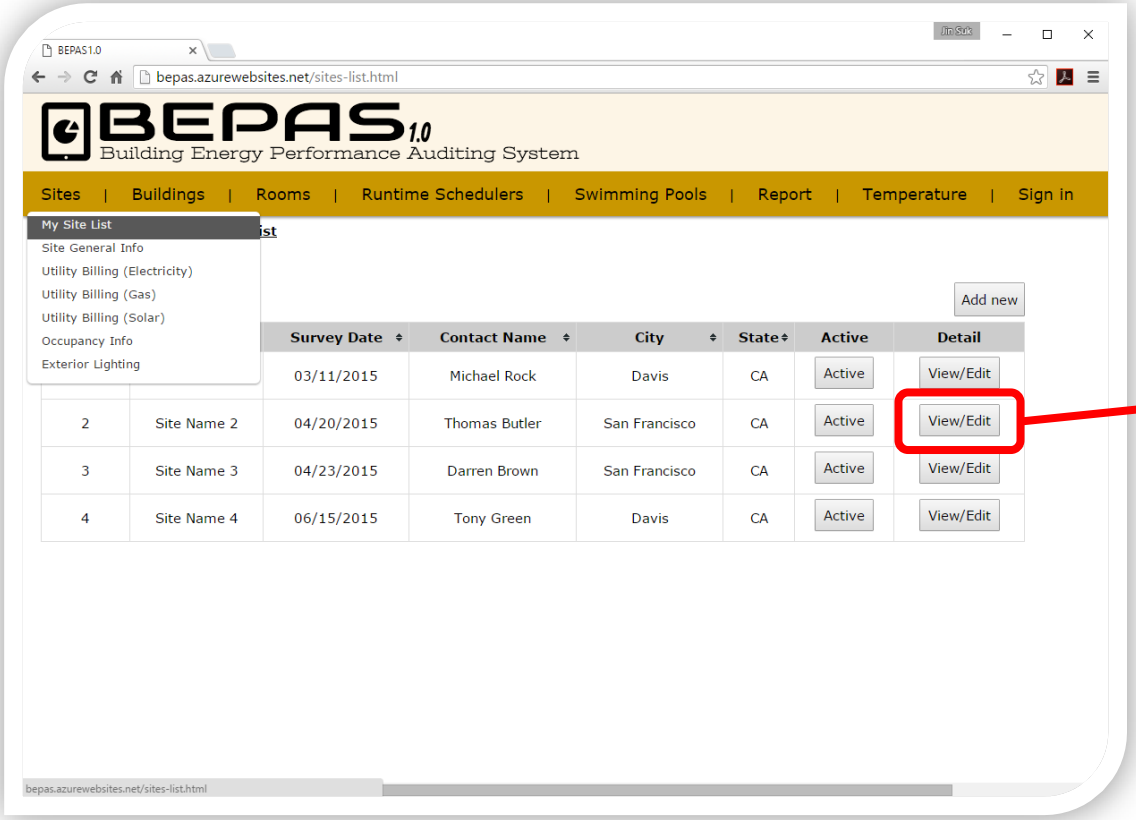
There are two main user groups (Auditors and Building owners), and UCD EEC plays the system administrator role.

	Auditors	Building Owners	UCD EEC
Data Entry	• Input audit results • Set up data sharing	• Input utility billing info. • Input site occupancy info.	
Data Consumption	• View audit reports	• View audit reports	
System Maintenance			• Security management • Master data management • Server management

UCDAVIS ENERGY EFFICIENCY CENTER

BEPAS prototype screenshots

My Site List Page: Shows the list of audited sites that the user has access to.

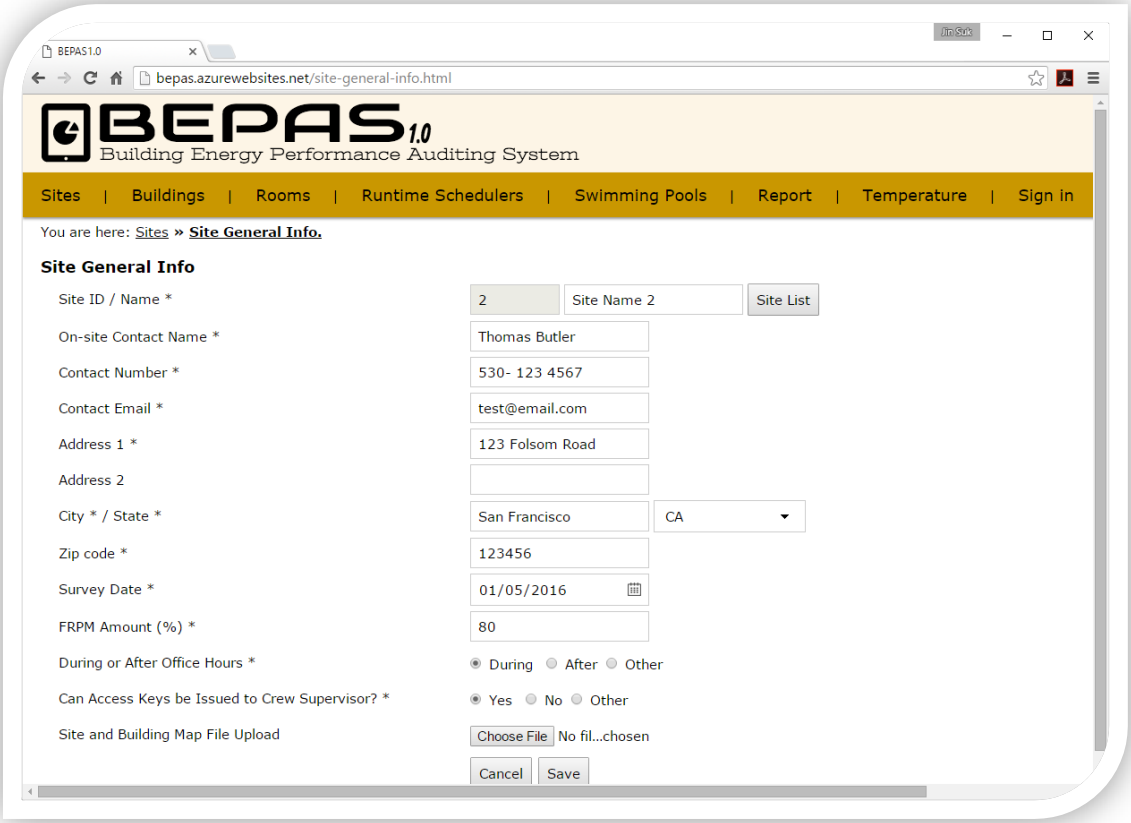


Next screenshot

UCDAVIS ENERGY EFFICIENCY CENTER

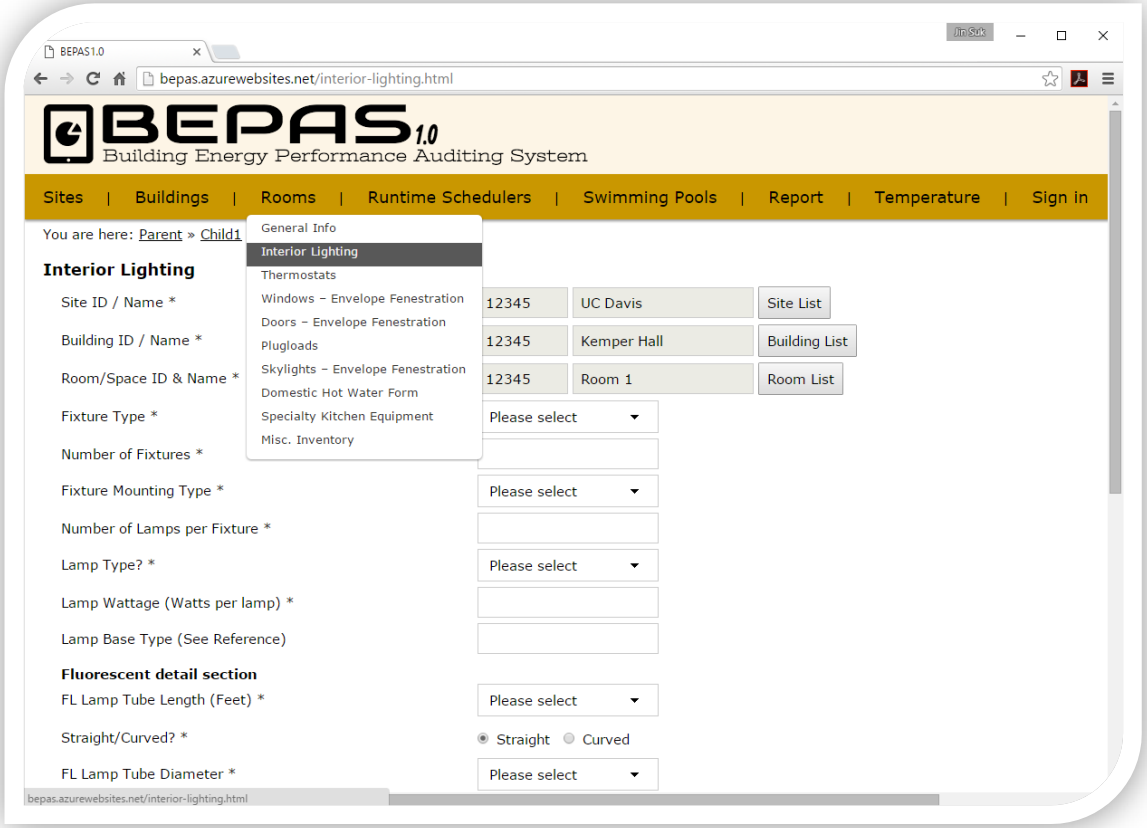
BEPAS prototype screenshots

Site General Info. Page: Shows and allows the user to edit the site information.



BEPAS prototype screenshots

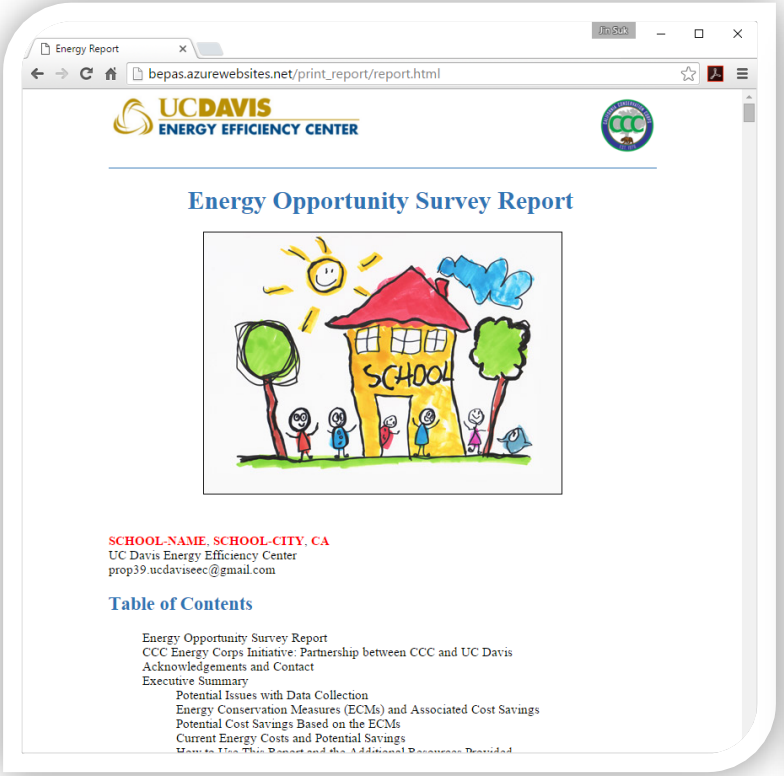
Room Interior Lighting Page: Shows and allows the user to edit the interior lighting information of a room.

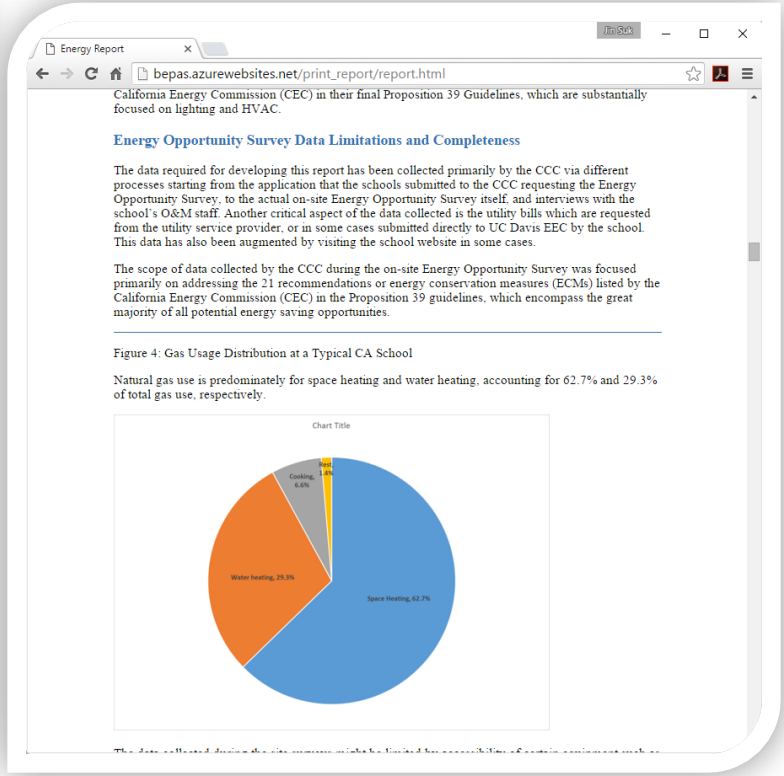


UC DAVIS ENERGY EFFICIENCY CENTER

BEPAS prototype screenshots

Audit Report Page: Audit reports are viewable on the web in real-time.





UCDAVIS ENERGY EFFICIENCY CENTER

Need for Market Transformation

- Predefined set of measures for low cost
- Customization of measures is very expensive

- Currently requires specialized skill
- An expensive step in the process
- No central repository of audit data to facilitate continued accuracy and reduce cost

- Often neglected
- Need to quantify savings accurately and increase customer confidence

UCDAVIS
ENERGY EFFICIENCY CENTER

Thank you

Contact: sgunda@ucdavis.edu