



**EFFICIENT AND  
HEALTHY SCHOOLS**

# 2022 Efficient and Healthy Schools Webinar Series

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**Webinar 4 of 4: Efficient HVAC for Indoor Environmental Quality**

U.S. Department of Energy and Lawrence Berkeley National Laboratory

July 14, 2022

# Efficient and Healthy Schools Campaign Webinar

Welcome!

- Agenda is in the chat
- Webinar is being recorded
- All attendees are muted during this webinar
- Please enter questions into the chat - they will be answered during the question and answer session toward the end
- We will send out the slides and presentation one week after the webinar



# Today's Webinar, Summary Agenda

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- Campaign Introduction – Rengie Chan, Berkeley Lab
- Campaign recognition program awardees presenting:
  - Best in Class: Greenville County Schools, Bill Knight, Director of Energy Management
- kW Engineering - James Donson, Director
- Question and answer session, moderated by Rengie Chan

# Efficient and Healthy Schools Campaign

The campaign aims to engage K-12 schools to improve energy performance and indoor air quality, with a focus on practical solutions involving HVAC and other technologies to reduce energy use and carbon emissions. This campaign is led by the U.S. Department of Energy with technical support from Lawrence Berkeley National Laboratory.



Organizing partners



# Recognition Program: 2021 Round One

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The Efficient and Healthy Schools Campaign aims to recognize schools and school districts that have implemented exemplary solutions involving HVAC upgrades and other approaches to reduce energy costs, and improve energy efficiency and indoor air quality.

<https://efficienthealthyschools.lbl.gov/recognition>



## Efficient HVAC for IEQ

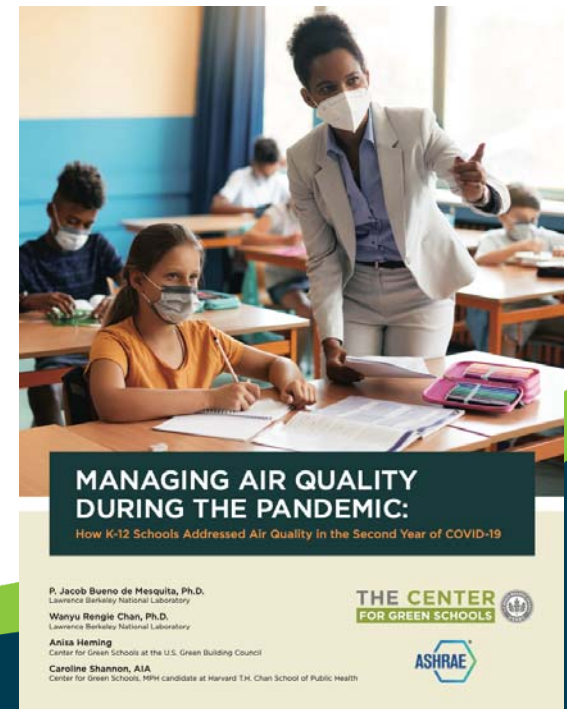
- Schools and school districts that use technical specifications for HVAC retrofits, upgrades, and replacement, resulting in reduction in energy costs and improvements in energy efficiency and indoor environmental quality (IEQ).
- Best-in-class applicants provided detailed design and technical specifications to ensure that HVAC meet outside air and other requirements for good indoor air quality.
- Included high-performance filtration specifications.
- Trending of CO<sub>2</sub> data to verify ventilation.



# Recent Survey (Oct-Dec 2021) of 88 School Districts

- Looking ahead, is your school district planning to implement additional ventilation and filtration strategies, or make other building changes, to support in-person instruction during the pandemic? Check all that apply:

	Yes
HVAC upgrade	56%
HVAC replacement	49%
CO2 monitoring	41%
HVAC assessment to verify outdoor air ventilation	27%
Modify air distribution	27%
NA / No work being planned at this point	27%
IAQ monitoring of other air pollutants (e.g. particles)	25%
Upgrade to higher MERV air filters	25%
Adding mechanical ventilation	19%
Install in-room (including portable) air cleaners w/ HEPA filters	15%



# ESSER III – Planned Spending

- Currently (July 2022), tabulated by category over \$83 billion in planned spending for 5,000 districts covering 74% of US K-12 public school enrollment.
- 42% districts with planned spending on HVAC
- Average planned spending around \$5.2M  
<https://info.burbio.com/essser-iii-spending/>

<https://www.future-ed.org/financial-trends-in-local-schools-covid-aid-spending/>

SELECTED CATEGORIES IN LOCAL EDUCATION AGENCIES' PLANNED ESSER III SPENDING			
Selected Categories	Budgeted Amount	Percent of Total	National Projection
Teachers, Interventionists	\$5,830,131,058	9.1%	\$9,985,070,953
HVAC	\$5,713,367,398	8.9%	\$9,785,093,729
Summer Learning & Afterschool	\$3,735,994,561	5.8%	\$6,398,513,242
Repairs to Facilities to Prevent Illness	\$2,867,670,398	4.5%	\$4,911,363,417
Staff Retention & Recruitment	\$2,594,501,467	4%	\$4,443,516,103
Tutoring, Math/ELA Coaching	\$1,806,389,334	2.8%	\$3,093,742,746
Professional Development	\$1,348,233,004	2.1%	\$2,309,073,684
Psychologists, Mental Health Professionals	\$1,308,006,297	2%	\$2,240,178,746
Mobile Devices	\$1,183,175,858	1.8%	\$2,026,385,818
Instructional Materials and Supplies	\$1,148,440,230	1.8%	\$1,966,895,267
Continuation of Operations	\$1,047,514,460	1.6%	\$1,794,043,068
Students with Disabilities	\$815,161,395	1.3%	\$1,396,099,726
Public Health Protocols	\$722,126,849	1.1%	\$1,236,762,563
Social-emotional Learning	\$707,204,406	1.1%	\$1,211,205,392
Transportation	\$556,385,937	0.9%	\$952,903,631
PPE	\$461,151,161	0.7%	\$789,798,209

*This FutureEd analysis is based on a June 7, 2022, compilation by the data-services firm Burbio on Covid-relief spending plans released by 5,004 local education agencies in 50 states and the District of Columbia representing 74% of the nation's public-school students. The analysis breaks down \$64.2 billion in designated spending in federal Elementary and Secondary School Emergency Relief (ESSER III) funds.*



# HVAC Design and Construction Standards

Efficiency and IEQ Hand in Hand

# Topics to Cover

- ▶ HVAC Standards and Specifications
- ▶ Testing and Balancing
- ▶ Commissioning



# Greenville County Schools

- ▶ Largest school district in SC, 44<sup>th</sup> largest nationally with 77,000 students
- ▶ Nearly 5,000 teachers, 9,000 employees
- ▶ 95 schools, 19 centers and offices
- ▶ 800 sq. miles, 3,000 acres
- ▶ 13,000,000 sq. ft.
- ▶ \$800M General Fund Budget
  
- ▶ Average age of building stock is 17 years



# Greenville County Schools

- ▶ 2002-2010 building program
- ▶ Genesis of current construction standards
- ▶ Facilities Design Guide
- ▶ Consensus approach to standardization and minimum requirements

GREENVILLE COUNTY SCHOOLS DESIGN GUIDE

Date of Revision: June 2021  
Revision # 3

## TABLE OF CONTENTS

- General Mechanical Design Requirements
- System Selection and Performance
  - Contract Administration
- Specific Space Requirements
  - Fire Protection Equipment, System and Products
  - Plumbing
  - Building Services Piping and Appurtenances
- Ductwork, Air Distribution and Accessories
- Sustainability Certification
- EQUIPMENT AND PRODUCTS:
  - Packaged HVAC Equipment
  - Low Pressure Water Boilers
  - Indoor/Outdoor Chilled Water AHUs
  - Packaged Cooling Towers
  - HVAC Water Chillers
  - Variable Air Volume (VAV) Terminal Units
  - Kitchen Exhaust Systems and Equipment
  - Motors
  - Facility Management And Control System (FMCS)



Information for You from Greenville County Schools

## School Construction Program



### BEST School Construction Program

The BEST (Building Equity Sooner for Tomorrow) School Construction Program was implemented to provide all students across Greenville County with quality school facilities built in a timely manner and at less cost.

The school construction program, completed in 2010, achieved all three goals and received national recognition as the 2008 National Program Management/Buildings Project both Private and Public Award from the Construction Management Association of America.

www.greenville.k12.sc.us



### Background – The Need

Greenville County Schools, like school districts across the nation, faced the challenge of how to affordably build schools to meet students' needs. The school system had aging and inadequate school buildings and an increasing student population, but could build only a few schools a year due to the debt limit set by the State Constitution. As a result, it "have required at least 23 years to complete the building program. In August 1999, the school system entered into a Program Management Agreement with Institutional Resources to oversee the school construction needs and to accelerate the construction. In April 2002, the school system entered into a Program Management Agreement with Institutional Resources to oversee the school construction and renovation of schools. The School Board established a non-profit foundation, Building Equity Sooner for Tomorrow or BEST, to fund the program.

### Improved Instruction

The "bottom line" for the BEST Construction Program is improved instruction and enhanced academic opportunities for students across Greenville County. Teachers no longer have to work around the limitations of inadequate school facilities. Each school has classrooms of adequate size, innovative lab space, music and band rooms, infrastructure to support the latest technology for research and development of ideas, and improved environmental features such as better lighting and heating/air-conditioning.

### Safer Schools

Elementary, middle and high schools include a "safety entrance" area for visitors. All new schools have security systems, including surveillance cameras. Telephones are available in every classroom and office for use during emergencies.

### Quality School Facilities for All Students

Students across Greenville County have access to quality school facilities with similar features. Equity is ensured as construction standards are the same for all schools serving the same grade levels.

### Needed Space for Growing Student Population

The school system is projected to continue to grow. School building needs will be addressed through the annual Long Range Facilities Plan and Capital Improvement Program.

### Schools Built When Needed

The accelerated construction schedule, achieved through an innovative funding model using a non-profit funding foundation, BEST, allowed the school system to build schools in 6.5 years versus at least 23 years. In making use of the traditional "pay as you build" plan, the school system would never catch up with its school building needs.

### 30 of BEST School Construction Program

chools and Centers  
e Construction Specifications for ALL Schools Serving Same Grade  
90  
years to Complete 69 of 70 Schools Versus Minimum of 23 Years Using  
Normal "Pay As You Build" Plan; Last School Opened August, 2010

Improved Instruction  
r Schools  
Quality School Facilities for  
All Students  
Needed Space for Growing  
Student Population  
Schools Built When Needed  
30% Built at Lower Cost



Listing of School Construction Projects on Back Page

INFOLine  
864.355.3100

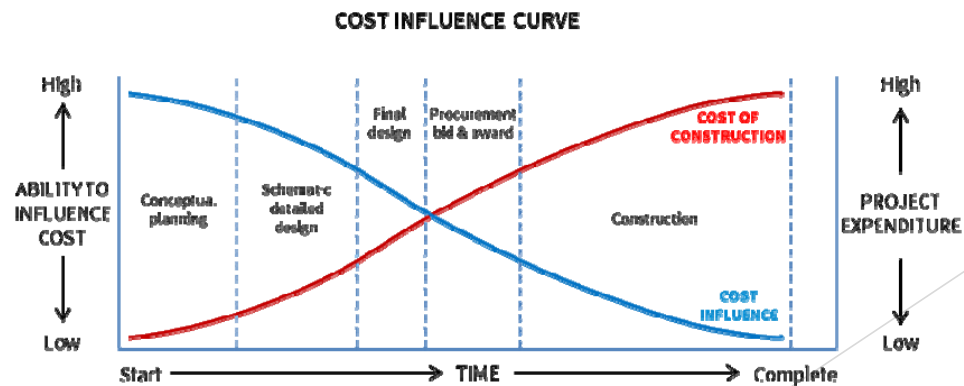
Website  
www.greenville.k12.sc.us

The Schools Channel  
Charter Cable 99

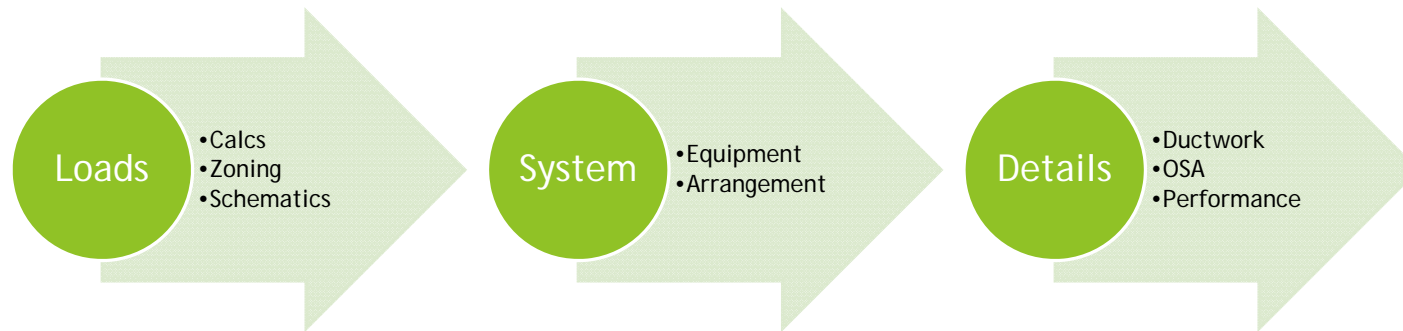
301 E. Camperdown Way  
Greenville, SC 29601

# Facilities Design Guide

- ▶ Systematic approach for project delivery
- ▶ Predictable results
- ▶ Standard HVAC Systems and equipment
- ▶ Most financial / pre-design decisions already made
- ▶ Increased staff knowledge and operation



# HVAC Specifications & Project Delivery Requirements

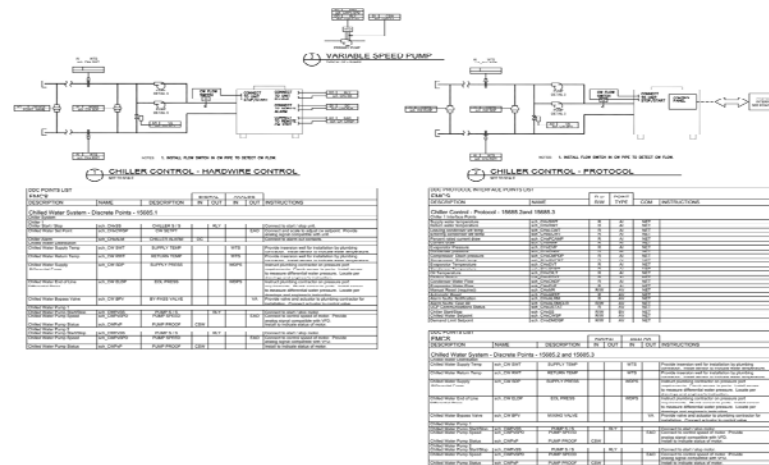
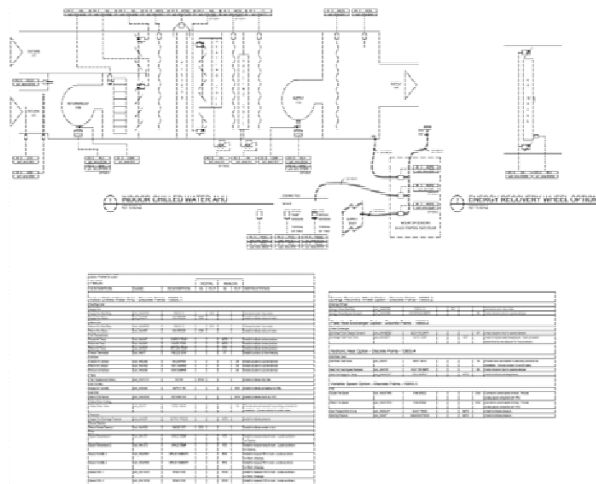


# HVAC System Standard Features

- ▶ DOAS - Dedicate Outside Air Systems
  - ▶ Decouples ventilation air
  - ▶ Low dewpoint (dry sponge)
- ▶ High Efficiency central equipment
- ▶ Heat recovery - airside, waterside
- ▶ Economizers, air and water

# HVAC System Design Requirements

- ▶ Limits on noise
- ▶ Fan and pump performance parameters
- ▶ DDC Sequences of Operation Standardized and based on ASHRAE Guideline 36 - *High-Performance Sequences of Operation for HVAC Systems*
- ▶ Review of ductwork, piping pressure losses and building air balance





## IEQ Features

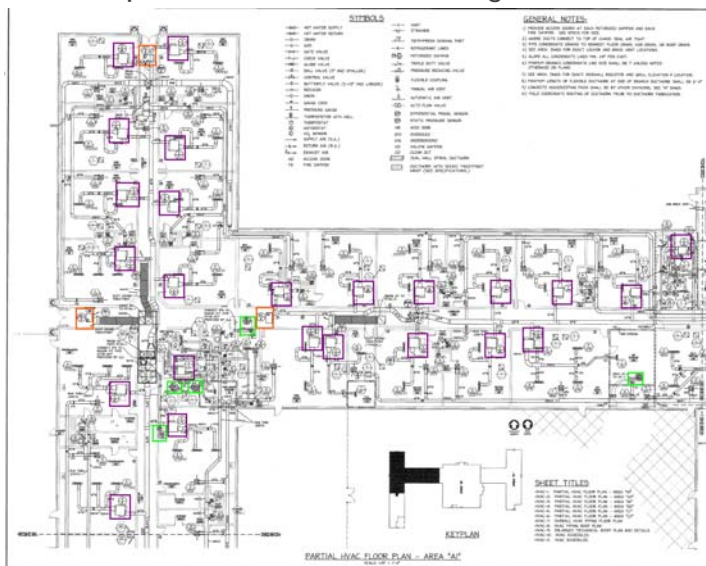
- ▶ Sloped SS Drain pans
- ▶ No duct liners liner
- ▶ CO<sub>2</sub> points
- ▶ Filters / cleaners
- ▶ Based on Std 62 - do the math (all of it)
- ▶ Construction IAQ requirements
- ▶ Designed for maintenance - clearance, access, training

## Testing, Adjusting and Balancing

- ▶ Essential part of project completion (code requirement)
- ▶ Firm selection based on qualifications
- ▶ Owner furnished! - holds construction contractor and engineer accountable
- ▶ Put through all modes of operation
- ▶ Correct deficiencies
- ▶ Maximize comfort, minimize energy
- ▶ Documentation of system performance for closeout.

# Systems Commissioning

- ▶ Firm selection based on qualifications
- ▶ Owner furnished! - holds construction contractor and engineer accountable
- ▶ Engage pre-design to develop Owner's Project Requirements (OPR)
- ▶ Most critical part of project closeout
  - ▶ Compiles all O&Ms, as-builts, submittals, training
  - ▶ Simplifies document management



GREENVILLE COUNTY SCHOOLS  
NORTHWOOD MIDDLE SCHOOL  
MECHANICAL COMMISSIONING DATA SHEET

VAV FAN POWERED TERMINAL UNIT

DESIGN CRITERIA/SPACE	SPECIFIED	SUBMITTED	COMMISSIONED
Unit	FPB-A-04	FPB-A-04	FPB-A-04
Model	VPWF	VPWF12065Q	VPWF12065Q
Primary Inlet	12"	12"	12"
Design Cooling Airflow (CFM)	1130	1130	1136
Min. Cooling Airflow (CFM)	0	0	0
Max. Inlet SP (in H2O)	0.75	0.75	---
APD @ Cooling Airflow (in H2O)	0.01	0.06	---
Fan Size	8	---	---
Fan Airflow (CFM)	1130	1130	111
Fan TSP (in H2O)	0.36	0.3	---
% of Fan Range	17	36	---
Motor Voltage	277	277	---
Fan Power Hp	0.5	0.5	---
Unit Heating Airflow (CFM)	1130	1130	0
Valve Heating Airflow (CFM)	0	0	0
LAT °F	95	94.42	---
Coil Heating Capacity (MBH)	30.64	29.92	---
Heating Flow Rate (GPM)	1.2	1.20	1.20
Coil Fluid PD (ft H2O)	0.5	0.5	---
Heating EVT °F	180	180	---
Heating Delta T °F	51.24	49.88	---
Heating CV Number	2.67	---	---
Control Type	DDC - Prop HW Vlv	DDC - Prop HW Vlv	---
Unit Insulation	1/2" Foil Faced	1/2" Foil Faced	---
Downstream SP (in H2O)	0.25	0.25	---
Max. NC	30	30	---
Rad. Fan NC	35	35	---
Dis. Fan NC	17	20	---
Attenuator Yes / No	Yes	Yes	---
Dis. Transfer Function	ARI 885-98	ARI 885-98	---
Rad. Transfer Function	ARI 885-98 Mineral Fiber	ARI 885-98 Mineral Fiber	---

- Floor Plans
- Submittals
- Owners Manual

## TABLE OF CONTENTS

- A. Executive Summary
- B. Commissioning Plan
  - 1. Appendix "A" - Pre-Commissioning Check Lists
  - 2. Appendix "B" - Functional Performance Test Forms
  - 3. Appendix "B" - Blank Functional Performance Test Forms
- C. Owner's Project Requirements
- D. Basis of Design
- E. Review Comments
- F. Commissioning Specifications
  - 1. Specification 01810 - General Commissioning Requirements
  - 2. Specification 15995 - Commissioning of Mechanical Systems
  - 3. Specification 16995 - Commissioning of Electrical Systems
- G. Daily Logs
- H. Test Reports
- I. Test and Balance Report
- J. Time of Day Schedule
- K. Guidelines for Tracking Benchmarks
- L. Seasonal Operational Issues
- M. Calibration Frequency
- N. User Adjustable Set Points
- O. Continuous Commissioning
- P. Diagnostic Tools
- Q. HVAC O & M Manual
- R. DDC Controls O & M Manual
- S. Electrical O & M Manual
- T. Plumbing O & M Manual
- U. Fire Alarm O & M Manual
- V. Mechanical Floor Plans
- W. Electrical Floor Plans
- X. Plumbing Floor Plans
- Y. Fire Alarm Floor Plans

# Healthy Efficient Schools

## HVAC Retrofit Best Practices

July 12, 2022



# Agenda



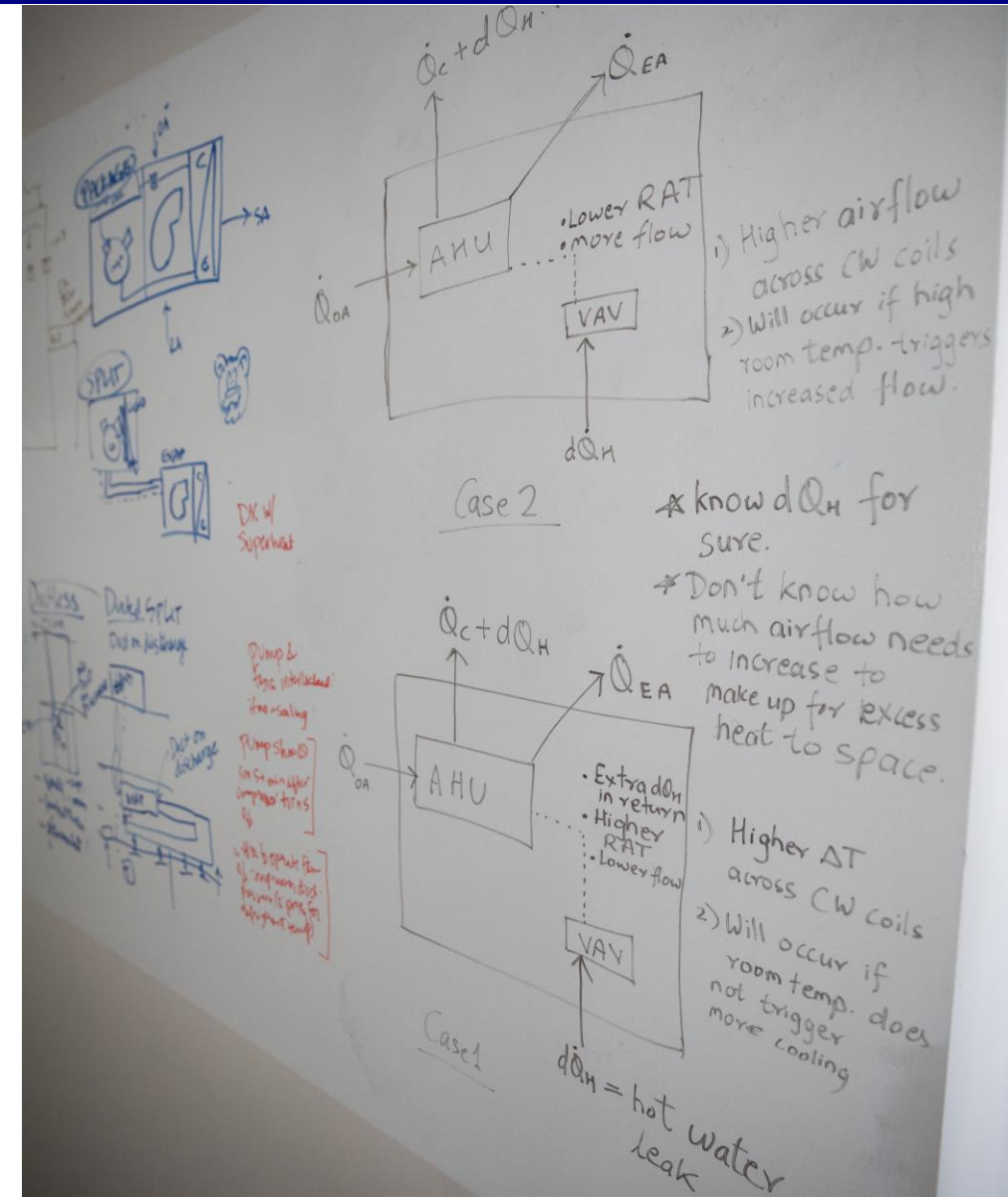
- Tips for Project Success
- Tips for High Efficiency Projects
- Tips for Ventilation and IAQ

# Tips for Project Success



# Scope Your Project

- What exactly do you need?
  - Start with how many of what, then flesh it out from there
- Put yourself in the installer's shoes
- Gather your resources
  - Humans!
  - Past documents
  - Funding
- Decide how you will proceed
  - Design Bid Build



# Build Your Team

- Figure out who will help you be successful
  - Who knows the facilities and occupants?
  - Who has the technical expertise?
  - Who can get the money to fund the project?
- Fill in the gaps on the bench
- Kick off the project with your team
  - Introduce the team, identify responsibilities
  - Review the scope together, solicit feedback
  - Chart the path from this meeting to completion
- Bring in your commissioning provider as early as possible





# Document, document



- As you refine your project and design, document intermediate findings
  - Owner's Project Requirements (OPR)
  - Basis of Design (BOD)
- Documentation of this sort helps in several ways
  - Tracking progress and why decisions were made
  - Staff/administration turn over
  - Reviewing design documents or contractor bids
- Denote the most critical decisions to communicate with bidders & designers
  - 'Detailed details and specific specifications'

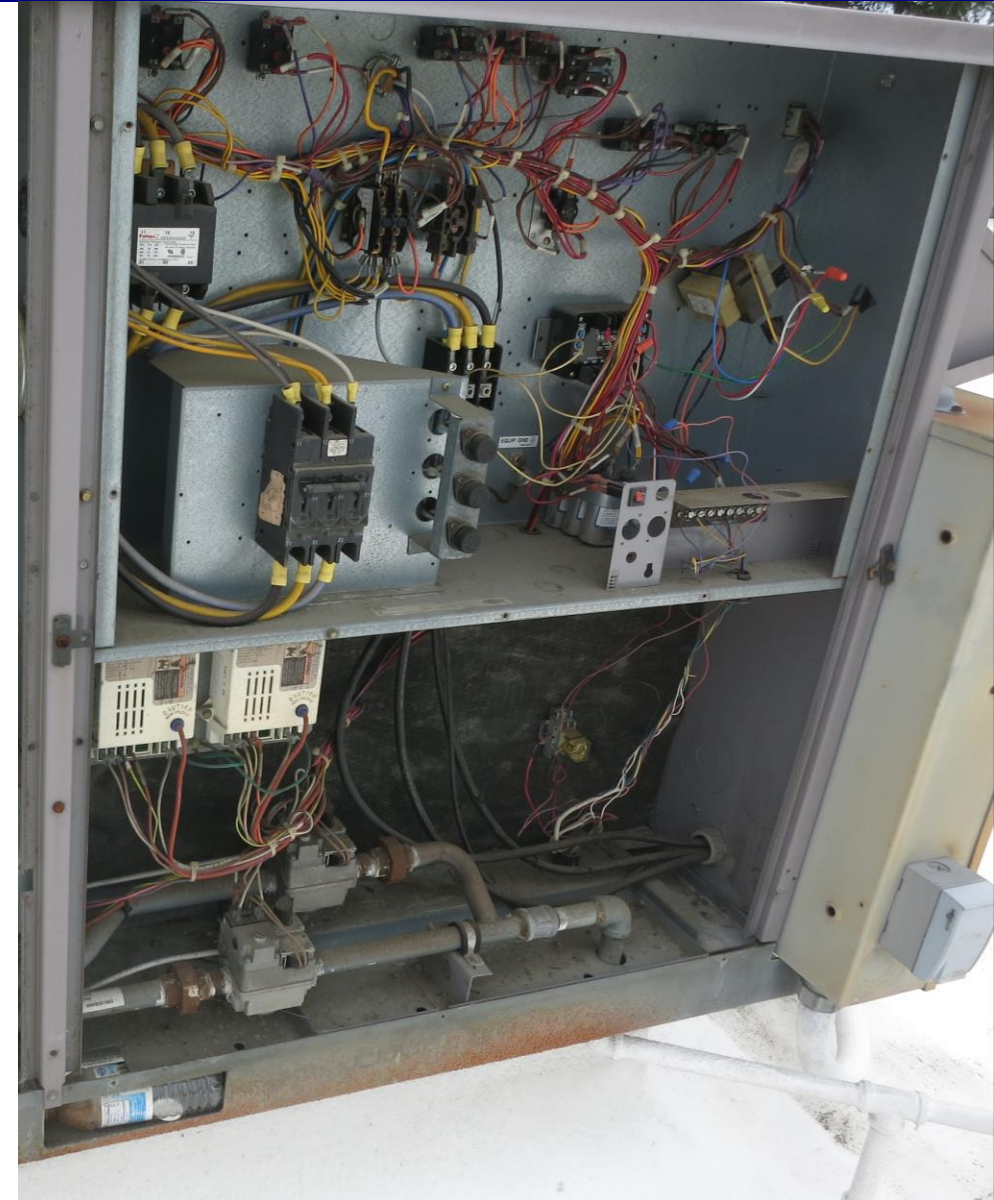
# Identify Efficiency & IAQ Improvements



- Don't miss opportunities to spruce up your projects
- Review your options to improve your impact
  - Review deferred maintenance needs
  - Review industry advice for achieving your goals
    - Integrated Systems Packages from LBNL
    - Advanced Energy Design Guides from ASHRAE
- List your options and priorities

# Include Add-Alternates for Repairs

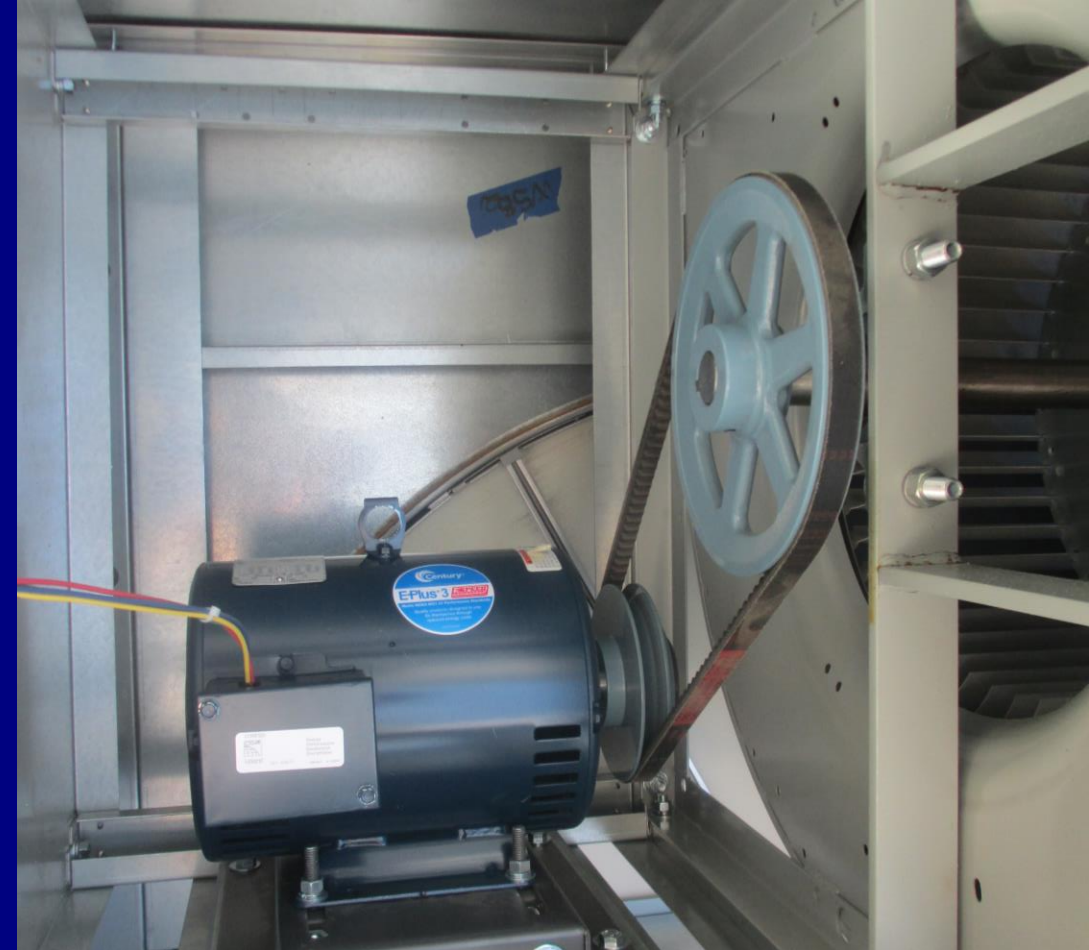
- Supporting hardware reused or reprogrammed during efficiency upgrades is often assumed to be functional, but could require repairs
- Work with your team to identify what common repairs you might encounter
- Ask vendors for unit pricing to repair these problems as add-alternates with their bid
- When found, the vendor has already provided unit pricing for demolishing, furnishing, and installing the new hardware
  - Speeds up the change order process



# Give Your CxP a Seat at the Table

- Commissioning is...
  - **not** just testing the system after installation
  - a quality control process that begins at project inception
- Look for your CxP to provide input by...
  - Translating “squishy” project goals into technical requirements
  - Identifying conflicts and design issues that could lead to trouble down the line
  - Reviewing submittals against the project (and their own testing) requirements
  - Testing, troubleshooting, and verifying problems in the field
  - Assembling the system manual and ensuring high quality training for site staff

# Tips for High Efficiency Projects



# Reach for Adjacent Systems

- During inception of the project, avoid putting on scope blinders
- Look for opportunities to address two needs at once
  - Replacing your rooftop units? What shape is the roof in? How's the roof deck insulation?
  - Looking at new thermostats in classrooms? Are there lighting controls you can tie into? How about devices to control plug loads?
  - Updating the cafeteria kitchen? How about water heater? Or the kitchen MAU?
- Look at the core of your project and then expand your view to encompass neighboring, up-steam/down-stream systems

# Integrated Systems Packages for Schools

- The Integrated Systems Packages (ISP) for Schools emphasize reaching out for adjacent systems!
- The ISP packages focus on discrete systems often the target for replacement
  - RTUs, Boilers, Chillers, Cooling Towers, BMS Hardware/Software
- Highlights ancillary systems that could be included in the scope and
- Identifies the critical technical requirements for achieve high efficiency and/or improved IAQ.
- Also provides some ballpark savings expectations for each package

# Require & Review Submittals

- Project submittals tell the stakeholders what their vendors **will provide**
- Reviewing the submittals against the bid requirements is critical to achieving your intended performance goals (energy & IAQ!)
- Who should review?
  - Designer and/or consultant for the system
  - System owner (typically facilities)
  - Commissioning provider
- Provide constructive comments!
  - What was found, what was required, why this needs a change, what change is needed



# Implement On-Going Commissioning

Site	Rule	Tue 3rd	Thu 5th	Sat 7th	Equips
Alameda	Unit Commanded On After H...	█	█	█	1
Alameda	Unit Running After Hours	█	█	█	x 2
Alameda Elementary	Unit Running After Hours		█		x 10
Alameda Middle	OAT Lockout Spark	█	█	█	1
Alameda Middle	Unit Commanded On After H...	█	█	█	x 5
Alameda Elementary	Unit Commanded On After H...	█	█	█	x 9
Alameda High	Unit Commanded On After H...	█	█	█	x 7
Alameda High	Unit Running After Hours	█	█	█	1
Alameda Elementary	Unit Commanded On After H...	█	█	█	x 19
Alameda Middle	Unit Commanded On After H...	█	█	█	x 21
Alameda Middle	Unit Commanded On After H...	█	█	█	x 15
Alameda Middle	Unit Running After Hours	█	█	█	x 4
Alameda Elementary	Unit Commanded On After H...	█	█	█	x 9
Alameda Middle	Unit Commanded On After H...	█	█	█	x 10
Alameda Elementary	Unit Commanded On After H...	█	█	█	x 2
Alameda High	Unit Commanded On After H...	█	█	█	x 21
Alameda High	Unit Commanded On After H...	█	█	█	x 4
Alameda High	Unit Running After Hours	█	█	█	1
Alameda Middle	Unit Commanded On After H...	█	█	█	x 17

- New hardware is prone to early failure and lost savings potential if not properly maintained and monitored
  - Particularly true for controls replacements or modifications
- Consider adding on-going commissioning or automated fault detection to your projects
  - On-going Cx tends to be more labor intensive, but captures a broader range of issues
  - Automated fault detection catches “slam dunks”, but often comes with software licenses to maintain

# Tips for Effective Ventilation & IAQ



# Ventilation & IAQ Basics

- Ventilation & indoor air quality (IAQ) are closely related
  - IAQ is a measure of how clean the air is inside our buildings
  - Ventilation brings in fresh outdoor air, improving the IAQ
- Strategies for improving IAQ in schools includes
  - High filtration efficiency air filters and routine replacement of dirtied filters
  - Well-designed ventilation systems, including
    - Properly specified ventilation rates
    - Locating air intakes away from contaminant sources
    - Economizers with CO2 monitoring

# Dial-in Ventilation Requirements

- ASHRAE Standard 62.1 provides a procedure for determining ventilation requirements
  - Based on people density, zone area, and the air distribution system itself
- Most installers are reluctant to do the ventilation calculations
- All projects involving ventilation should include updated ventilation calculations with work shown
  - Newer control sequences track the people component separate from the area component to reduce ventilation when vacant
  - Assumptions regarding air distribution system (including diffuser types) should be called out, just in case a substitution needs to be approved in the future



# Test and Balance Ventilation Systems



- Ventilation systems out of the box won't be dialed in
- Testing and balancing (TAB) does the following
  - Tests the behavior of the system as provided to the TAB contractor
  - Balances and calibrates the system to provide the design flows
  - Tests once again to verify its working as intended
- Adjusting setpoints and damper positions based on feel or experience is not sufficient to ensure proper ventilation

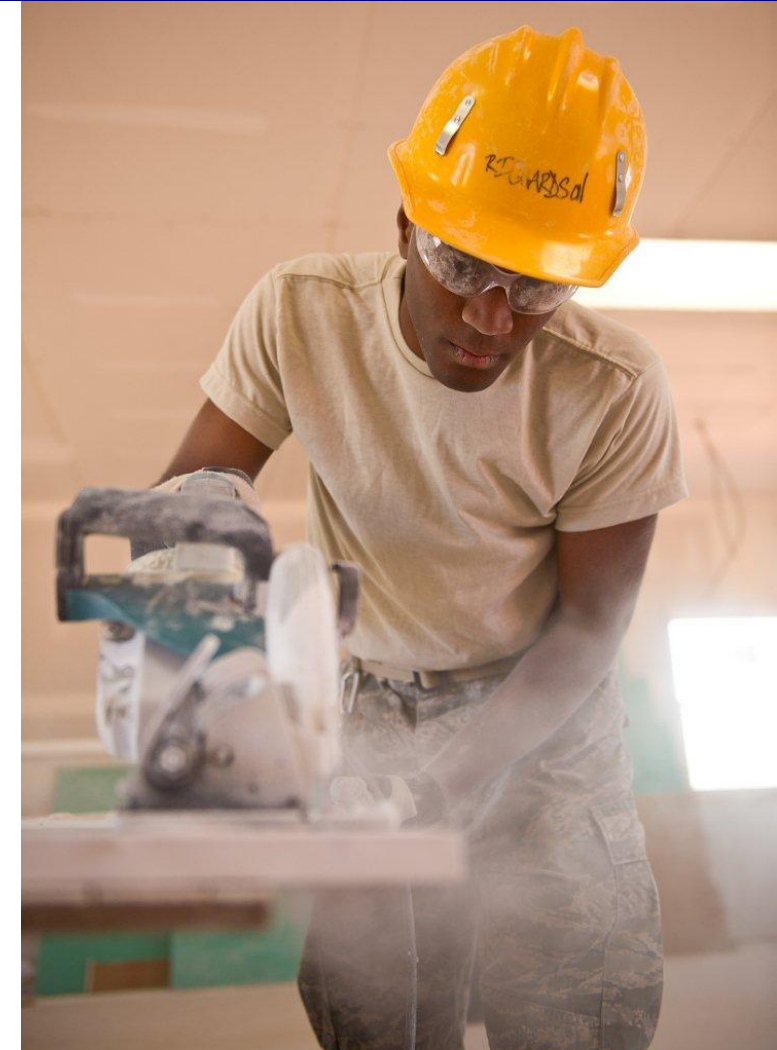
# Install High Efficiency Air Filters

- We generally follow ASHRAE guidelines, which suggest using MERV-13 filters in most HVAC applications
- Specify new hardware that can support MERV-13 filters
- Use caution when specifying MERV-13 filters on older equipment
  - Possible reduction in the heating and cooling capacity due to less air flow
  - Possible rise in fan energy use due to higher pressure drop across the filters
  - Consider testing
- Make sure the filters are installed properly

Approximate Equivalent Ratings for Filters Tested Under ASHRAE Standard 52.2 (MERV) and ISO 16890	
ASHRAE MERV* (Standard 52.2)	ISO 16890 Rating
1-6	ISO Coarse
7-8	ISO Coarse >95%
9-10	ePM <sub>10</sub>
11-12	ePM <sub>2.5</sub>
13-16	ePM <sub>1</sub>

# Use Construction Filters

- When you're doing dirty messy work, make sure filters are installed in your units!
  - Minimizes how much debris ends up in the ducts or in the coils of the unit.
- Construction filter quality not terribly important, a MERV-8 will get the job done
  - If the space was previously occupied, leaving the old filters in place is fine, too
- Once the job is complete (including sweep up!), schedule filter replacement with your MERV-13



# Use Good Filter Maintenance Practices

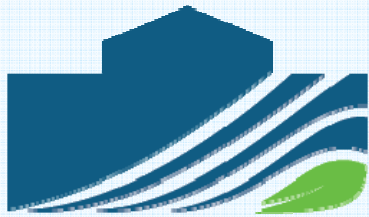


- Treat your filters right
  - Keep them a dry place
  - Keep them sealed/covered
- Change filters every year
  - Systems that run more often should get a twice-yearly filter swap
- Make sure the filters are seated properly inside the air handler
  - No gaps between filters
  - Orient filters per manufacturer labels
  - Make sure the ends of the filters are flush with the end of the rack



# Calibrate your CO2 Sensors

- Calibrate your CO2 sensors to ensure they're working accurately.
- Regularly review the CO2 trends
  - If the CO2 reads are continuously elevated, check it with a known good meter
    - Consider replacing (or recalibrating the sensor if feasible)
- Consider whether an ambient CO2 sensor is absolutely necessary
  - Schedule your recalibrations on the ambient sensor twice a year
  - Shop around for the highest quality ambient CO2 sensor you can find
- Automated fault detection pairs very well with CO2 sensors



## Q&A

Contact us at [EHSC@lbl.gov](mailto:EHSC@lbl.gov)

# Become a Participant or Supporter

- Access technical assistance and resources on best practices, guidance, case studies, and webinars
- Campaign prioritize schools serving low-income communities and in rural areas
- Campaign participants can receive recognition for their exemplary efforts to improve energy efficiency and indoor air quality
- Campaign supporters are encouraged to share and promote goals and benefits of efficient and healthy schools

## Engaging K-12 Schools to Improve Energy Efficiency and Indoor Air Quality

The Efficient and Healthy Schools campaign will engage schools—especially those serving low-income student populations—to reduce energy costs and improve energy efficiency and indoor air quality. The campaign aims to connect schools with practical solutions to heating, ventilation and air conditioning (HVAC) systems and other technologies. Its goal is to reduce energy use, lower carbon emissions and promote a healthy learning environment by enabling good indoor air quality.

### PARTICIPANT

As participants, schools will:

- Stay informed by receiving newsletter.
- Engage in peer-to-peer learning.
- Participate in the development of technical resources to simplify and scale solutions that improve energy performance and indoor air quality.

Participating schools can receive recognition for their exemplary efforts to improve energy efficiency and indoor air quality through operation and maintenance, HVAC upgrades and replacement, ongoing monitoring and data analytics, and support for a culture for efficient healthy school buildings.



**ENERGY** | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

### SUPPORTER

The campaign plans to engage supporters such as designers, engineers, consultants, program implementers, and others that work with K-12 schools.

As supporters, organizations will:

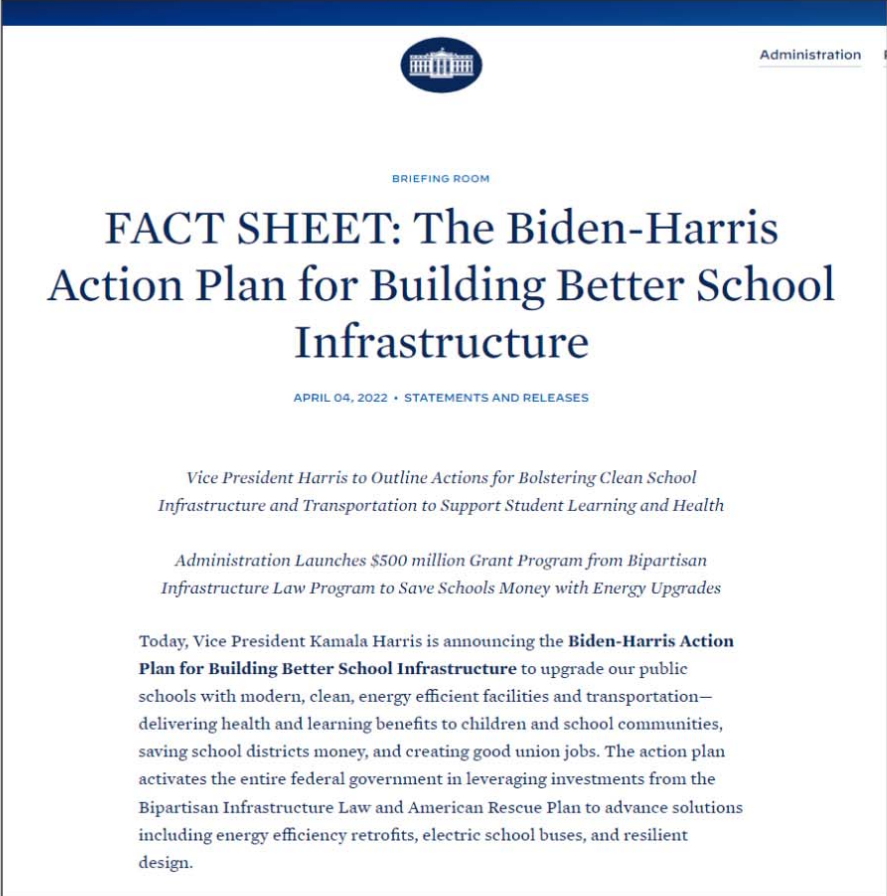
- Help us share the benefits of efficient and healthy school buildings.
- Partner with the campaign team to promote improvements in K-12 schools.
- Receive public recognition for your support.
- Share and promote existing resources, programs and tools.

To learn more, please visit [efficienthealthyschools.lbl.gov](http://efficienthealthyschools.lbl.gov) or contact us at [EHSC@lbl.gov](mailto:EHSC@lbl.gov)

# DOE at Center of Building Better Schools Action Plan

The Biden-Harris Action Plan for Building Better School Infrastructure will:

**Invest in More Efficient, Energy-Saving School Buildings:** The Department of Energy (DOE) is launching a \$500 million grant program through President Biden's Bipartisan Infrastructure Law to make public schools more energy efficient. This new program will lower energy costs, improve air quality, and prioritize schools most in need, enabling schools to focus more resources on student learning.

The image shows the cover of a fact sheet from the U.S. Department of Energy. At the top left is the DOE logo, and at the top right is the word "Administration". Below that, it says "BRIEFING ROOM". The main title is "FACT SHEET: The Biden-Harris Action Plan for Building Better School Infrastructure". Below the title is the date "APRIL 04, 2022" and "STATEMENTS AND RELEASES". There are two sub-headlines: "Vice President Harris to Outline Actions for Bolstering Clean School Infrastructure and Transportation to Support Student Learning and Health" and "Administration Launches \$500 million Grant Program from Bipartisan Infrastructure Law Program to Save Schools Money with Energy Upgrades". The main body of text starts with "Today, Vice President Kamala Harris is announcing the Biden-Harris Action Plan for Building Better School Infrastructure to upgrade our public schools with modern, clean, energy efficient facilities and transportation—delivering health and learning benefits to children and school communities, saving school districts money, and creating good union jobs. The action plan activates the entire federal government in leveraging investments from the Bipartisan Infrastructure Law and American Rescue Plan to advance solutions including energy efficiency retrofits, electric school buses, and resilient design."/>

Administration

BRIEFING ROOM

## FACT SHEET: The Biden-Harris Action Plan for Building Better School Infrastructure

APRIL 04, 2022 • STATEMENTS AND RELEASES

*Vice President Harris to Outline Actions for Bolstering Clean School Infrastructure and Transportation to Support Student Learning and Health*

*Administration Launches \$500 million Grant Program from Bipartisan Infrastructure Law Program to Save Schools Money with Energy Upgrades*

Today, Vice President Kamala Harris is announcing the **Biden-Harris Action Plan for Building Better School Infrastructure** to upgrade our public schools with modern, clean, energy efficient facilities and transportation—delivering health and learning benefits to children and school communities, saving school districts money, and creating good union jobs. The action plan activates the entire federal government in leveraging investments from the Bipartisan Infrastructure Law and American Rescue Plan to advance solutions including energy efficiency retrofits, electric school buses, and resilient design.

## News from Organizing Partners

- Department of Education – Green Ribbon Schools

### In the News



### View the 2022 U.S. Department of Education Green Ribbon Schools Ceremony Live

The 2022 U.S. Department of Education Green Ribbon Schools Ceremony will be broadcast live on July 26 at 2 p.m. ET on ED social media accounts ([Facebook](#) and [YouTube](#)). While in-person attendance at the event is limited, anyone can tune in to view the ceremony online.

<https://www.ed.gov/news/press-releases/schools-districts-and-postsecondary-institutions-honored-2022-us-department-education-green-ribbon-schools>



# News from Organizing Partners

- USEPA Key actions outlined in the Clean Air in Buildings Challenge include:
  - Create a clean indoor air action plan,
  - Optimize fresh air ventilation,
  - Enhance air filtration and cleaning, and
  - Conduct community engagement, communication and education.

<https://www.epa.gov/indoor-air-quality-iaq/clean-air-buildings-challenge>

[https://www.epa.gov/system/files/documents/2021-09/iaq\\_proven-strategies\\_infographic.pdf](https://www.epa.gov/system/files/documents/2021-09/iaq_proven-strategies_infographic.pdf)

## Proven Strategies to Improve Indoor Air Quality in Schools

Putting strategies in place to ensure adequate ventilation and filtration in school buildings is critical for providing healthy indoor air to students and staff. To **reduce pollutants in the air and limit the spread of viruses and bacteria**, schools should maximize ventilation rates to the extent possible by bringing in as much outdoor air as weather and outdoor air quality permit. When sufficient HVAC adjustments are not possible, consider other means of bringing in outdoor air, and also consider increasing HVAC filter efficiency and using portable air cleaners as a supplemental filtration strategy.

### Increase Ventilation Rate



- Conduct an HVAC assessment to evaluate the condition of the existing HVAC system components and unit ventilation equipment.
- Ensure a scheduled inspection and maintenance program for HVAC systems is in place to allow for repair, modification or replacement of equipment.<sup>1</sup>
- Assess and service your ventilation system to ensure it continues to perform as designed.
- Adjust the HVAC system to bring in more outdoor air.
- When HVAC adjustments are not possible, consider other means of bringing in outdoor air, such as opening windows and using window fans, if weather and outdoor air quality permit.
- Keep unit ventilators clear of books, papers and other items that could reduce airflow.

### Increase HVAC Filter Efficiency



- Increase filter efficiency in existing HVAC systems by using filters with the highest Minimum Efficiency Reporting Value (MERV) rating possible (per equipment specifications). If possible, increase the level of the air filter to MERV 13 or higher.
- Make sure the filters are sized, installed and replaced according to the manufacturer's instructions.

### Supplement with Portable Air Cleaners



- Consider using portable air cleaners as a supplemental filtration strategy. Choose portable air cleaners that use proven technology and are appropriately sized for the spaces they will service. Replace filters according to the manufacturer's instructions.
- Do not use air cleaners that intentionally generate ozone in occupied spaces or that do not meet state regulations or industry standards for ozone generation.
- If air cleaners are used, they should be placed so that air is not blown directly from one person to another, as this could potentially facilitate the spread of viruses and bacteria to others. Air flow to and from air cleaners should not be obstructed.

<sup>1</sup> Ensure HVAC assessments and maintenance are in accordance with minimum inspection standards of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)/Air Conditioning Contractors of America (ACCA) Standard 180, ASHRAE handbooks, or other equivalent standards and guidelines.



## News from Organizing Partners

- ENERGY STAR Portfolio Manager – Certification Nation 2022



Earn new special recognition in 2022!



### Member

Certify **5 or more** buildings or plants in 2022. Starting this May, all members will receive:

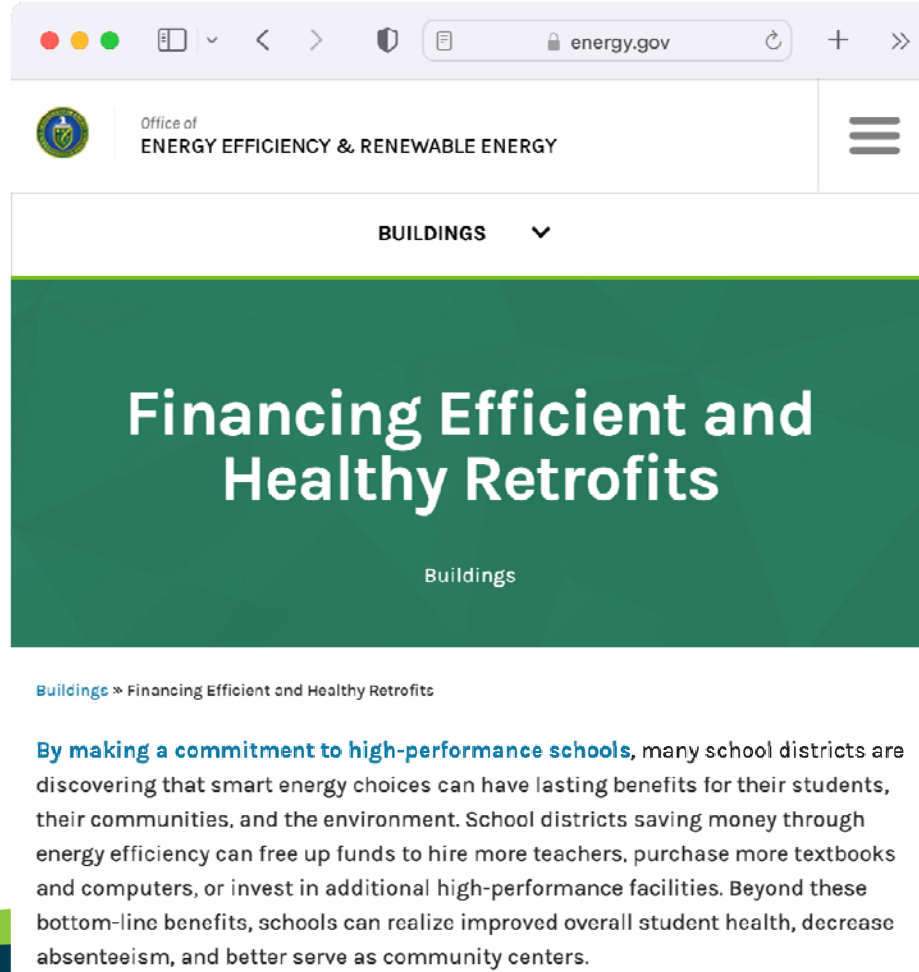
- A listing on our website
- A digital badge (shown at left)



## Campaign – Looking ahead

- New recognition categories will be announced soon
- Encourage participants to reach out to Campaign for technical assistance and resources
- Examples toolkits from Better Buildings:
  - [Energy Savings Performance Contracting \(ESPC\) Toolkit](#)
  - [Rooftop Air Conditioning Unit Evaluation Methodology](#)
  - [K-12 Lighting Toolkit](#)
  - [Smart Energy Analytics Campaign Toolkit](#)
  - [Low Carbon Technology Strategies Toolkit](#)

<https://www.energy.gov/eere/buildings/financing-efficient-and-healthy-retrofits>



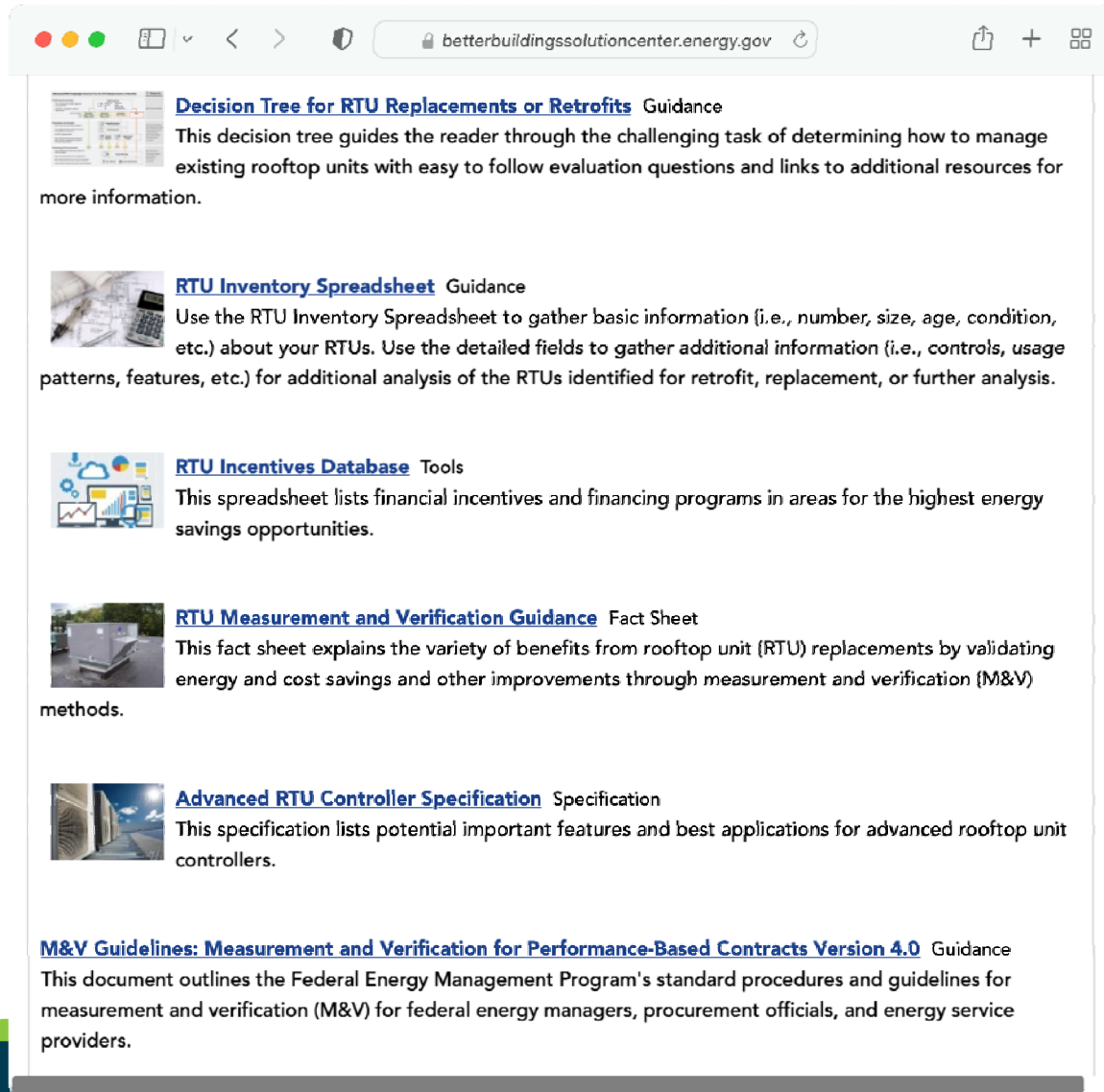
The screenshot shows a web browser window with the URL <https://www.energy.gov/eere/buildings/financing-efficient-and-healthy-retrofits>. The page header includes the Office of Energy Efficiency & Renewable Energy logo and a navigation menu with 'BUILDINGS' selected. The main content area features a large green banner with the title 'Financing Efficient and Healthy Retrofits' and the sub-header 'Buildings'. Below the banner, the breadcrumb 'Building » Financing Efficient and Healthy Retrofits' is visible. The main text reads: 'By making a commitment to high-performance schools, many school districts are discovering that smart energy choices can have lasting benefits for their students, their communities, and the environment. School districts saving money through energy efficiency can free up funds to hire more teachers, purchase more textbooks and computers, or invest in additional high-performance facilities. Beyond these bottom-line benefits, schools can realize improved overall student health, decrease absenteeism, and better serve as community centers.'



## ROOFTOP AIR CONDITIONING UNIT EVALUATION METHODOLOGY

This toolkit contains resources to guide building owners and facility managers through a step-by-step method of evaluating and managing their inventory of RTUs and how to make the business case for replacements, retrofits, and quality maintenance practices.

<https://betterbuildingssolutioncenter.energy.gov/toolkits/rooftop-air-conditioning-unit-evaluation-methodology>



**Decision Tree for RTU Replacements or Retrofits** Guidance  
This decision tree guides the reader through the challenging task of determining how to manage existing rooftop units with easy to follow evaluation questions and links to additional resources for more information.

**RTU Inventory Spreadsheet** Guidance  
Use the RTU Inventory Spreadsheet to gather basic information (i.e., number, size, age, condition, etc.) about your RTUs. Use the detailed fields to gather additional information (i.e., controls, usage patterns, features, etc.) for additional analysis of the RTUs identified for retrofit, replacement, or further analysis.

**RTU Incentives Database** Tools  
This spreadsheet lists financial incentives and financing programs in areas for the highest energy savings opportunities.

**RTU Measurement and Verification Guidance** Fact Sheet  
This fact sheet explains the variety of benefits from rooftop unit (RTU) replacements by validating energy and cost savings and other improvements through measurement and verification (M&V) methods.

**Advanced RTU Controller Specification** Specification  
This specification lists potential important features and best applications for advanced rooftop unit controllers.

**M&V Guidelines: Measurement and Verification for Performance-Based Contracts Version 4.0** Guidance  
This document outlines the Federal Energy Management Program's standard procedures and guidelines for measurement and verification (M&V) for federal energy managers, procurement officials, and energy service providers.



**EFFICIENT AND  
HEALTHY SCHOOLS**

**Thank you!**

Contact us at [EHSC@lbl.gov](mailto:EHSC@lbl.gov)

U.S. DEPARTMENT OF  
**ENERGY**

Office of ENERGY EFFICIENCY  
& RENEWABLE ENERGY

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