

# COMMUNITY PARTNERS & PLANNING COMMITTEE



 Thank you to all our community partners and the NH High Performance Schools Working Group

LAVALLEE BRENSINGER ARCHITECTS

































## ne

#### **Thank You Exhibitors**

- CoolGreenPower
- Lighten UP!
- Hillyard
- HMFH Architects
- Leviton
- RPF Environmental
- Sika Sarnafil Roofing & Waterproofing
- LighTec

- Conservation Solutions
   Corporation
- Window Film Depot
- Kalwall
- Clean-O-Rama
- Filter Sales & Solutions
- Fujitsu
- TRC Solutions
- Garland



#### **JOIN THE CONVERSATION:**

#### **#NHSUMMIT16**









And share your ideas by writing on the flipcharts scattered throughout the summit meeting space!

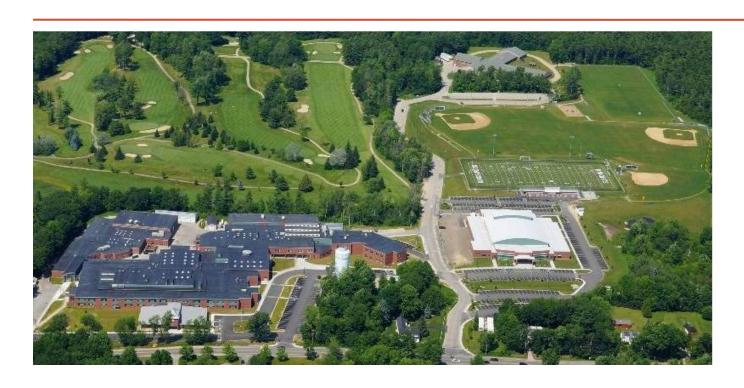
# THANK YOU TO OUR HOSTS – Governor Wentworth School District





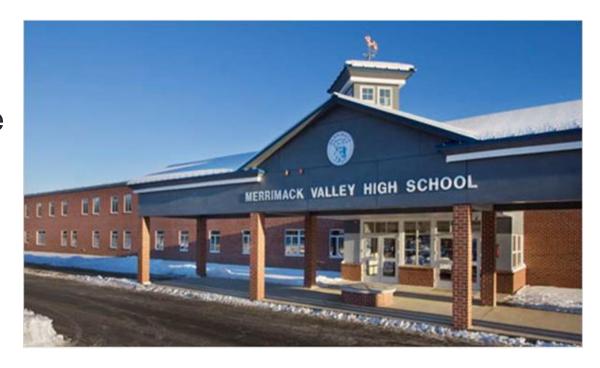


# NH HIGH PERFORMANCE SCHOOL SUMMIT



## NH High Performance Schools

 NH HPS features New Hampshire High Performance buildings which are safe, healthy, energy efficient, and which have the least possible impact on the natural environment.



#### Keene Middle School



 Many of us remember when our schools looked like this, many built during the Great Depression in the 1930s.

#### What was "School?"

 Classrooms often looked like this, and...





 little changed in class rooms right up until the last few years...

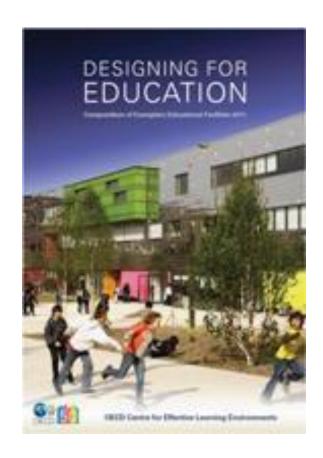
## School Buildings



- Similarly, the school buildings that were built did not change much from the 1960s until this century...
- They were often inefficient, not built smartly with respect to weather, or other environmental concerns....

## But with a new Century, that has all changed!

School Name	Location
Keene Middle School	Keene
Merrimack Valley High School	Penacoock
Profile School	Bethlehem
Mason Elementary School	Mason
TNT Alternative School	Keene
Idelhurst Elementary School	Somersworth
Lebanon Middle School	Lebanon
Portsmouth Middle School	Portsmouth
Kingswood High School	Wolfeboro
Abbot-Downing Elementary School	Concord
Christa McAuliffe Elementary School	Concord
Mill Brook Primary School	Concord
Laconia Middle School	Laconia



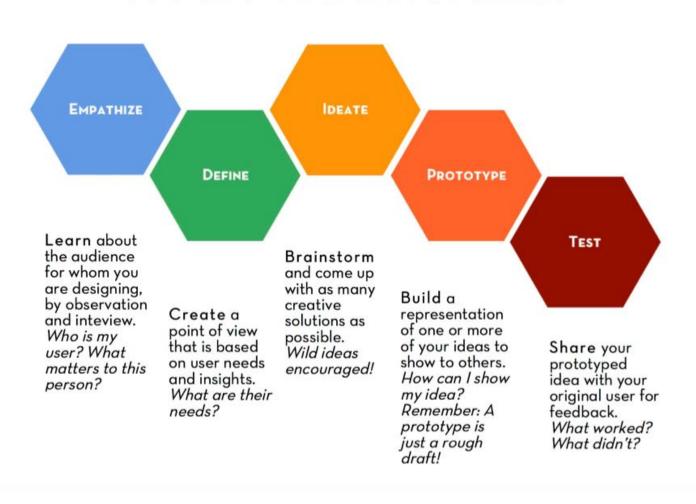
#### Teaching and Learning Has Also Changed!

- Perhaps you have seen the movie, "Most Likely To Succeed," by Ted Dintersmith
- Project Based Learning is a teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an engaging and complex question, problem, or challenge.
- -- Buck Institute for Education



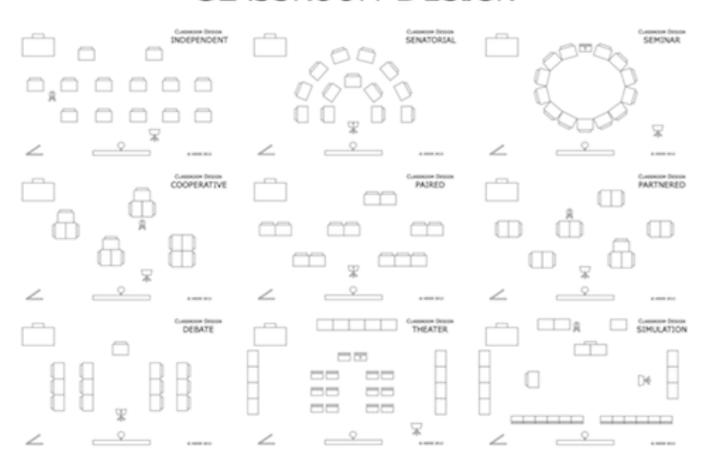
#### We Need To Consider New Models

#### We are all DESIGNERS!



#### Classrooms Will Look Different!

#### CLASSROOM DESIGN



© ASIDE 2012

#### Multi-Grade, Personalized Learning Design

#### Where learning is:

- student-centered, not class-centered
- Asynchronous, not cohort based
- Supports:
  - Class and teacher multi-tasking
  - Project-based



#### **New Models**



21<sup>st</sup> Century
 Classrooms may
 now look like this...

## Abbot-Downing Elementary School

 And Schools may now look more like this...



## Christa McAuliffe Elementary School

- When we are focused on work study practices like:
  - Creativity
  - Collaboration
  - Communication, and
  - Self-Determination
- Schools need to consider light, color, shapes, a well as spaces for congregation and alone time...



## Abbott-Downing Elementary School



 And although some traditional aspects of schools will remain, like individual locker spaces, other things may change, like open spacing and sight lines for safety and egress...

## Keene Middle School Today!

- So when we conceptualize a middle school for the future, it needs to take the whole child and the community needs into account...
- Factors like
   Learning, Health,
   Safety, Resiliency,
   and Energy
   Efficiency...



#### Let's Get On With the Show!

## We are so very fortunate to have:

- The NE
   Collaborative for
   High Performing
   Schools,
- The NE-CPS
   Criteria for High
   Performance
   Schools, and
- Today's Summit of NH High Performing Schools!



Kingswood Arts Center



#### NORTHEAST ENERGY EFFICIENCY PARTNERSHIPS

"Accelerating and transforming markets for energy efficiency in the Northeast & Mid-Atlantic States"

#### Mission

Accelerate energy efficiency as an essential part of demand-side solutions that enable a sustainable regional energy system

#### **Vision**

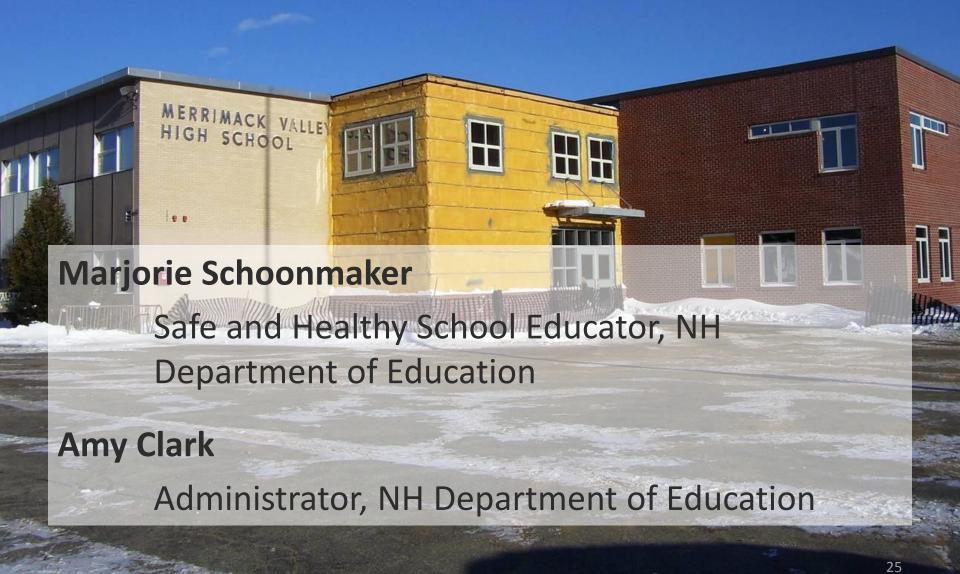
Region embraces Next Generation Energy Efficiency as a core strategy to meet energy needs in a carbon-constrained world

#### **Approach**

Overcome barriers and transform markets via Collaboration, Education and Enterprise

One of six Regional Energy Efficiency organizations (REEOs) funded by the U.S. DOE to support state efficiency policies and programs.

#### **NH Department of Education Overview**



### Vision For NH Schools

 The state of New Hampshire is devoted to giving students across the state access to the best possible school facilities. The physical environment in which students learn is vitally important to their long-term health, as well as their academic performance. Providing high quality learning environments (or High Performance Schools) that are energy-efficient, easy to maintain and operate, provide natural daylight and are optimized for highquality acoustical performance will lead to greater educational outcomes. Additionally, schools designed to meet a high performance criterion contain better indoor air quality leading to multiple health benefits for students and staff.

# The Future of School Building Aid

Amy C. Clark, PE

Civil Engineer

Administrator, School Safety & Facility Management Bureau

**NH** Department of Education

Tel (603) 271 - 2037

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 Grant money to aid local school districts in meeting the costs of constructing school buildings

\$350,000/year appropriated



Just over \$1 million/year appropriated

Costs of land now eligible

SAU offices now eligible

Planning and design costs now eligible



Over \$6 million/year appropriated

Substantial renovations now eligible



First year over \$10 million appropriated



 Kindergarten Construction Aid program established



First year over \$20 million



First year over \$30 million



First year over \$40 million

Great Recession hits



 \$1.2 million taken from building aid to help cover budget deficit

 Kindergarten made mandatory by school year 2009-2010



New building aid not included in House budget

Shortfall in building aid of 1.8 million (never restored)

Ultimately funded through sale of state bonds



 HB 2 imposes moratorium on new projects through June 30, 2013

 Building aid still appropriated for previous awards (obligated awards)



 HB 2 imposes moratorium on new projects through June 30, 2015

Building aid still appropriated for obligated awards

 Cap set at \$50 Million per year. Obligated awards is \$47 million.



 HB 2 imposes moratorium on new projects through June 30, 2017

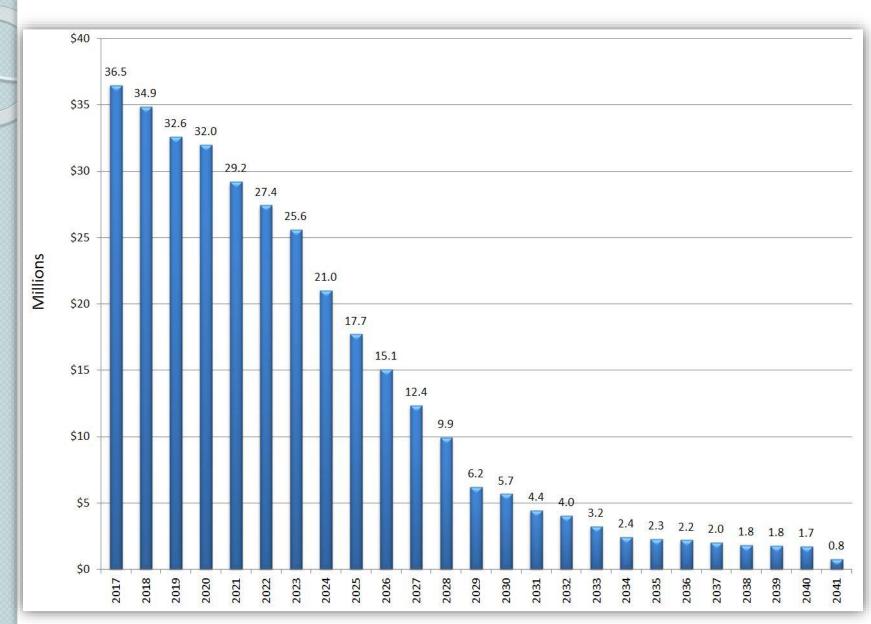
Building aid still appropriated for obligated awards



DOE requests \$50 million per year in next budget

• ???

## Obligated Awards (the "Tail")



### Law caps aid at \$50 Million (impacts if funded)

Appropriated school building aid funds are first used to pay for obligated awards

```
$50,000,000 max requested (by law)
- $36,500,000 obligated awards FY18
$13,500,000 left for 2017 projects (FY18)
```

- \$15.1 million for 2018 projects (FY19)
- No more 20 year payments. Now payments made in two disbursements
  - 80% upon project approval and the balance upon completion of construction
- Limited funds and new payment structure, so awards will be competitive
- Applications must be detailed and complete & thorough planning and design must take place prior to application

## Eligible

- Land
- Site development
- Planning & design
- Construction
- Substantial renovations
- Purchase of buildings
- Furniture, Fixtures, and equipment
- Charter school construction (new in 2013)

## Not Eligible

- Finance charges and interest
- Normal maintenance
- Lease costs
- Work funded through gifts, donations, etc.
- SAU offices
- Portable classrooms
- CTE projects (CTE aid still available!)

## School Building Aid Rate

- 30%-60% based on rankings for median family income and equalized valuation per pupil
- 3% incentive for high performance school buildings no longer exists

## **Application**

Download from website:

http://www.education.nh.gov/program/school\_approval/

- Identify problem to be solved
- Existing conditions
- 2+ feasible alternatives
- Life Cycle Cost Analysis
- Complete and reliable cost estimates
- Maintenance plan
- 20 Year plan for efficient use of space

## Scoring Criteria

- 1. Life-safety (ADA, security, emergency notification)\*
- 2. Overcrowded conditions (projected enrollments)
- 3. Space deficiencies (not meeting Ed 321 standards)
- 4. Building operations deficiencies
- 5. Eligibility for free or reduced cost meals
- 6. Historical preservation
- 7. Maintenance program
- 8. Consolidation/reduced property taxes

\*If no State aid used to fix, can take retro points

## Timeline for Applying

- By July 1<sup>st</sup> preliminary application due
- By September I<sup>st</sup> application due
- By December I<sup>st</sup> prioritized list approved by School Building Authority and submitted to State Board of Education
- By January 15<sup>th</sup> State Board of Education publishes prioritized list

# School Building Aid Rules Ed 321

 Identifies requirements and standards for the construction of K-I2 facilities

Outlines procedures for applying for building aid

Includes major revisions to address 2013 law change



## Legislation

- Infrastructure needs survey sent out
  - https://www.surveymonkey.com/r/NHSchoolBldgSurvey
- Watch for legislation
  - http://www.gencourt.state.nh.us/
  - http://www.education.nh.gov/program/school\_approval
- Make NH's school needs heard write or speak to the education committee, legislators, governor, etc.
- Change in rate? Eligibility? Change in structure?

## Questions?

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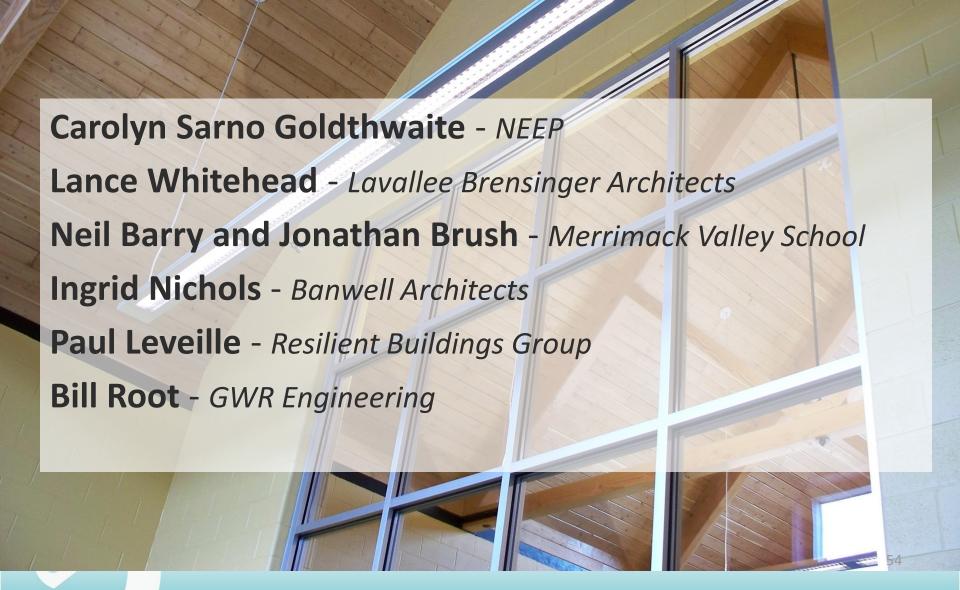
## **Networking and Exhibitor Break**

10:00 AM - 10:30 AM





# Recognizing the Multiple Benefits of High Performance Schools & Featured School Projects





### **SCHOOLS SHOULD BE ....**









- 43
- Not designed to meet demands of today's
- 70% of school energy use
- Per pupil energy expenditure have risen
   19%



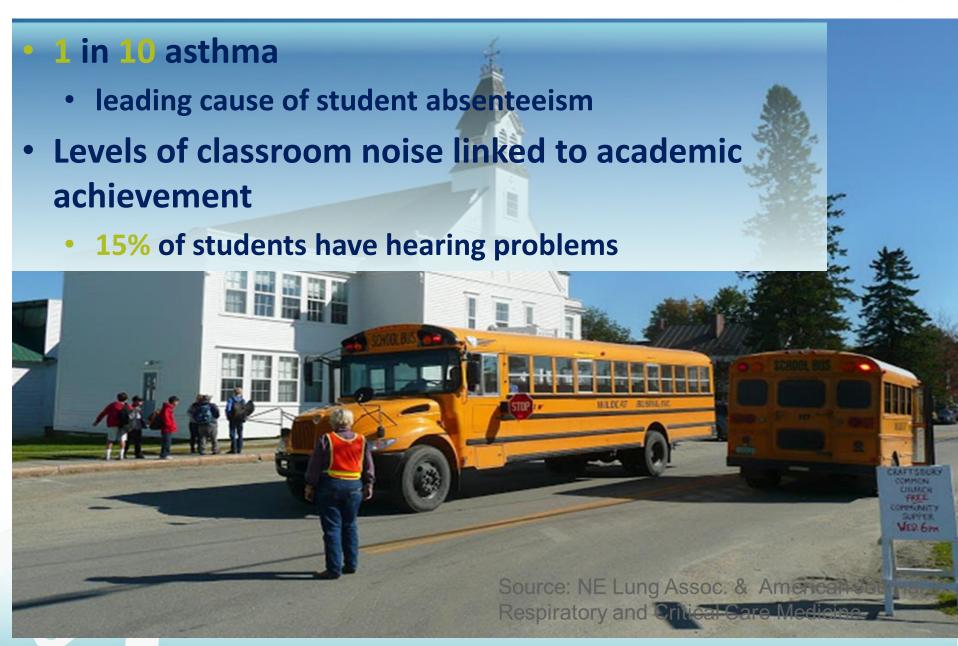
## **TECHNOLOGY**





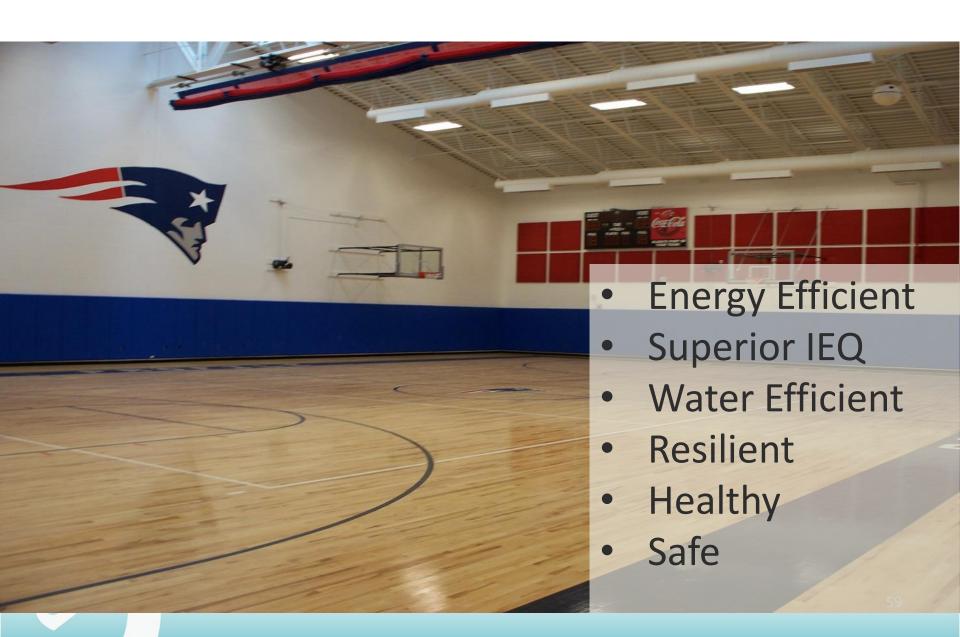
### THE CHALLENGE -IEQ







## **High Performance Schools**



## **Creating the Pathway**



### **Regional Stakeholder Group**

### Established 2002

- NEEP Licensed from CHPS 2006
  - Adapted for unique climate, characteristics, educational priorities, energy codes
  - NE-CHPS Version 1.0 (2007)
    - Now on 3.0
  - Supporting Resources
  - Companion O&M Guide





## **RESLIENT, HEALTHY SCHOOLS**

#### **Integration and Innovation**

- Integrated Design
- Educational Display
- Crime Prevention through Environmental Design

#### **Operations and Metrics**

- Facility, Staff, and Occupant Training
- Performance Benchmarking
- Indoor Environmental Management Plan
- Integrated Pest Management
- Anti-Idling Measures
- ENERGY STAR Equipment and Appliances

#### **Indoor Environmental Quality**

- HVAC Designed to ASHRAE 62.1
- Outdoor Moisture Management
- Low Emitting Materials
- Daylighting: Glare Protection
- Views
- Acoustic Performance (35 dBA)



#### **Energy**

- Energy Performance (IECC 2012+10%/ NBI)
- Commissioning
- Environmentally Preferable Refrigerants
- Local Energy Efficiency Incentive & Assistance

#### Sites

- Site Selection
- Site and Building Best Practices

### **Materials and Waste Management**

- Storage and Collection of Recyclables
- Minimum Construction Site Waste Management

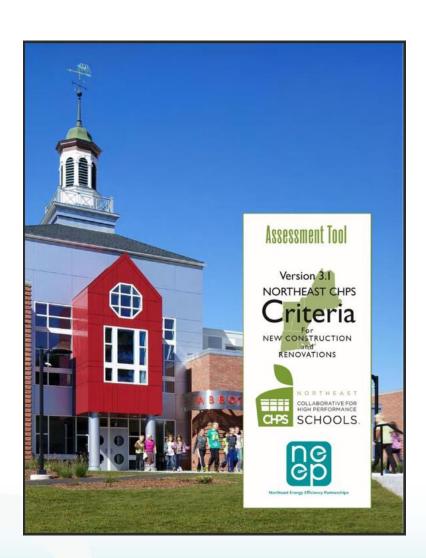








## Integration



#### INTEGRATION

#### Integrated Design

#### Intent

Integrate high performance goals into district planning in early programming and in ongoing decision-making to maximize system integration, and the associated efficiencies and cost benefits of high performance schools, as well as identify other sustainable opportunities.

II 1.0 - Integrated Design

II 1.1 – Enhanced Integrated Design

Integrated design is the consideration and design of all building systems and components together. It brings together the various disciplines involved in designing a building to develop and review their recommendations as a whole. It recognizes that each discipline's recommendations have an impact on other aspects of the building. For example, the HVAC system selection and design should take into consideration the building envelope and other building systems such as lighting and daylighting. A lack of teamwork can result in oversized systems or systems that are optimized for non-typical conditions. Integrated design allows professionals working in various disciplines to take advantage of efficiencies that are not apparent when they work in isolation. The earlier the integration is introduced into the design process the greater the benefit for both

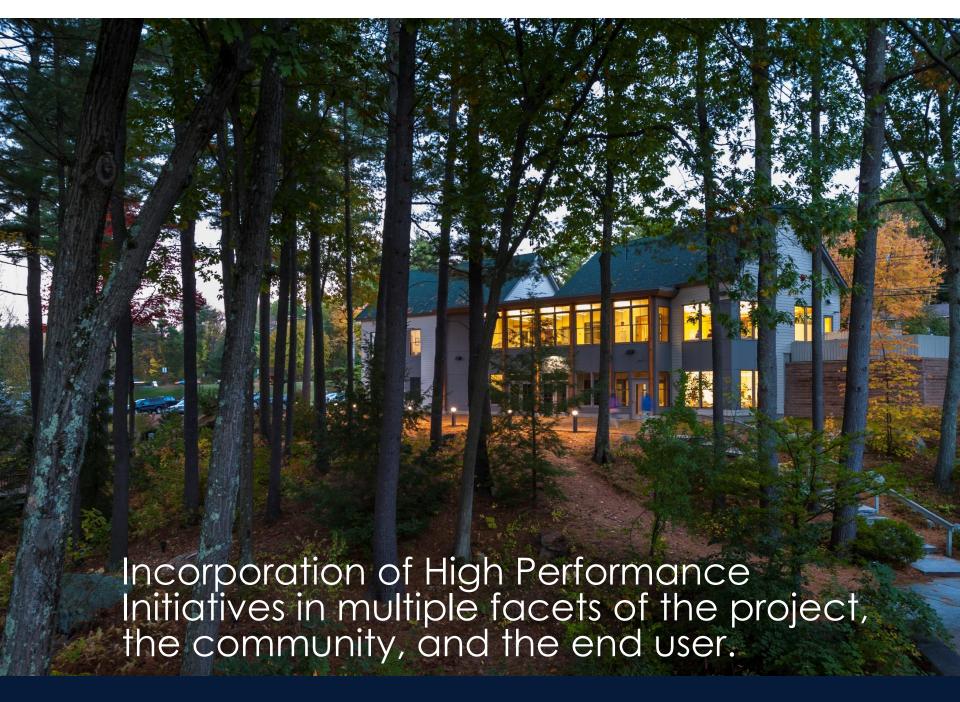
new construction and renovation projects.

II 1.0 – Integrated Design		Prerequisite	
		3 points	
Applicability	Verification Required		
All projects.	Design Review	Construction Review	Performance Review

Requirement

8

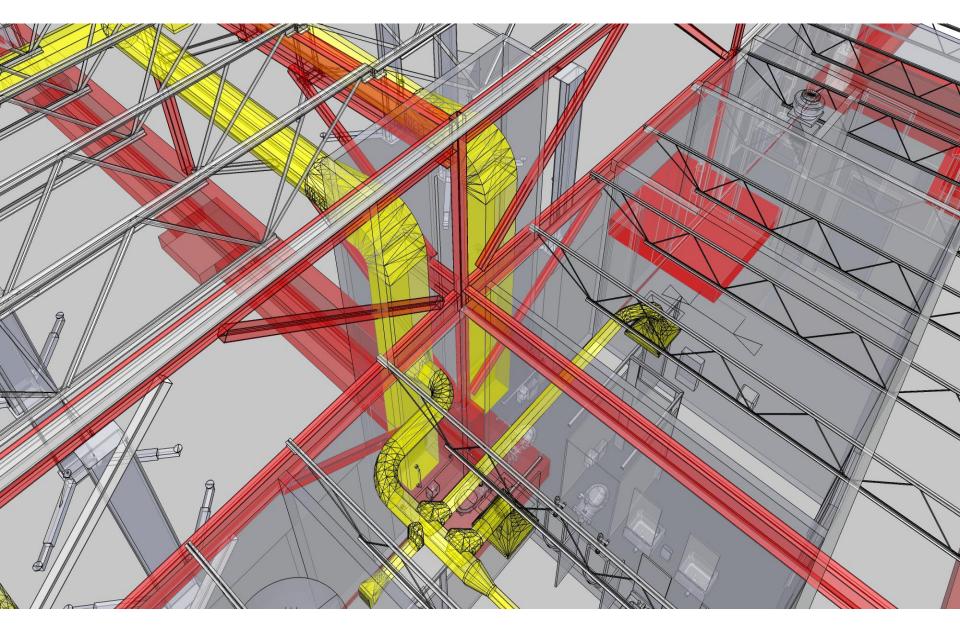






## **Integrated Design**

Workshops/Charrettes with All Parties



## Enhanced Integrated Design Integrated Design Workshops with Contractors and Others

- Utilize BIM

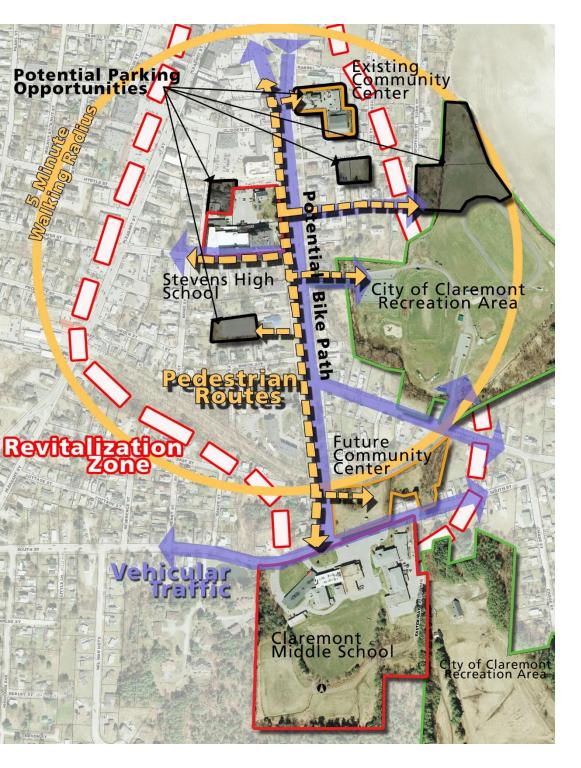


Enhanced Integrated Design
Integrated Design Workshops with Contractors and Others

- Utilize BIM



District Level Commitment
Client Public Commitment to Mandate Program Moving Forward



### **School Master Plan**

 Campus Planning to Embrace High Performance Initiatives

### **Current Production** 36.92 kW Production Weather Min: 24.8 °F Max: 48.2 °F Rochester, US Wind: 0.0 mph 3-day forecast Tu Min: 33.8 °F Min: 33.8 °F Min: 33.8 °F Max: 62.6 °F Max: 55.4 °F Max: 50.0 °F



Plant Information

East Rochester School Solar Array 773 Portland St. 03868 Rochester



Educational Display
Permanent Display In the School describing High Performance Issues



news resources contribute about us proje



#### Welcome to WIRE!

The wind turbine and solar panels are up! Another huge thanks to everyone who helped make this project happen! Come to the Windham High School to see WIRE's completed Alpha.



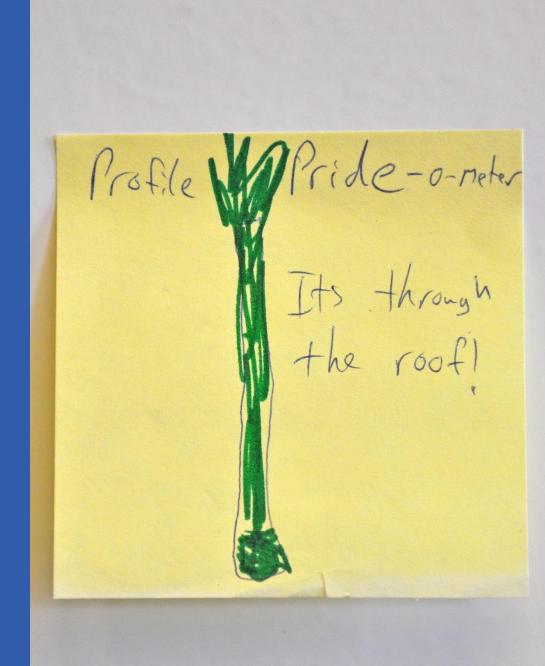
Thanks to our matching donor and the many contributions of private citizens, we have <u>reached our goal of</u>
\$50,000!
Donations still welcome.

Donate visa : PGP same

# **Educational Integration**

- Include High Performance into Curriculum
- Student Committees
- Projects

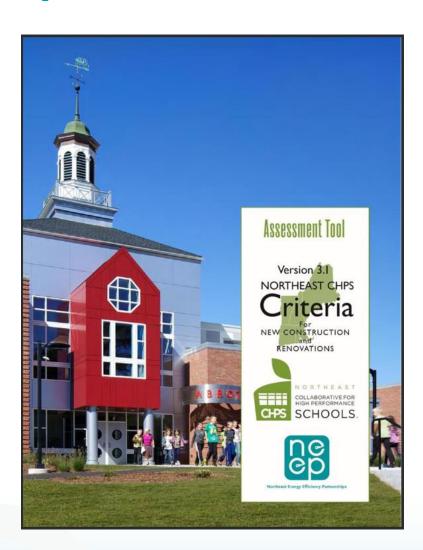
### **Outcomes**



# Questions?



# **Operations and Metrics**



#### **OPERATIONS & METRICS**

#### **Facility Staff & Occupant Training**

#### Intent

Training is the foundation of effective maintenance programs and is an essential tool to maintain and receive the high performance benefits such as protecting indoor air quality, thermal and visual comfort and maintaining superior energy performance.

OM 1.0 – Facility Staff & Occupant Training

The design and construction of the school may incorporate all the latest high performance features, yet problems can occur simply because important information is not transferred from the design and construction teams to the school facilities and maintenance staff, or to the building occupants. Training the facilities and maintenance staff is essential to the performance of the building, but is often not performed or is hastily completed.

Provide students, teachers and staff with more indepth knowledge for each aspect of high performance design on their school site, including how they interact with the facilities' systems and features to maintain and effectively receive the high performance benefits. Training the teachers and administration staff in how they can control their

room environments provides them with an understanding that will also help the facilities staff keep the building performing optimally.

For example, maintaining energy savings and thermal comfort by correctly operating HVAC systems; achieving continued energy savings from lighting systems and the continued reduction of plug loads; maintain visual comfort from effective daylight and especially proper control of shading devices; maintaining air quality by populating spaces with low emitting furniture, using green cleaning products or employing natural ventilation, etc.

OM 1.0 – Facility Staff & Occupant Training		Prerequisite		
		3 points		
Applicability	Verification Required			
All projects.	Design Review	Construction Review	Performance Review	

Requirement

36

# CHPS PROJECTS

Northeast CHPS Program is a "GUIDE" for achieving "High Performance," in the Facilities Operation and the people learning & teaching within the building.

# Integrated Design

- Minimum (2) Design workshops, (conceptual & final design), should take place prior to start of work.
- They have to be collaborative and meetings should continue throughout the project.
- Architect, engineering, facility leadership and contractor.
- Items covered... Lighting, HVAC controls, Facility cleaning needs, Recycling plan, Trash collection and Consumable deliveries.
- Keep records of meetings, which helps as a check list of agreed upon design.

## District Level Commitment

- This is a tough sell point.
- The Upper Administrative Team needs to be committed to the concept.
   They have to make the tough sell of the overall importance to Staff and the taxpayers.
- The same old approach to school buildings as simply rooms to educate in, is a known thing of the past. We can do much better than that.

### The School Master Plan

- It is just as much a convincing educational instrument for the taxpayer as it is for the people who work within the building.
- It has to be "believed in" for the overall success of the building.

## The Transition Plan

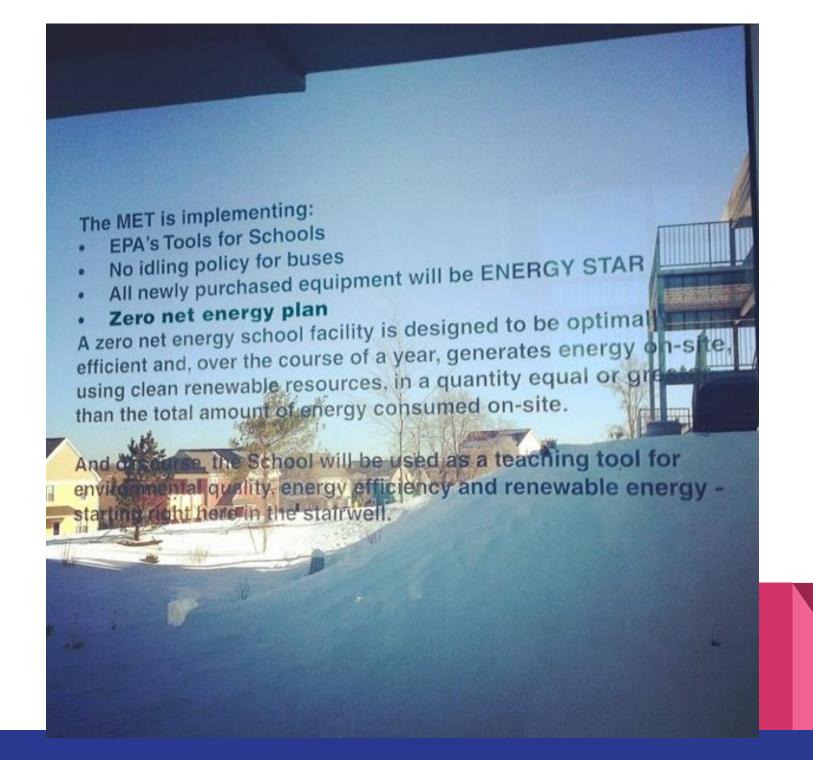
• There has to be a PLAN, whether it's phased renovation or construction planning for the school or schools and it has to show an intended end result.





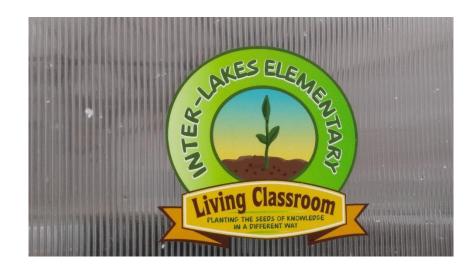
# **Educational Display**

- In the same way a demonstration on the amount of fats in a meal at "fast food " drive-ins inspired people to re-think their eating, a display in multiple locations, showing the healthy, efficient and environmentally sustainable features of the CHPS approach will inspire people.
- If they can be brought to an understanding, then supportive energy is much more likely.



# **Educational Integration**

- Reinforcing the concept by integrating Energy Efficiency, Water
   Conservation and Quality and Waste Management into the learning
   experience. Also, include teaching about the carbon footprint of the school
   operation, as well as personal impacts.
- Challenge students and staff to be innovative.





# Facility Staff & Occupant Training

- It doesn't work until people know how to make it work.
- TRAINING
- Learning time for Facility Management Folks, when receiving the facility from construction, has to be in depth and repetitive.
- Commissioning is a great value in this effort. It can ensure the O&M system works and can be operated as designed.
- Staff and students need to know and understand they are in a collaborative and smart environment.
- Everyone plays a part, i.e.: drawing the shades to shield against solar gain, when not wanted.
  - Shut lights off when room is not occupied, understanding thermostat controls.
- Conduct a survey, after occupancy, to be sure all is understood and working as it should be.

# Green Cleaning

- It is the responsibility of classroom staff and custodial maint. staff to keep all surfaces safe and clean.
- Safe for the custodians, who work with the chemicals 8 hours per day and for those who come in contact with the surfaces after the cleaning.
- If the school system has not converted yet, then "the time has come." There are good quality **green** products as effective as the good quality **non-green** products.
- Don't allow household chemicals to be brought into the school.
- MSDS

# Benchmarking Energy Use

- Once in operation, (with HVAC operating), hold a performance review meeting with: design team, facilities team, admin reps, teacher reps.
- CHPS has an online Interactive Operations Scoreboard, which compares: Year-To-Year Energy, thermal comfort, indoor air quality info and makes suggestions for improvements.
- Also:There is EPA's PORTFOLIO MANAGER, which generates a 0-100 score, using data on energy use. A score of 75 or better, compared to "like sized" schools across the U.S., qualifies for an energy star rating and percentage.
- CHPS highly recommends "recommissioning" the building (2) years AFTER construction to ensure all is performing as it should be.

# System Maint. Plan

- If followed, helps ensure that the school is to operating according to the high performance intent.
- A maintenance work order system should be put in place.
- Inventory of equipment with routine and preventative maint. Schedules.
  - Who does what operation
  - Electrical, HVAC, plumbing, life safety, communications and building envelope/roofing



# Indoor Environment Management Plan

- I.A.Q. (Indoor Air Quality)
- EPA "Tools for Schools"
  - Great guidance platform for acquiring important information of the school behavior, giving clues on follow-up.
  - NH has an electronic questionnaire, sent out annually, following up on "Tools for Schools." It is mandatory that it be completed and sent back,

#### Indoor Air Quality



Tools For Schools

# "IPM" Integrated Pest Management

- Designing of the structure should incorporate pest resistance. A CHPS guideline is provided.
- Training for people operating within the building is important. Management storage of food in classrooms, kitchen areas and locker rooms.





# **Anti-Idling Measure**

- Buses especially should be held accountable.
   Fumes and particulate matter can be pulled into the building by HVAC system.
  - · Delivery vehicles as well.
- (Side Note For New Construction): heating plant should either have tall exhaust stacks and/or be located at one end of the building away from air intakes of the building.

# Green Power Purchasing

- In today's market, it is marginally more expensive to have a green power contract.
- Well worth the public relations for a community



# Energy Star Equipment & Appliances

- Whenever possible substitute energy star units for old design energy hogs.
  - Saves on operating budgets year-to-year, which helps pass overall budgets
  - Keep a spreadsheet listing of equip ( new & old ).
  - Have a school policy on record for replacement of equipment and appliances.

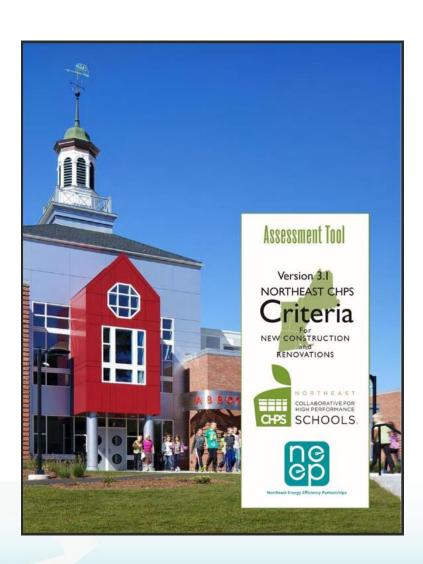
# "CMMS" Computer Maint. Management System

- Required !!! Many types are available: "stand alone" or "cloud based systems."
- Word orders for daily repair requests.
- Work orders for preventative maintenance responsibilities.
- Electronically tracked and scheduled.
- Costs and purchase order number tracking
- Old style paper work orders don't get refer as "lost in the laundry"...!





# **Indoor Environmental Quality**



#### INDOOR ENVIRONMENTAL QUALITY

#### **HVAC Design - ASHRAE 62.1**

#### Intent

Air Systems

Establish a minimum level of indoor air quality to protect student and staff health and improve performance and attendance.

EQ 1.0 – HVAC Design – ASHRAE 62.1

EQ 1.1 – Enhanced Filtration EQ 1.2 – Dedicated Outdoor Establishing a minimum level of indoor air quality positively impacts student and teacher performance, can reduce absenteeism, and avoid the potential for long and short-term health problems. All of the criteria in this category can be used to achieve excellent indoor air quality which starts during construction with proper drainage of the site, careful siting of air intakes, protecting building materials from moisture, and protecting HVAC systems from dust and debris. Implementing all the criteria in this section will provide a foundation for providing clean, breathable air in your school.

EQ 1.0 – HVAC Design – ASHRAE 62.1		Prerequisite		
		8 points		
Applicability	Verification Required			
All projects.	Design Review	Construction Review	Performance Review	

Requirement

67

# IEQ - CHPS

INDOOR ENVIRONMENTAL QUALITY	
EQ 1.0 - HVAC Design - ASHRAE 62.167	
EQ 1.1 - Enhanced Filtration	
EQ 1.2 - Dedicated Outdoor Air System	
EQ 2.0 - Pollutant & Chemical Source Control	
EQ 3.0 - Outdoor Moisture Management	
EQ 4.1 - Ducted Returns84	
EQ 5.1 - Construction Indoor Air Quality Management86	
EQ 5.2 - Construction Moisture Management	
EQ 6.1 - Post Construction Indoor Air Quality94	
EQ 7.0 - Low Emitting Materials96	
EQ 7.1 - Additional Low Emitting Materials97	
EQ 8.1 - Low Radon	
EQ 9.1 - Thermal Comfort - ASHRAE 55	
EQ 10.1 - Individual Controllability	
EQ 10.2 - Controllability of Systems	
EQ.11.0 - Daylighting: Glare Protection	
EQ 11.1 - Daylight Availability	
EQ 12.0 - Views Prerequisite	
EQ 12.1 - Additional Views	
EQ 13.1 - Electric Lighting Performance	
EQ 13.2 - Superior Electric Lighting Performance	
EQ 14.0 - Acoustical Performance	
EQ 14.1 - Enhanced Acoustical Performance	
EQ 15.1 - Low-EMF Wiring	
EQ 15.2 - Low-EMF Best Practices	
EQ 16.1 - High Intensity Fluorescent Fixtures 149	

# EQ Prereq. 1.0

### HVAC Design – ASHRAE 62.1

#### Intent

Establish a minimum level of indoor air quality to protect student and staff health and improve performance and attendance.

EQ 1.0 - HVAC Design -ASHRAE 62.1

EQ 1.1 - Enhanced Filtration

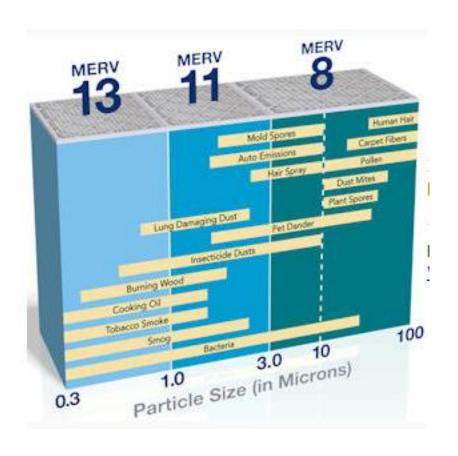
EQ 1.2 – Dedicated Outdoor Air Systems Establishing a minimum level of indoor air quality positively impacts student and teacher performance, can reduce absenteeism, and avoid the potential for long and short-term health problems. All of the criteria in this category can be used to achieve excellent indoor air quality which starts during construction with proper drainage of the site, careful siting of air intakes, protecting building materials from moisture, and protecting HVAC systems from dust and debris. Implementing all the criteria in this section will provide a foundation for providing clean, breathable air in your school.

# EQ c 1.1: Enhanced Filtration

2 points

EQ 1.1

Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 or higher.



# MERV 13



# EQc1.2 DOAS

#### Requirement

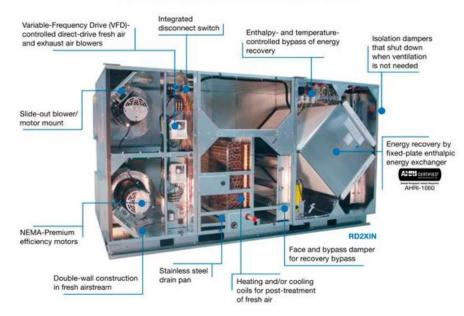
3 points

EQ 1.2 Provide a dedicated outdoor air ventilation system with the ability to efficiently process and manage ventilation down to the individual room level.

### **Energy Efficient DOAS**

(Dedicated Outdoor Air System)

#### RenewAire RD-Series



# EQ Prereq. 2.1: Pollutant and Chemical Source Control

#### Pollutant & Chemical Source Control

#### Intent

Achieve good indoor air quality to protect student and staff health and improve performance and attendance.

EQ 2.0 – Pollutant & Chemical Source Control Good indoor air quality includes proper ventilation, filtration, moisture and humidity management, and contaminate source control. This section includes an array of best practices to prevent or eliminate pollutants and chemicals releases.

- Off-gassing (Exhuast)
- Walk-off Mats
- Covered Hard Surface and Canopies
- Electric Ignition
- No Mobile Fossil-Fuel Equipment indoors
- CO Monitors
- Electronics meet EPEAT

# EQ Prereq. 3.0: Outdoor Moisture Mgmt.

#### Requirement

1 point EQ 3.0

Drainage - Design surface grades to slope away from the building and the building foundation to drain away rainwater, snowmelt, and HVAC condensate and to prevent ponding, pooling or otherwise saturating the building envelope or foundation. Rain leaders, or downspouts, must be directed to infiltration structures, on site storage, rain gardens, or daylight - provided that surface drainage moves water well away from the building and does not result in unintended ponding or pooling. HVAC systems that use evaporation drip pans for condensate removal are prohibited.

Lawn irrigation systems shall be designed to prevent spray on building walls.



# EQc4.1: Ducted Returns

 Intent: prevent dust and Microbial growth issues associated with plenum returns



# IEQc5.1: Construction IAQ Mgmt.

1 point

During construction, meet the recommended Design Approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) *IAQ Guideline for Occupied Buildings Under Construction*, 2007, Chapter 3. Include the erosion and sedimentation control measures to minimize site dust during occupied renovations.

2 points

EQ 5.1.3 Building Flush Out.

The project team shall develop a plan, and include it in the specifications to flush out the building with outdoor air (no return air) based on the requirements and recommendations in the specifications to remove indoor pollutants prior to occupancy. The information should also be detailed in



EQ 5.1.1





# IEQc5.2: Construction Moisture Mgmt.

1 point

EQ 5.2

Mold Prevention - Building materials, especially gypsum wallboard, wood, porous insulation, paper, and fabric, should be kept dry to prevent the growth of mold and bacteria. Cover these materials to prevent rain





# IEQc6.1: Post Construction IAQ

#### Intent

Improve indoor air quality by minimizing the amount of indoor pollutants that are distributed and retained by the surface materials and ventilation systems during construction.

EQ 6.1 – Post Construction Indoor Air Quality



Vacuum carpeted and soft surfaces with a certified vacuum or highefficiency particulate air (HEPA) filter vacuum that meets or exceeds the CRI Seal of Approval/Green Label Vacuum Cleaner Program after construction is complete and prior to occupancy. For phased, occupied renovations, HEPA vacuum the carpet daily in occupied areas, and in areas adjacent to those affected by construction activities.

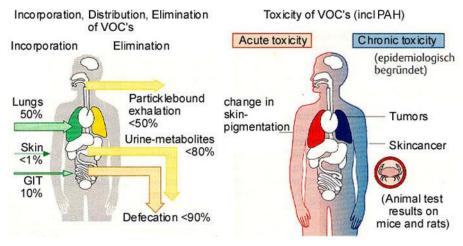
# EQ Prereq. 7.0 Low Emitting Materials

 Intent – provide classrooms with acceptably low indoor air concentrations of harmful VOCs that derive from building products and materials used

indoors

Paints and coatings

- Flooring materials
- Composite Wood
- Adhesives and Sealants
- Furniture and Furnishings
- Ceilings and Wall Systems



# EQc8.1 Low Radon

- Intent: screen for radon gas to determine whether mitigation is necessary to reduce health effects
- US EPA Tools for Schools Radon Testing
- Make necessary radon mitigations if radon air concentrations equal or exceed 4 pCi/L

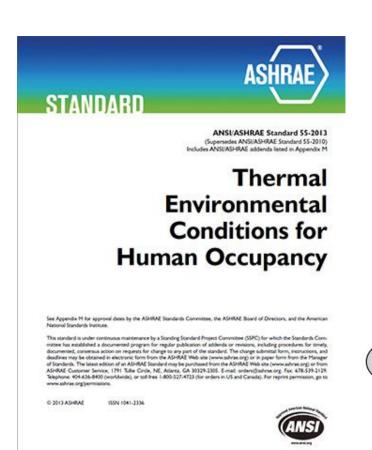


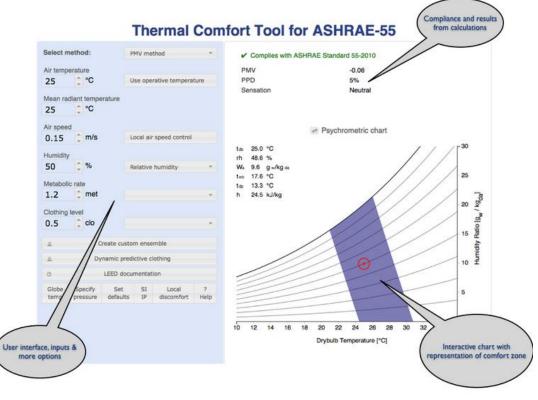
# IEQc9.1: Thermal Comfort – ASHRAE 55

4 points

EQ 9.1

Comply with the current ASHRAE *Standard 55* for thermal comfort standards.





http://comfort.cbe.berkeley.edu/

# IEQc10.1: Individual Controllability

#### Intent

Enable teachers to have reasonable control of the thermal environment within their classrooms.

# EQ 10.1– Individual Controllability



1 point EQ 10.1 Provide an individual temperature control for each classroom with an independent temperature sensor.

# IEQc10.2: Controllability of Systems

1 point

EQ 10.2

Ninety percent (90%) for new schools and new school buildings, and seventy five percent (75%) for major renovations, of all classrooms shall have a minimum of one operable window per classroom that is reasonably accessible to the occupants. This precludes the use of ladders to adjust the window opening.

Provide a temperature control device that can be locally adjusted to the conditions in the individual classroom.





# EQ Prereq. 11.0: Daylighting: Glare Protection

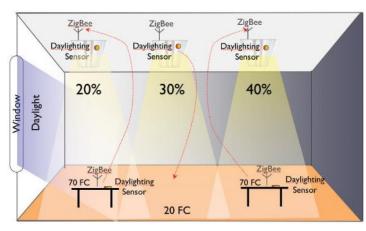
 Intent: provide daylighting in classrooms to enhance student performance, to improve student productivity through quality daylighting designs that minimize glare and direct sunlight penetration and ensure energy savings.



- No direct sun at work surface plane located 4' or more from exterior wall (9-3)
- OR max illuminance to avg illuminance ratio can't exceed 15

# EQc11.1: Daylight Availability

• 1-3 points:



- Multiple Point in Time Approach including daylight responsive lighting controls AND
- 1 pt = over 20 fc annual avg illuminance for over 75% of classroom area
- 2 pt = over 35 fc annual avg illuminance for over 75% of classroom area
- 3 pt = over 50 fc annual avg illuminance for over 75% of classroom area

# EQ Prereq. 12.0: Views

Intent: provide connection between indoor spaces and outdoor environment through sunlight and views into the occupied areas

- Direct line of sight to view glazing from 70% of the floor area of classrooms, library and admin
- Glazing area is equal or greater than 7% of floor area, transparent but not translucent, above 2.5 ft below 7.5 ft and total width of view windows
  - greater than 1% of floor area
- 80%- additional point
- 90%- additional point

# EQc13.1: Electric Lighting Performance

 Intent: Integrate hp lighting with daylighting to promote health and wellbeing of occupants while maximizing energy efficiency. Provide high quality and flexible classroom lighting with teacher controls tailored to new teaching methods.



- LED lights
- Color Rendering Index of 80 or greater
- RoHS compliant lights
- Teacher control of general CR, AV mode, white board control, manual override
- Minimial "flicker"
- Minimum levels of initial light output after 50,000 hours

# EQ Prereq. 14.0: Acoustical Performance

Intent: provide classrooms with adequate acoustical environments:

- Follow ANSI/ASA Standard S12.60-2010/Part 1 Section 3
- Standard lists maximum allowed reverberation times, total background noise allowed
- Noise isolation design requirements (outdoor to indoor, indoor to indoor airborne
- Wall to wall, floor to ceiling, doors, mechanical equipment
- Structure-bourne impact sound isolation
- Classroom audio distribution systems



- Provide inter-classroom workspaces, small and large group rooms
- Performing Arts spaces include audio recording studio and control rooms, drama classrooms and theaters
- Large Assembly spaces include MPR
- Confidential speech privacy rooms

# IEQc15.1: Low-EMF Wiring

1 point

EQ 15.1

No net current magnetic fields - Correct school wiring

#### Intent

Minimize exposure to extremely low frequency (ELF) magnetic fields.

#### EQ 15.1 – Low-EMF Wiring

The wiring in all school rooms shall be compliant with the currently adopted US National Electrical Code (NEC) in the local jurisdiction, and applicable state electrical code

All school rooms shall be free of the following common wiring errors:

- a. Improperly wired subpanels (neutral-to-ground bond);
- b. Incorrect three-way switch wiring;
- Incorrect wiring of switched outlet circuits;
- Neutrals from separate branch circuits that are connected anywhere beyond the panel of origin for the circuits;
- e. Neutral-ground shorts (intentional or inadvertent) anywhere in the system.

The correctness of the wiring shall be checked in each room and the ELF magnetic field exposure measured levels (tRMS) comply with 1 mG (100 nT) in new construction and 2 mG (200 nT) in existing school renovations, see the Austrian Sustainability Building Council (2009) – Total Quality Building Assessment Rating System as shown in Table 6 below.

# IEQc15.2: Low-EMF Best Practices

OR
1 point

EQ 15.2.1

Low EMF Best Practices for Computers

OR
1 point

EQ 15.2.2

Wired local area network (LAN) to reduce RF EMF

• Install a wired local area network (LAN) for Internet access

OR

**OR** 1 point

EQ 15.2.3

Wired Phones to reduce RF EMF in classroom

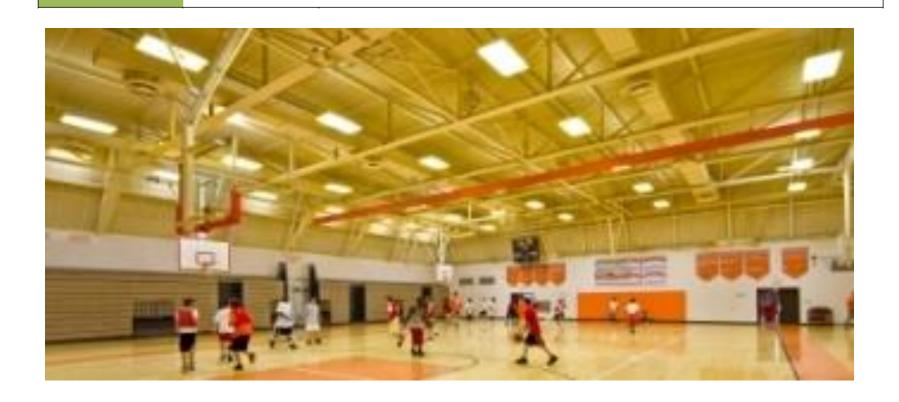
 Install easily accessible hard-wired phones for teacher and student use and prohibit installation and use of standard DECT cordless phones and cordless phones operating at

# IEQc16.1: High Intensity Fluorescent Fixtures

1 point

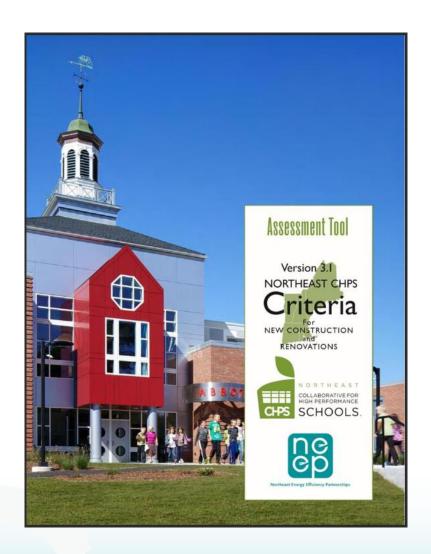
EQ 16.1

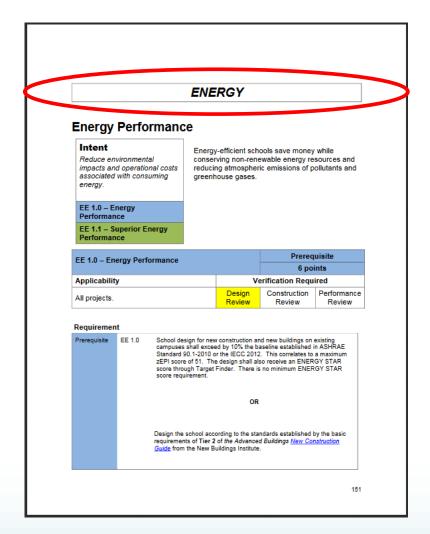
Install high intensity fluorescent lighting fixtures instead of HID fixtures in the gymnasium and other high ceiling areas.





# **Energy**





# **ENERGY**

Bill Root, PE, HBDP, LEED AP GWR Engineering, PC

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# SCORECARD

#### Project Scorecard: NE-CHPS Version 3.1

Use this scorecard to track expected scores. Note that prerequisites have points associated with them even though they are required. This enables project teams to talk more meaningfully about the effort

being put into each section of the Criteria. Prerequisite point columns are also highlighted for reference. Mark each credit as ready for review by using the appropriate column for each phase of the review. Key: P - Prerequisite; PS - CHPS Plan Sheet Required; CD - Construction Documents Required; A - Attachment Required **Construction Review** Construction Review Performance Review Performance Review Points Targeted Ready for Design Points Possible Requirements Requirements Design Review Requirements Ready for Responsible Criteria Title **Documentation** 250 Total Energy CD EE 1.0 **Energy Performance** 6 CD A 40 EE 1.1 Superior Energy Performance CD EE 2.1 3 Zero Net Energy Capable CD EE 3.0 Commissioning 4 EE 3.1 Additional Commissioning Qualifications 1 CD EE 3.2 **Building Envelope Commissioning** 1 CD EE 3.3 CD **Enhanced Commissioning** CD EE 4.0 **Enviornmentally Preferable Refrigerants** EE 5.1 2 CD **Energy Management System** EE 5.2 Advanced Energy Management System and Submetering 2 CD PS CD EE 6.1 Natural Ventilation and Energy Conservation Interlocks 2 Α Α EE 7.0 Local Energy Efficiency Incentive and Assistance 2 EE 8.1 Variable Air Volume Systems 1 CD EE 9.1 1 CD Renewable Energy Performance Monitoring Α EE 10.1 Electric Vehicle Charging 1 CD Α Subtotal

Energy			
EE 1.0 Energy Performance		Р	6
EE 1.1 Superior Energy Performance			40
EE 2.1 Zero Net Energy Capable			3
EE 3.0 Commissioning		P	4
EE 3.1 Additional Commissioning Qualifications			1
EE 3.2 Building Envelope Commissioning			1
EE 3.3 Enhanced Commissioning			1
EE 4.0 Enviornmentally Preferable Refrigerants		Р	1
EE 5.1 Energy Management System	,		2
EE 5.2 Advanced Energy Management System and Submetering			2
EE 6.1 Natural Ventilation and Energy Conservation Interlocks			2
EE 7.0 Local Energy Efficiency Incentive and Assistance		Р	2
EE 8.1 Variable Air Volume Systems	·		1
EE 9.1 Renewable Energy Performance Monitoring			1
EE 10.1 Electric Vehicle Charging			1
Su	btotal		

# PREREQUISITES – 13 POINTS

EE 1.0 – ENERGY PERFORMANCE

EE 2.0 – COMMISSIONING (Cx)

EE 3.0 — ENVIRONMENTALLY PREFERABLE REFRIGERANTS

EE 4.0 – LOCAL EE INCENTIVES & ASSISTANCE

## **Energy Performance**

#### Intent

Reduce environmental impacts and operational costs associated with consuming energy.

Energy-efficient schools save money while conserving non-renewable energy resources and reducing atmospheric emissions of pollutants and greenhouse gases.

#### EE 1.0 – Energy Performance

#### Requirement

#### Prerequisite

EE 1.0

School design for new construction and new buildings on existing campuses shall exceed by 10% the baseline established in ASHRAE Standard 90.1-2010 or the IECC 2012. This correlates to a maximum zEPI score of 51. The design shall also receive an ENERGY STAR score through Target Finder. There is no minimum ENERGY STAR score requirement.

OR

Design the school according to the standards established by the basic requirements of **Tier 2** of the Advanced Buildings <u>New Construction</u> <u>Guide</u> from the New Buildings Institute.

# MAX zEPI SCORE = 51 KBTU/SF/YR

2003 CBECS<sup>1</sup> Weighted Mean Energy Use Intensities<sup>2</sup> by Subsector and Climate Zone<sup>3,4</sup>: IP Units kBtu/ft<sup>2</sup>.yr

		Climate Zones													
Subsectors	All	1A	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	6A	6B	7
All	90	74	72	114	89	70	62	95	108	88	104	87	89	97	71
Office/professional	93	42	82	72	88	70	58	97	143	95	107	66	110	114	68
Nonrefrigerated warehouse	42	22	16		22	21	20	39	29	37	79	60	37	58	33
Education	83	52	73	160	62	74	105	102	38	58	87	79	90	90	84
Retail (except malls)	74	61	93	129	60	50	31	65	100		88	80	93	97	102
Public assembly	94	75	60		112	48	45	110	44	249	103	97	88	102	97
Service	77	60	53		49	61	27	82	83		80	101	88	99	65
Religious worship	44		31		28	31		47	58		52	39	53	34	
Lodging	94	81	91		98	57		92	264	545	89	65	108	93	68
Food services	258	393	208		423	393	82	234		260	258	228	203	238	192
Inpatient health care	249	200	248	360	205	257	204	248	163		294	245	240	235	258
Public order and safety	118		91		160	79		129			108	94	126	148	
Food sales	200		168		212	183	120	242			203	147	242		199
Outpatient health care	95	19	77		55	108		70	190		111	120	112	91	168
Vacant	21		4	47	4	6	0	40	3	60	21	93	22		55
Other	79		48		100	175		71	26		94	92	69	85	57
Skilled nursing	125		71		84	85		148			148	153	118	134	
Laboratory	305				242	170		600			370		268	115	
Refrigerated warehouse	99							120			68	51	62		

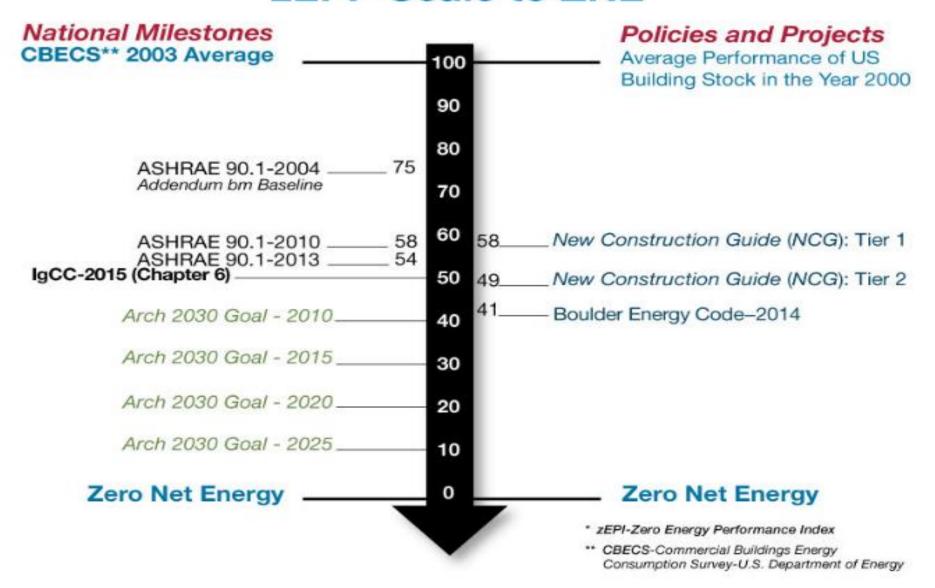
Data source is 2003 CBECS public use microdata.
 Values are mean EUIs weighted by floor area.
 Climate zones are defined in ANSI/ASHRAE/IESNA Standard 169-2006.
 Climate zones with no data had no samples in 2003 CBECS. For missing climate zones, use EUIs for the most similar climate zone (e.g. zone 7 for 8 or zone 2A



#### U.S. National Median Reference Values for All Portfolio Manager Property Types

Broad Category	Primary Function	Further Breakdown (where needed)	Source EUI (kBtu/ft²)	Site EUI (kBtu/ft²)	Reference Data Source - Peer Group Comparison
Banking/Financial	ncial Bank Branch *			87.0	CBECS - Bank/Financial
Services	Financial Office*		148.1	67.3	CBECS - Office & Bank/Financial
	Adult Education		141.4	59.6	CBECS - Education
	College/University		262.6	130.7	CBECS - College/University
Education	K-12 School*		141.4	58.2	CBECS - Elementary/Middle & High School
	Pre-school/Daycare		145.7	70.9	CBECS - Preschool
	Vocational School		141.4	59.6	CBECS - Education
	Other - Education		141.4	09.0	ODEO2 - Education

#### zEPI\* Scale to ZNE



EE 1.1 – Superior E	nergy Performance
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#### Credit

#### 40 points

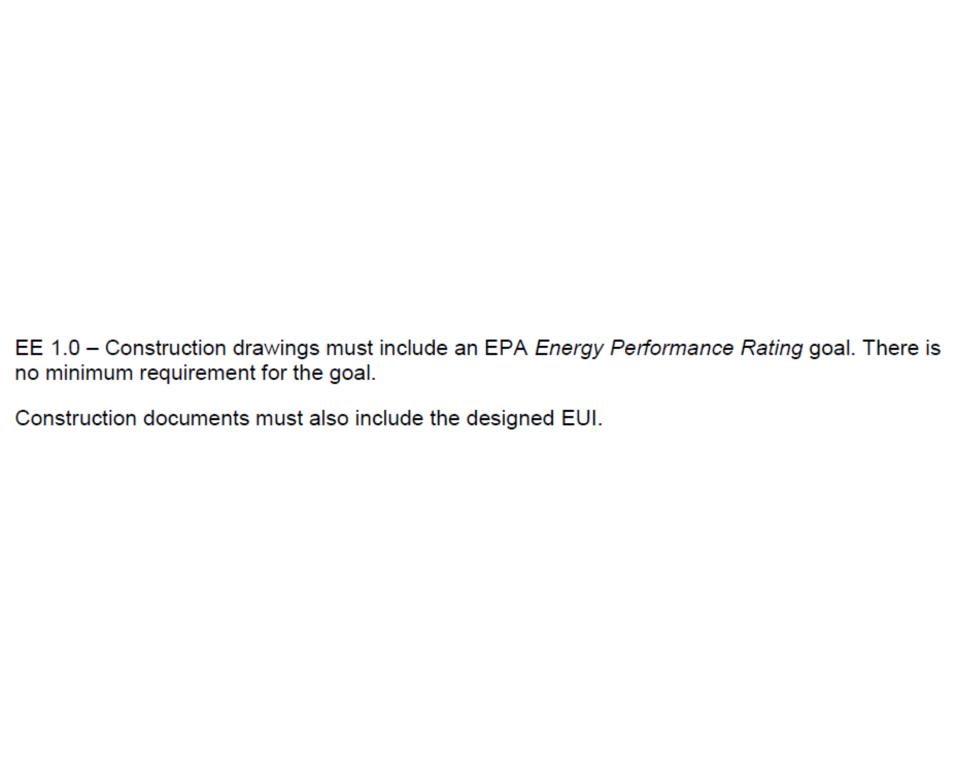
30 points

EE 1.1 Utilize the protocol in Energy EE 1.0 for quantifying reductions in total energy use. Points are awarded according the percentage saved over a baseline building. Projects may optionally use the Zero Energy Performance Index (zEPI), which provides a more stable benchmark that will not vary with future code updates.

Points	Reduction Requirement	zEPI Equivalent
Prerequisite	10% minimum reduction	51
9 Points*	15% minimum reduction	49
12 points	20% minimum reduction	46
18 points	30% minimum reduction	40
22 points	40% minimum reduction	34
25 points	50% minimum reduction	29
28 points	60% minimum reduction	23
31 points	70% minimum reduction	17
34 points	80% minimum reduction	11
37 points	90% minimum reduction	6
40 points	100% minimum reduction (zero net-energy school)	0

Interpolation between the values in the above table is permitted.

Projects may not achieve more than 18 points unless they can demonstrate that their designed EUI is less than or equal to 40 kBtu/sq.ft.



## Zero Net Energy (ZNE) Capable

#### Intent

Further acknowledge the school to produce as much energy as it consumes on an annual basis.

EE 2.1 – Zero Net Energy Capable This criterion provides a bonus on the Superior Energy scale (EE.1) for schools that are designed to achieve zero net-energy or are capable of achieving zero net-energy.

EE 2.1 – Zero Net Energy Capable	Credit
<b></b>	3 points

EE 2.1.1 Zero Net-Energy Capable. A complete design of a PV system that will provide 100% of the annual electric energy needs and operate an average efficiency of at least 80% of the optimal for your location as determined by the US DOE's PVWatts program. The roof-top PV arrays must cover at least 65% (unless a smaller area is needed to provide full capacity) of the total roof area (the remainder of the PV can be located on parking covers or free-standing mounting structures). Other solutions

The complete PV system can be installed with:

may be considered on a case by case basis.

- No structural modification to the roof to accommodate 5 lbs. per sq. ft. additional weight.
- No additional roof or wall penetrations are need for electrical wiring.
- No physical expansion of electrical or mechanical rooms to accommodate the inverter(s) and other electrical system components.

The project must have a projected annual site EUI of 40 kBtu per square foot to qualify for these credits.

OR

EE 2.1.2 Zero Net-Energy. Show through the energy modeling required for EE 1.0 that on-site renewable energy systems produce as much energy on an annual basis as is used by sum of all the building systems. Project is eligible for two (2) innovation points from II 10.1.

The project must have a projected annual site EUI of 40 kBtu per square foot to qualify for these credits.

## Commissioning

#### Intent

Verify that building elements and systems are designed, installed, and calibrated to operate as intended, and provide for the ongoing accountability and optimization of building energy performance over time

#### EE 3.0 – Commissioning

EE 3.1 – Additional Commissioning Qualifications

EE 3.2– Building Envelope Commissioning

EE 3.3 – Enhanced Commissioning

Commissioning is vitally important to the performance of the school and are the keys to achieving and maintaining energy efficiency. Commissioning involves a rigorous quality assurance program that ensures the building and its systems are built and operated as designed and that the school district receives the proper training and documentation needed to operate and maintain the building. No building can perform optimally without adequate maintenance.

Buildings, even simple structures, are complex systems of electrical, mechanical, and structural components. High performance buildings are healthy, efficient, environmentally sensitive structures whose performance can be significantly affected if the building has not been designed following the owner's project requirements or constructed according to the designers' specifications. Commissioning is a rigorous quality assurance program administered by a knowledgeable third party that ensures the building performs as expected.

#### Prerequisite

EE 3.0 ALL of the fundamental best practice commissioning procedures must be implemented:

Engage an independent, third-party commissioning agent (CxA). The commissioning agent will be responsible for commissioning the following critical building systems:

#### Electrical Systems:

- Lighting systems and controls (daylight, occupancy, timing switches, etc.);
- On-site renewable solar electric or wind systems

#### Mechanical Systems:

- HVAC systems (such as hot water systems, chilled water systems, central air systems, ventilation systems);
- Energy management system
- Renewable energy heating systems
- Central plant systems in existing schools if they will serve new HVAC work and if they have not been commissioned or retrocommissioned within five years of submitting the project for review

#### Plumbing Systems:

- Flow control devices
- Pumping systems
- Special hazardous waste treatment systems (e.g. for lab wastes)
- Domestic hot water systems
- Graywater systems (if applicable)

The commissioning scope of services shall include:

- Review Owners Project Requirements (OPR) (formerly known as Design Intent documentation) and Basis of Design (BOD) documentation.
- Conduct a focused review of the design prior to the construction documents phase.
- Conduct a focused review of the construction documents when close to completion.
- Include commissioning requirements in the construction documents.
- Develop and utilize a commissioning plan.
- Conduct a selective review of contractor submittals of commissioned equipment.
- Review the Operations & Maintenance manual.
- Verify installation, functional performance testing (including off-season testing), training, and operations and maintenance documentation. A minimum 20% sampling strategy for testing terminal units and repetitive units is permissible. All major systems must be tested.
- Participate in training of facility staff in accordance with the training plan (OM.1).
- Complete a commissioning report.
- Conduct a 10-month warranty, post-occupancy review.

Commissioning efforts in this prerequisite shall be coordinated with commissioning requirements in WE 6.0 – Irrigation Commissioning.

# OPR can just focus on what is to be commissioned.

- ✓ Be Specific
- ✓ Make it Quantitative
- ✓ Focus on GOALS

# OPR IS A TOOL TO USE!

# SPECIFIC & MEASURABLE!!!!

## **VERY POOR EXAMPLE:**

✓ Minimize energy use.

# **GOOD EXAMPLE:**

✓ Building to achieve **EUI** < <u>26.4</u> kbtu/sf/yr

1 point	EE 3.1	The commissioning authority responsible for commissioning is a licensed architect or engineer with at least two years' experience in the state when he/she practices.
---------	--------	---

This criterion is intended to allow project managers to think beyond the typical scope of a commissioning authority, into other useful system testing.

EE 3.2 – Building Envelope Commission	Credit 1 point			
Applicability	Verification			
All projects.	Design Review	Construction Review	Performance Review	

This full scope of commissioning applies to a new school. For major renovations and a new building on an existing campus this commissioning scope is required based on the scope of the project. The scope of commissioning services for major renovations will depend on the whether the building envelope is being upgraded.

#### Requirement

1 point	EE 3.2	Commission the building(s) envelope using the National Institute of Building Sciences (NIBS) Guideline 3 or using an equivalent approach. The commissioning authority shall be a licensed architect or engineer with at least two years of building envelope commissioning experience in the state where s/he practices.
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Fog curling out from behind the steel I-beam.



The ZIP sheathing can be spray foamed to the steel plate from the outside to connect the roof AVB to the ZIP sheathing. Kit foam would be best for this small application.

1 point  EE 3.3 In addition to the prerequisite requirements, perform first-year optimization of the building systems and develop a systems manual.	EE 3.3 – Enhanced Commissioning			Credit
				1 point
	1 point	EE 3.3		• • • • • • • • • • • • • • • • • • • •

## **Environmental Preferable Refrigerants**

#### Intent

Reduce the ozone layer impact and global warming contribution of refrigerants.

EE 4.0 – Environmental Preferable Refrigerants

Because many refrigerants in use today have been found to adversely affect the ozone layer and contribute to the accumulation of atmospheric greenhouse gasses, this criterion requires the use of environmentally preferable refrigerants in Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC&R) systems.

EE 4.0 – Environmental Preferable Refrigerants	Prerequisite
g	1 point

#### Requirement

1 point	EE 4.0	Use no CFC or HCFC based refrigerants in building Heating, Ventilating, Air Conditioning, & Refrigeration (HVAC&R) systems.
		HFC refrigerants are allowed and preference should be given to low GWP refrigerants.
		Existing HVAC equipment in renovation projects are exempt from this requirement if any non-compliant equipment was installed within the last 10 years.

# **Energy Management System**

#### Intent

Provide control, accountability, and optimization of building energy performance.

EE 5.1 – Energy Management System

EE 5.2 – Advance Energy Management System and Submetering Energy Management Systems (EMS), lighting control and metering are important systems for controlling, monitoring and understanding patterns of energy use in schools.

The prerequisite requires a base level EMS system to be installed, whereas EE 5.2 gives points for a more advanced system.



EE 5.1 - Energy Management System

2 points

#### EE 5.1

2 points

Install a base level energy management system (EMS) to control the operating schedule of HVAC systems throughout the building including terminal units, packaged units, air handling units, make-up air units, centralized hydronic heating and cooling systems, pumps, and fans including fume hoods. Fractional horsepower fans, fractional horsepower pumps and units providing air conditioning to spaces requiring continuous 24/7 cooling such as computer server rooms, network equipment rooms, or walk-in refrigerators and freezers are excluded. The base level EMS shall provide the following energy saving features:

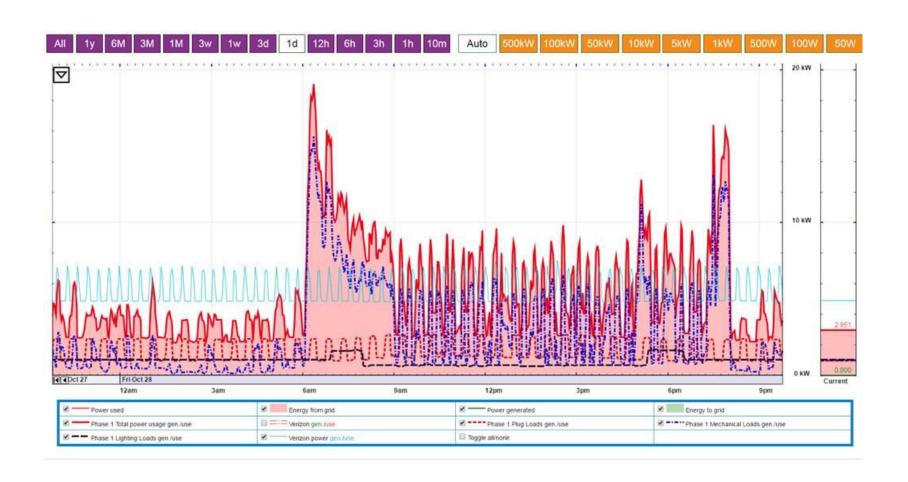
EE 5.2 – Advanced Energy Management System and Submetering		Credit 2 points	
EE 5.2.2	Data Acquisition and Storage. Install storage system for all electrical power system can use the main utility meter supplied sub-meter provided that all electrical powers.	r used within the building. The as a data source or an owner	

building is recorded. Data from the system shall at a minimum recor

# EE 5.2 – Advanced Energy Management System and Submetering

Credit

### 2 points



# Natural Ventilation & Energy Conservation Interlocks

### Intent

Provide a bonus for school designs that incorporate natural ventilation and an incentive to install interlocks on doors and windows.

EE 6.1 – Natural Ventilation & Energy Conservation Interlocks Natural ventilation is an effective energy design strategy for schools in many climates. Natural ventilation is already credited in the Superior Energy Performance criterion (EE 1.1) and this criterion offers additional bonus points when the strategy is employed.

EE 6.1 – Natural Ventilation & Energy Conservation	Credit
Interlocks	2 points

	,	•
2 points	EE 6.1.1	Design schools such that at least 90% of the classrooms are designed to provide comfort conditions with no mechanical cooling according to the comfort conditions defined in ASHRAE Standard 55-2010.
		Naturally ventilated classrooms (with no mechanical cooling) shall meet the classroom ventilation requirements of ASHRAE Standard 62.1-2010 § 5.1 or demonstrate that engineered natural ventilation systems satisfy the requirements.
	EE 6.1.2	For hybrid systems that use natural ventilation is combination with mechanical cooling, Install interlocks, or an equivalent mechanism, to prevent heating and cooling equipment from operating when exterior windows or doors are open.

EE 7.0 - Local Energy Efficiency Incentives and	
Assistance	

Prerequisite

2 points

# Local Energy Efficiency Incentives and Assistance

### Intent

Require participation in local energy efficiency incentives and technical assistance programs.

EE 7.0 – Local Energy Efficiency Incentives and Assistance Virtually every utility customer in the Northeast region is eligible to participate in at least one, and typically several, energy efficiency programs. The programs offer either technical assistance or incentives for efficient equipment and practices. Many programs offer both technical assistance and financial incentives for the installation of efficient equipment and the incorporation of efficient design practices

2 points

EE 7.0

Participate in energy efficiency incentive and technical assistance programs that are available through applicable utility and governmental programs.

### EE 8.1 – Variable Air Volume Systems

# Variable Air Volume Systems

### Intent

Install a VAV system to ensure exceptional access to fresh air.

School buildings require abundant amounts of fresh air in order to maintain indoor air quality. If the air volume is not carefully controlled, energy will be wasted needlessly conditioning excess fresh air.

EE 8.1 – Variable Air Volume Systems	Credit
	1 points

1 points EE 8.1 Install a VAV system with variable speed drives on appropriate fans motors. Control air volume in response to indoor air quality needs
--

# EE 9.1 – Renewable Energy Performance Monitoring

# Renewable Energy Performance Monitoring

### Intent

Monitor the performance of renewable energy systems and publicly display results online.

Renewable energy systems are significant investments for schools. Ensure that they are performing as expected by specifically monitoring their performance. Displaying the results online helps drive accountability and improve community engagement in the school.

EE 9.1 – R	Renewable E	Credit		
			1 point	
1 points	EE 9.1		stem that monitors installed on-site isplays the results on a Web site	













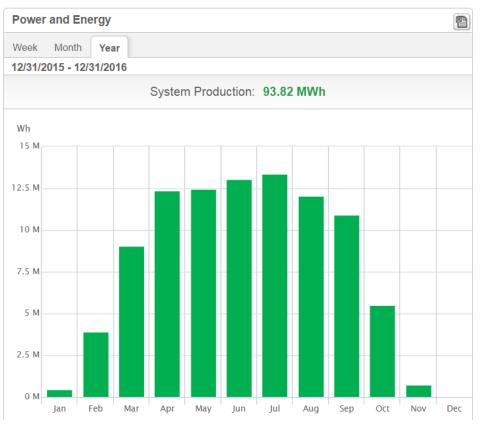


Choose a site (insert at least 3 letters to search):

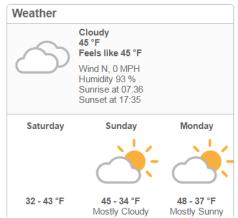
VPR Vermont Public Radio



Overview Energy today Energy this month **Current Power** Lifetime energy Lifetime revenue 0 W 40.26 kWh 728.6 kWh 93.98 MWh \$18,763.42







# **Electric Vehicle Charging**

### Intent

Provide electric vehicle supply equipment to support electric vehicle charging.

Electric vehicles have rapidly gained popularity in the Northeast and throughout the country. Infrastructure to charge and support electric vehicles is still developing. This credit incentivises projects to provide charging stations at schools to further encourage the adoption of electric vehicles.

EE 10.1 – Electric Vehicle Charging			Credit
			1 point
1 point EE	parking these s spaces addition	g spaces used spaces for the s s that include E	cle supply equipment (EVSE) in 2% of all by the project. Clearly identify and reserve sole use by plug-in electric vehicles. Parking VSE must be provided separate from and in parking spaces for green vehicles.

# EE 10.1– Electric Vehicle Charging

**ALL PRODUCTS** ~ □ CART Enter keyword, item, model or replacement part number. **SEARCH** BULK ORDER PAD 💙 PRINT Fleet and Vehicle Maintenance | Automotive Maintenance Tools 

| Electric Vehicle Charging Stations | **ELECTRIC VEHICLE CHARGING STATIONS** FILTER RESULTS BY 3 Results Found that Include 35 Products Search within these results How can we improve the Search Experience? GO Top Sellers Sort results by: View Previously Purchased Products Only **BRANCH AVAILABILITY** Select a pickup branch to see products in stock now. VOLTAGE Level 2 - Commercial Charging Stations 95 to 264VAC (1) 208 to 240VAC (33) These commercial charging stations are designed for charging electric vehicles. They feature a durable design for daily, all-season, outdoor use. 240VAC (1) **Brands** BOSCH, GENERAL ELECTRIC, LEVITON and SCHNEIDER ELECTRIC **AMPS** 16 (1) 30 (31) Number of Price Voltage -Cable Length Mount Type Brand Item # Amps Connec... 40 (3) 208 to 240VAC 12 ft. Wall/Pedestal BOSCH 16 36VZ38 \$766.50 /Each NUMBER OF CONNECTORS GENERAL 208 to 240VAC 30 16 ft. 1 Wall 14A021 \$1,796.45 /Each ELECTRIC SCHNFIDER 1 (26) 208 to 240VAC 30 18 ft. Pedestal 11X296 \$2,642.00 /Each ELECTRIC 2 (9) SCHNFIDER 208 to 240VAC 18 ft. Pedestal 30 39WD74 \$7,519.00 /Each ELECTRIC SCHNEIDER **CABLE LENGTH** 208 to 240VAC 18 ft. Pedestal 39WD75 30 \$6,414.00 /Each ELECTRIC SCHNEIDER 208 to 240VAC 18 ft. Pedestal 30 1 11X298 \$3,261.00 /Each 12 ft. (1) ELECTRIC SCHNEIDER 15 ft. (3) 208 to 240VAC 18 ft. Wall 28DU25 30 \$1,579.00 /Each ELECTRIC 16 ft. (1) SCHNEIDER 208 to 240VAC 30 18 ft. Wall 11X294 \$1,957.00 /Each ELECTRIC 10 # (10)

# Warm & fuzzy feeling?



# Heating Options - Fuels

- Fuel Oil: UST; 86% max AFUE
- Natural Gas If Available
- LP Up to 94% AFUE, Direct vent
- Wood Chip Cost effective > 30K sf
- Pellets Small School Option
- Geothermal Need full Htg-Clg Load
- ASHP

# Vermont Fuel Price Report

October 2016

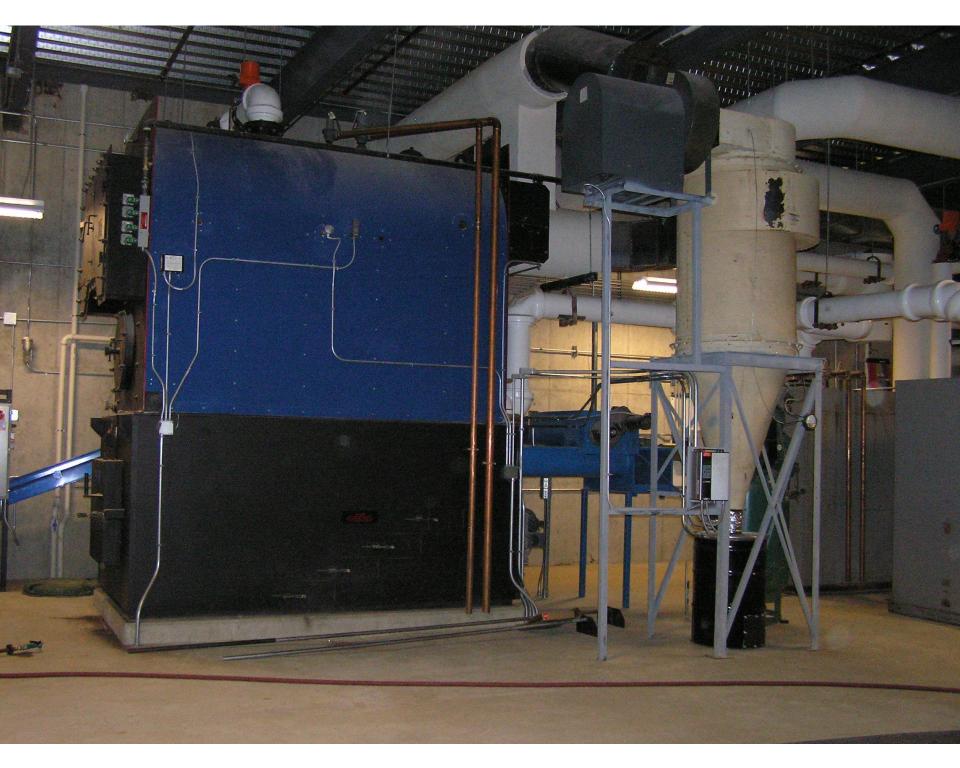
### Comparing the Cost of Heating Fuels

Type of Energy	BTU/unit	Typical Efficiency	\$/unit	\$/MMBtu	High Efficiency	\$/MMBtu
Fuel Oil, gallon	138,200	80%	\$2.10	\$18.95	95%	\$15.96
Kerosene,	136,600	80%	\$2.67	\$24.40		
Propane, gallon	91,600	80%	\$2.27	\$30.96	95%	\$26.07
Natural Gas, Ccf	100,000	80%	\$1.41	\$17.67 *	95%	\$14.88
Electricity, kWh (resistive)	3,412	100%	\$0.15	\$43.46		
Electricity, kWh (heat pump)	3,412		\$0.15	#	240%	\$18.32
Wood, cord (green)	22,000,000	60%	\$227	\$17.21 ^		
Pellets, ton	16,400,000	80%	\$278	\$21.18 ^		

<sup>\*</sup> Natural Gas price is based on VGS residential rate effective Aug 5th, 2016.

 $<sup>\</sup>hbox{\# see October 2015 Fuel Price Report for discussion of heat pump coefficient of performance } \\$ 

 $<sup>^{\</sup>land} \text{Cord Wood price updated 8/2015 from small survey sample. Pellet price updated } 10/2016 \text{ from small survey sample}$ 





# **Enjoy Lunch Sponsored By...**

# SIEMENS Ingenuity for life

Please remember to recycle.

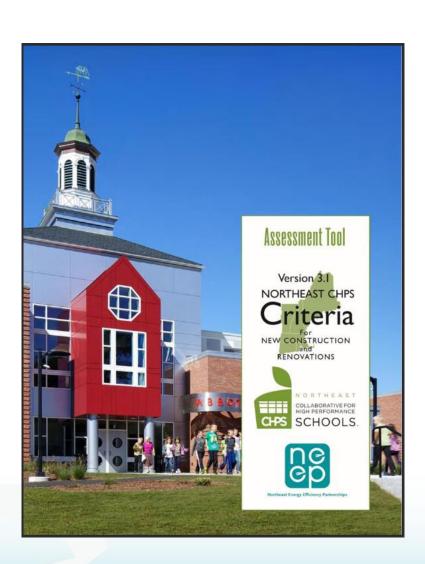


# **Featured School Projects Part Two**





# **Engaging with your Utility**



### Local Energy Efficiency Incentives and Assistance

### Intent

Require participation in local energy efficiency incentives and technical assistance programs.

EE 7.0 – Local Energy Efficiency Incentives and Assistance Virtually every utility customer in the Northeast region is eligible to participate in at least one, and typically several, energy efficiency programs. The programs offer either technical assistance or incentives for efficient equipment and practices. Many programs offer both technical assistance and financial incentives for the installation of efficient equipment and the incorporation of efficient design practices

EE 7.0 – Local Energy Efficiency Incentives and Assistance		Prerequisite		
		2 points		
Applicability	Verification Required			
This criterion applies to all projects.	Design Review	Construction Review	Performance Review	

### Requirement

### Implementation

Virtually every utility oustomer in the Northeast region is eligible to participate in at least one, and typically several, energy efficiency programs. The programs offer either technical assistance or incentives for efficient equipment and practices. Many programs offer both technical assistance and financial incentives for the installation of efficient equipment and the incorporation of efficient design practices.

In addition to utility and state government operated programs, the Federal Government offers a tax credit program that will allow the designers of energy efficient buildings to apply for a tax credit to help offset the c

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# NH High Performance School Summit: Partnering With Your Utility

November 9, 2016

Joseph Lajewski
Program Administrator,
New Hampshire Electric Cooperative













# What is NHSAVES?

NHSAVES is a collaboration of the 4 Electric and 2 Gas utilities in NH

- The programs are designed assist with the identification and implementation of energy efficiency measures
- There are no NHSAVES offices or employees, each utility administers the program to their customers









# Why are these programs important?

- Efficiency vs. Conservation
- •Influence the purchase and installation of efficient technology
  - Technical review
  - Identifies efficiency opportunities
  - Assist in the capital budgeting process
  - ·Create a multi-year plan
- •Demand reduction which allows for growth without increased capacity
  - •The least expensive kilowatt is the one you don't buy. Efficiency ~ \$0.05 kWh



# Incentives/Rebates:



75%-100% incremental cost new construction/ end of life equipment

Lighting technologies
Refrigeration
Variable Frequency Drives (VFDs)
Chillers



35%-50% installed cost for a retrofit existing equipment

Occupancy sensors
Energy-efficient motors
HVAC equipment and controls
Compressed Air

Custom projects that have documented kWh savings

# On-Bill Financing:

- Available to Municipalities for retrofit projects
- Allows for project implementation with NO out of pocket expense
- Project is repaid through charge on Utility bill
- Low to No cost interest
- Financing is designed to be a cashflow-neutral or
  - cashflow-positive transaction



# Getting project qualified



Contact utility in the beginning of the process before plans are set

They can review programs and process to help lead

you to success

 Ensure equipment meets qualification criteria

 Reserve funding to ensure it is available for your project



# Case studies: Interlakes School District



# Case studies: Shaker Regional School District



# Case studies: Plainfield Elementary School





Utility	Phone	Website
<b>EVERSURCE</b>	(866) 554–6025	www.eversource.com
Liberty Utilities	(603) 595–2304	www.libertyutilities.com
NEW HAMPSHIRE Electric Co-op  A Touchstone Energy Cooperative	(800) 698–2007	www.nhec.com
<b>S</b> Unitil	(603) 294–5121	www.unitil.com

www.nhsaves.com/save-work



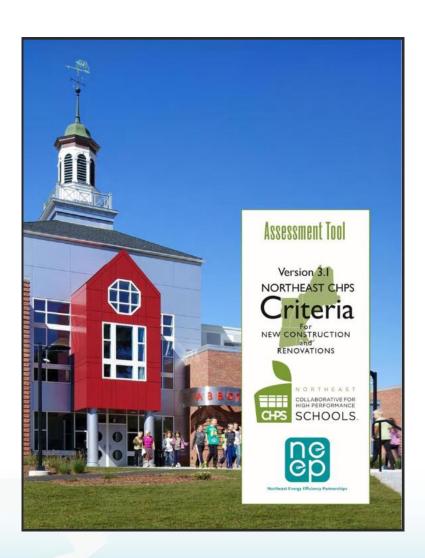


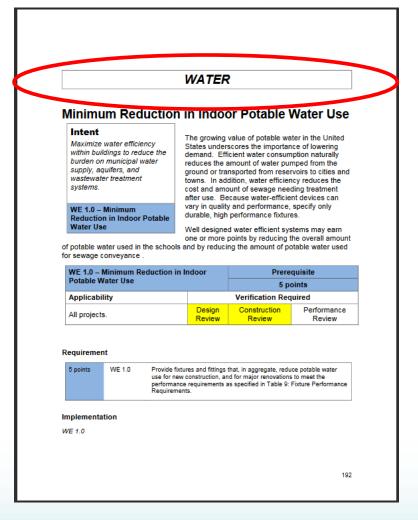
Joseph Lajewski
Energy Solutions Program Administrator
New Hampshire Electric Cooperative, Inc.
579 Tenney Mountain Highway
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Phone (603)536-8663
Cell (603)998-7480
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Joseph Lajewski 2016



## Water



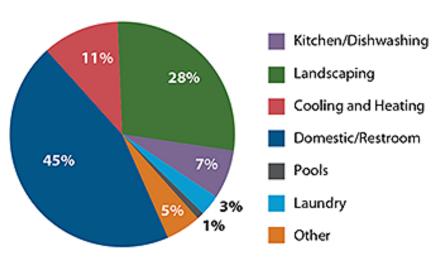




# **Water Efficiency**

- Intended Outcome: Reduce demand for water in schools
- Why should we seek to improve our water efficiency?
  - **\$\$\$**
  - Sustainability
  - Energy
  - Educational

### **End Uses of Water in Schools**



# **Objective:**



# **Reduce Potable Water Usage - Indoors**

- Strategies:
  - RequireWaterSenseFixtures
  - "Keep Water Local"
  - Graywater



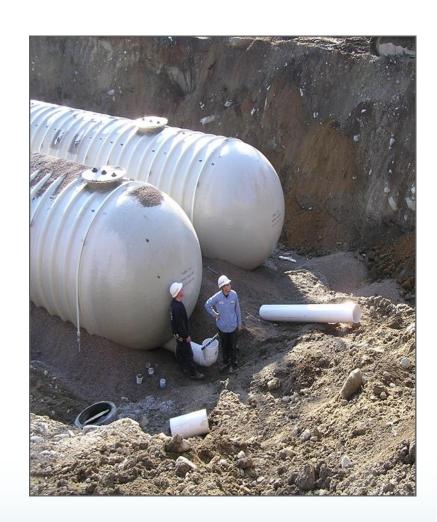
"Green Schools Use 32 percent less water than conventional Schools"
- AIA

# **Objective:**



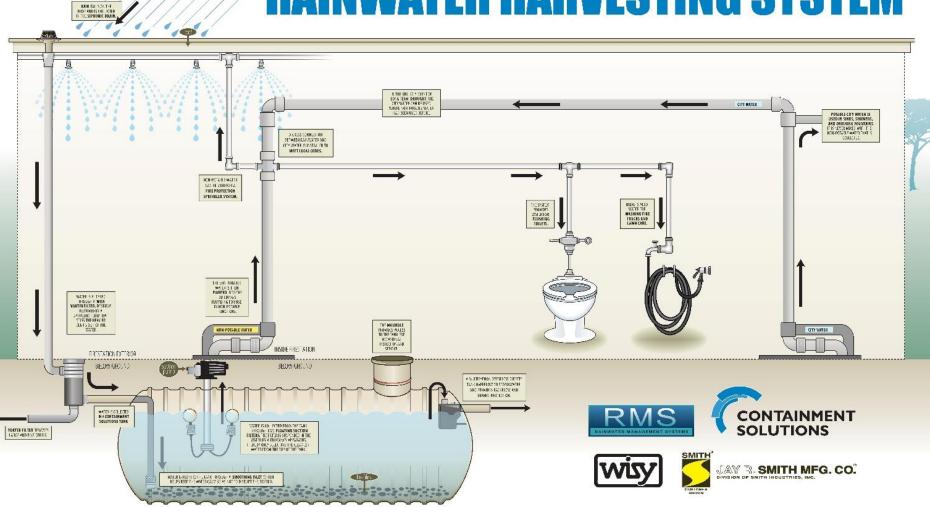
# Reduce water used for Irrigation

- Strategies:
  - Develop an irrigation water budget
    - EPA Tool
  - Rainwater collection
  - Water management system
  - Water-efficient native plants



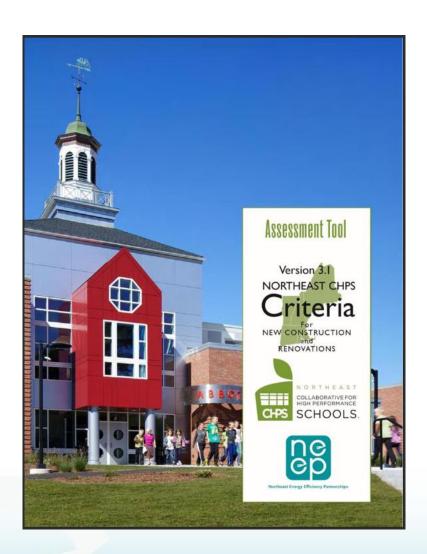


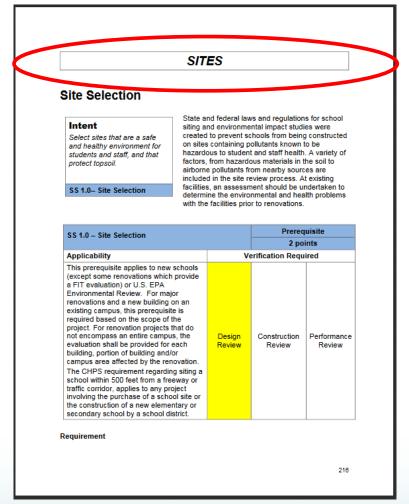
# **RAINWATER HARVESTING SYSTEM**





# **Sites**









- Old vs New
- Orientation
- Open space
  - Minimal parking
- Reduce
  - Sprawl
    - Centrally locate
  - Light pollution

# **COMMUNITY COLLABORATION**





#### **HUMAN POWERED!**

## ne

#### **Alternative Transportation**



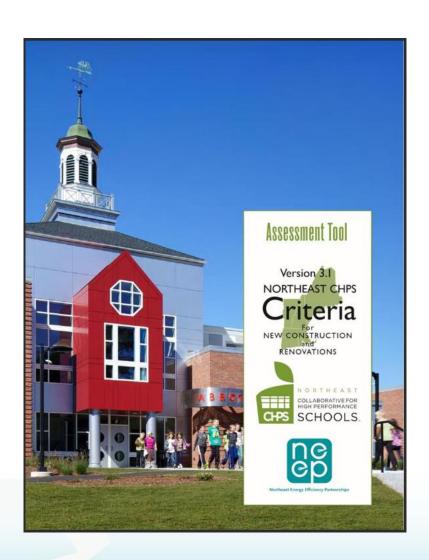


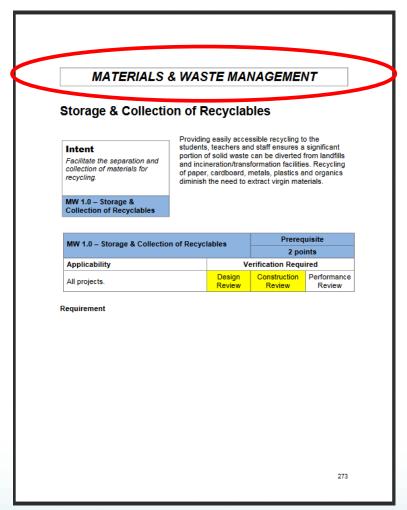
#### **SCHOOL GARDENS**





## **Materials and Waste Management**







## **Materials and Waste Management**

#### Two Main Components of this section:



**Recycling Waste** 



**Building Materials Used** 



## **Storage & Collection of Recyclables**

**Goal:** Provide easily accessible recycling to occupants to divert waste from landfills

#### **Important Considerations:**

- Integrate <u>Facility Manager</u> into design process
- Mobility and accessibility
- "Parallel Access" = Trash and recycling are next to each other
- Good Signage





#### **Common Issues...**













## **Construction Site Waste Management**

(Note: Don't need to include all these stats)

25% - 40% of the solid waste stream is building-related waste.

Only 20% of demolition and construction debris is recycled.

164 million tons of building-related waste is generated per year.

**Goal:** Limit the amount of construction and demolition materials going to landfill.

 Recycle, reuse, and/or salvage no less than 50% of nonhazardous construction and demolition waste



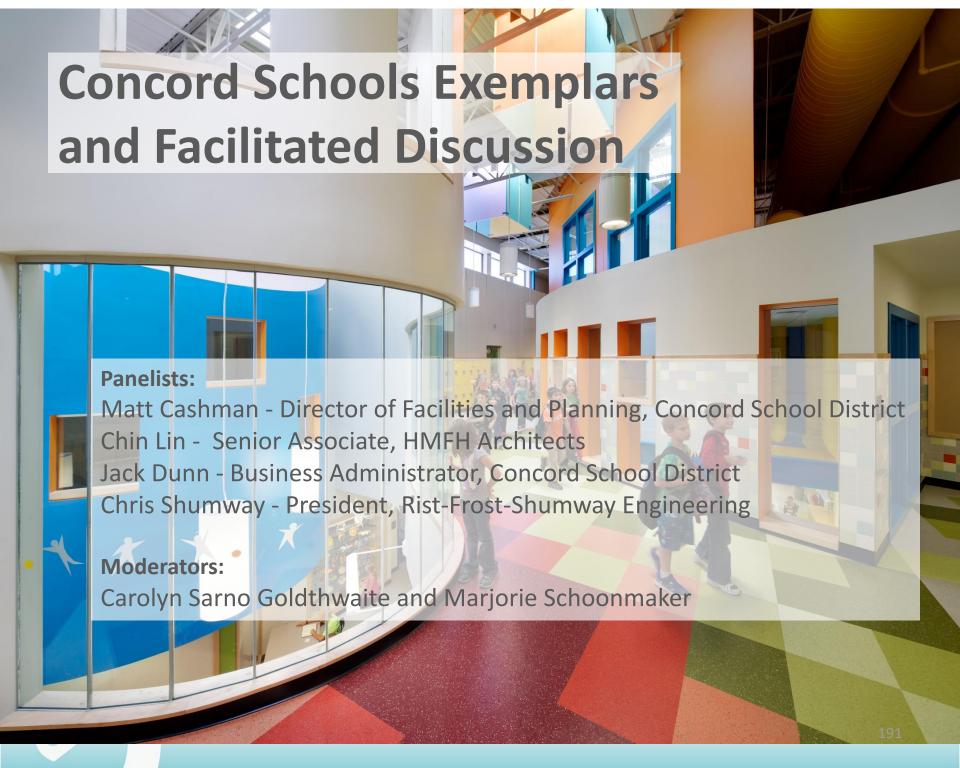
## **Building Materials**

Goal: Maximize the use of building materials that will have the least amount of negative impact on the

environment

- This includes the use of...
  - Recycled content
  - Rapidly renewable materials
  - Certified wood
  - Materials from existing buildings





















**SIEMENS** Ingenuity for life



#### **School Tour**

- Tour Leaders:
  - Phil Custeau, Governor Wentworth School District
  - Chip Krause, CMK Architects



# Concord Elementary Schools Concord, NH



HMFH ARCHITECTS

























