Building Efficiency for a Sustainable Tomorrow (BEST) National ATE Center

National Science Foundation
Advanced Technology Education

Presented to: Peralta Board of Trustees

Presented by Peter Crabtree, PI, CTE Dean
Larry Chang, Project Consultant
Hadley Hartshorn and Chuck Frost, ECT Faculty
Laney College, Oakland, CA

The BEST Center Laney Faculty Team

- ***Nick Kyriakopedi***, **Co-PI, ECT Department Chair, program leader.**
- ***Adan Rosillo***, **new full time instructor in the department, mechanical engineer with years of experience in energy efficiency and design. engineering in commercial buildings sector; almost 10 years as a stationary engineer.**
- ***Chuck Frost***, **adjunct instructor, Laney graduate with 25 years industry experience; day job is Energy Manager at UC Berkeley.**
- ***Hadley Hartshorn,*** **adjunct instructor, mechanical engineer, senior engineer at Lawrence Livermore National Lab (ret.)**
- ***Roger Goetsch***, **mechanical engineer, refrigeration systems expert.**
- ***Maya Salabasheva***, **mechanical engineer, building commissioning expert**
- ***Armen Alayan***, **engineer and information technology specialist.**
- ***Bruce Douglas***, **mechanical engineer, energy efficiency specialist**
- ***Solomon Obolu***, **Particle Physicist, Electrical Engineer**

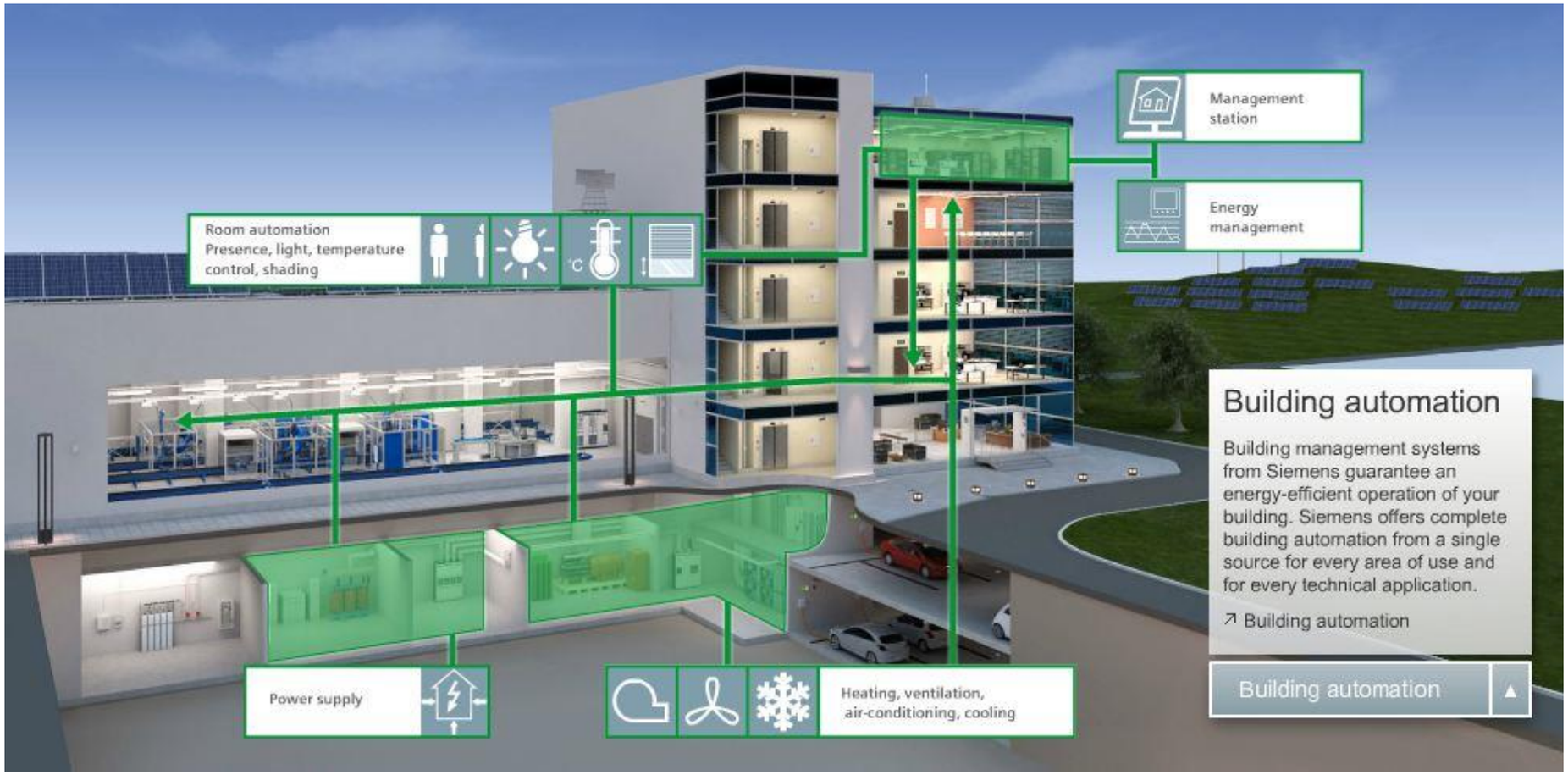
The need for the BEST Center

- Rapidly evolving “smart building” technologies including automated building controls, energy management systems, and convergence of mechanical with IT systems
- Need to professionalize building operations
- Economic drivers including global business competition, rising energy costs, and ultimately, the cost of inaction
- “Greening” of the commercial building sector and technical occupations within it
- Climate change & the critical role of building efficiency in reducing carbon footprint
- Urgent need for building technicians who can keep up with technology – technicians who can learn
- Need for the development of energy literacy for technicians as well as all building stakeholders
- Need to engage all building stakeholders, including occupants in energy efficiency and conservation

A RACE AGAINST TIME, A CALL TO ACTION

Our Vision & Mission

- To support the transition to high-performance, energy efficient buildings in the commercial building sector by creating a national forum on building efficiency issues
- To serve as a responsive vehicle for the dissemination and adoption of exceptional building technician educational programs, research, technology, and industry collaboration
- To advocate for high-performance buildings and appropriate technician training at local, regional, and national levels



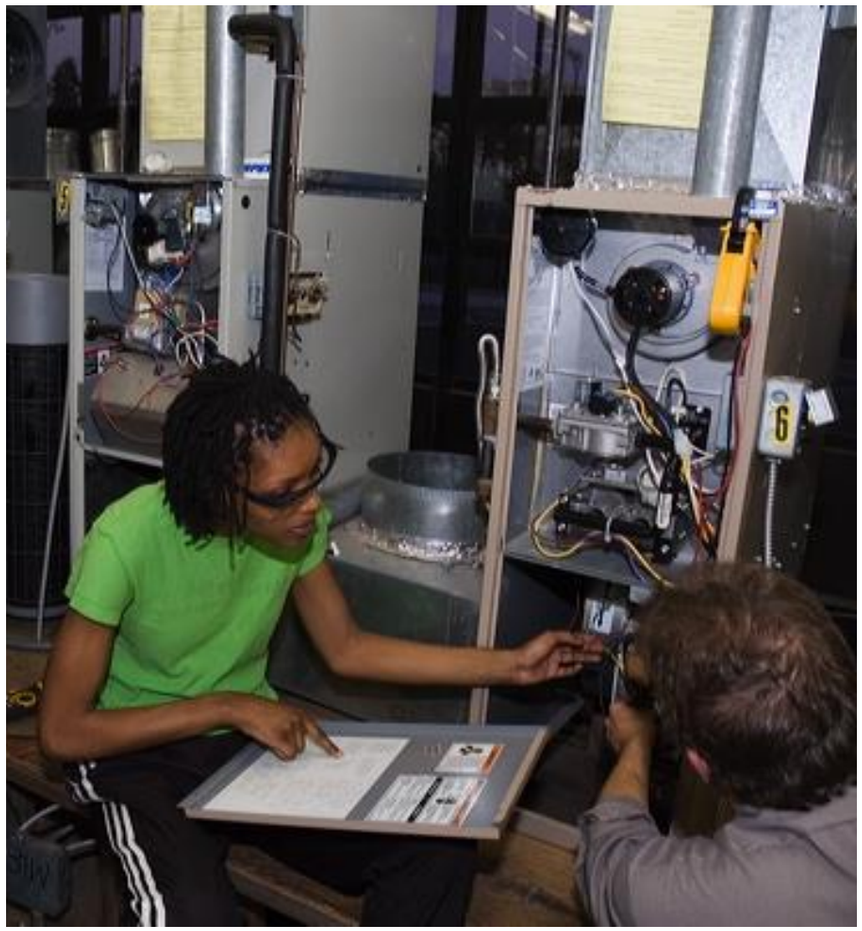
The BEST Center has an emphasis on commercial buildings

- **Buildings account for about 40% of U.S. greenhouse gas emissions and for about 70% of electricity usage.**
- Commercial buildings are the only sector that has outpaced gross domestic product in emissions growth.
- The convergence of information technology with building automation systems and energy management systems creates complex building operations and increased demands on technicians. A well-trained clean energy workforce will help U.S. businesses to cut energy costs, become more competitive in the global market, and reduce greenhouse gas emissions.
- The U.S. Better Buildings Initiative goal of improving energy efficiency nationwide in commercial & industrial buildings by 20% by 2020 can reduce energy costs by nearly $40 billion and create American jobs.

What are the new roles of building technicians?

- As older buildings are retrofitted and stringent environmental regulations are applied to new construction, demand is rapidly increasing for highly-trained technicians to operate and maintain technologically-complex, “high performance” buildings.
- Technicians must maintain multiple building systems including HVAC/R, lighting, Building Automation and Energy Management systems and ensure indoor air quality.
- Technicians play a critical role in ensuring occupant health, promoting energy conservation, and sustaining financial savings.

What must today's building technicians know and be able to do?



Key Competencies

- Apply systems thinking to perform root cause problem-solving
- Use data analysis for fault detection & energy modeling
- Apply critical thinking skills to building system diagnostics
- Present ideas effectively orally and in writing to building stakeholders including owners, managers, and occupants

High level Job Functions

- Perform ongoing energy monitoring and optimize sequences of mechanical system operations
- Measure and verify system performance
- Troubleshoot system-level problems
- Provide critical input on cost-benefit analysis for capital improvement opportunities
- Use soft skills to manage teams, work with multiple stakeholders, and present ideas to building managers
- Apply routine preventative maintenance strategies and practices
- Ensure currency of knowledge and skills by engaging in ongoing professional development activities

The goals of the BEST Center

1. Build and transform the instructional capacity of community colleges in the field of building systems technician education

The BEST Center is documenting--into an online and searchable website--model curriculum, lab designs, and best practices in commercial HVAC, Building Automation, Sustainable Building Operations, and Energy Management

BEST Center Provides an online Database of Resources and Information

The goals of the BEST Center

2. Engage industry stakeholders in a national collaboration with community colleges to support high quality instructional programs for new and incumbent building technicians. For example, Hadley and Chuck are representing BEST and Peralta in national DOE initiative to map technician skills.

The goals of the BEST Center

3. Strengthen the national STEM pipeline for educating building technicians and engineers, starting in high school

How Do Laney Students Benefit?

- Access to cutting edge curriculum and instructional programs
- Advanced instructional laboratories
- Internships and job placement assistance
- Effective instructional practices including problem-based learning

How Do Employers Benefit?

- Access to highly qualified student graduates
- Laney grads have skills in energy management
- Laney grads have system thinking abilities
- Laney's model commercial program provides strong depth and breadth of preparation

Who We Are

Principal Investigator and Co-PIs

- Laney College (CA) – PI & Co-PI
- Georgia Piedmont Technical College (GA) – Co-PI
- Milwaukee Area Technical College (WI) - Co-PI
- Lawrence Berkeley National Lab (CA) - Co-PI

Dissemination Partners

- Adv. Technology Environmental and Energy Center (IA)
- Central New Mexico Community College (NM)
- Edmonds Community College (WA)
- Lansing Community College (MI)

Curriculum Partners

- L.A. Trade Technical College (CA)
- Mt. San Antonio College (CA)
- Salt Lake Community College (UT)
- Wenatchee Valley College (WA)

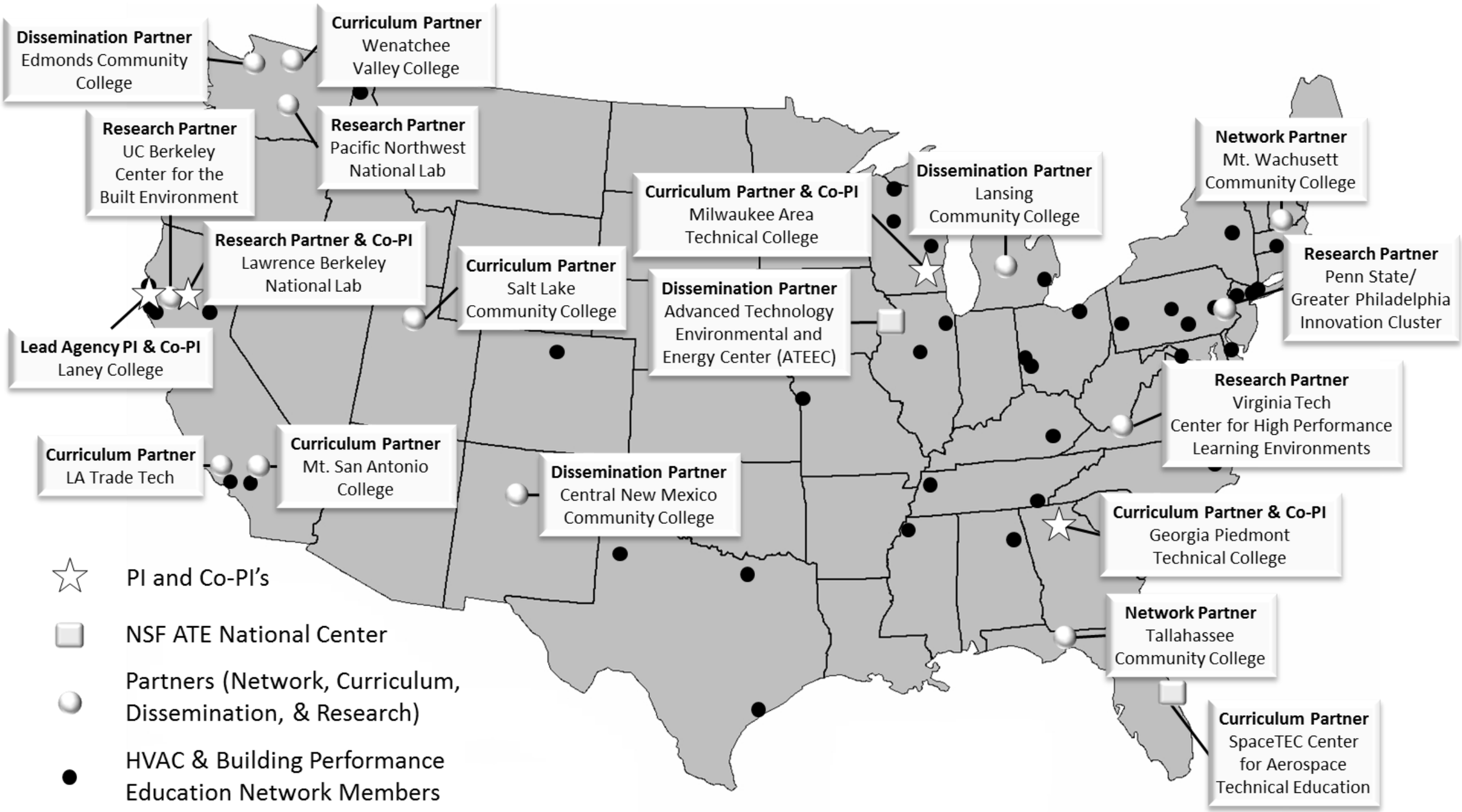
Network Partners

- Mt Wachusett Community College (MA)
- Tallahassee Community College (FL)
- SpaceTEC Center for Aerospace Technical Education (FL)

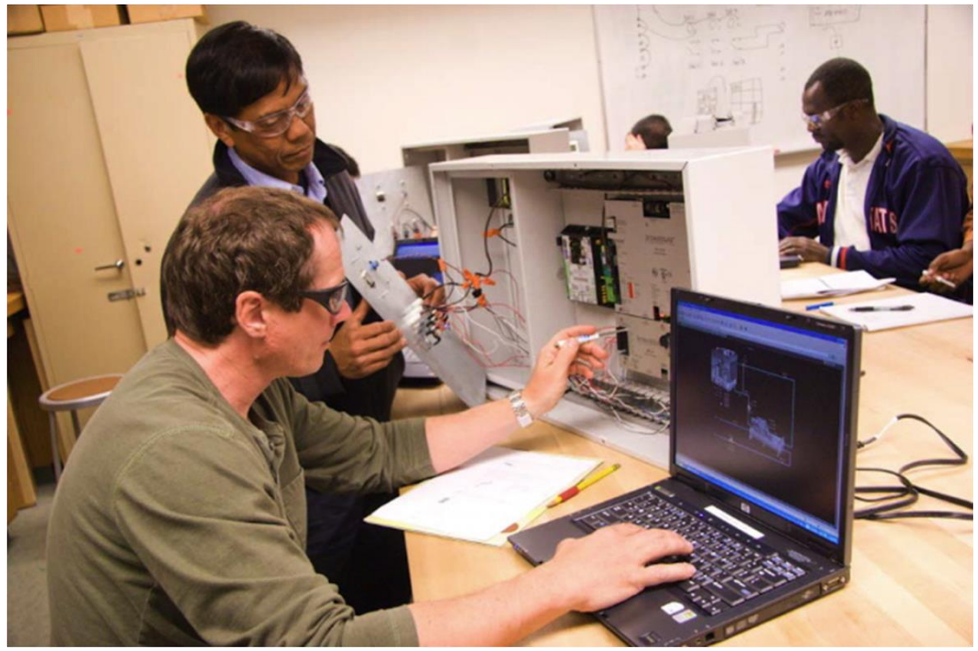
Research Partners

- Pacific Northwest National Lab (WA)
- Penn State/ Greater Philadelphia Innovation Cluster (PA)
- UC Berkeley Center for the Built Environment (CA)
- VA Tech Center for High Performance Learning Environments

BEST Center Affiliates Across the Country



Campus as Living Lab Initiative



Partnership between BEST Center and AACC SEED Center (Sustainability, Education and Economic Development)

- Growing national movement to utilize campus facilities as student learning opportunities while capitalizing on energy retrofit projects and renewable energy projects
- Key theme at CNM BEST Center workshop
- Career technical students need access to campus facilities including data monitoring of energy consumption
- Carefully controlled access to campus facilities can provide CTE students hands on labs and opportunities for energy data collection and analysis
- Student community needs opportunities to become energy literate and engage with energy systems on campus
- Provides opportunities to teach sustainability across the curriculum

Laney College BEST Sustainability Center

Project developed in two phases. Phase one, to start in spring 2014, and fully funded, consists of three structures:

- Building Performance Institute (BPI) Test House of approximately 1250 square feet.

- Laboratory Test House 2 to support sustainable residential system installation practices, approximately 1250 square feet.

- Passiv building to feature sustainable design for classroom and meeting room, approximately 2,500 sq. ft. with student access to mechanical systems and a demonstration building for cross-disciplinary labs including architecture and carpentry

BPI Test House

- Provides permanent structure to teach building performance standards and practices for residential energy efficiency systems.
- Provides permanent location to proctor field exams for BPI certifications in Building Analyst, Building Envelope Specialist, Certified Building Efficiency Installer, and more

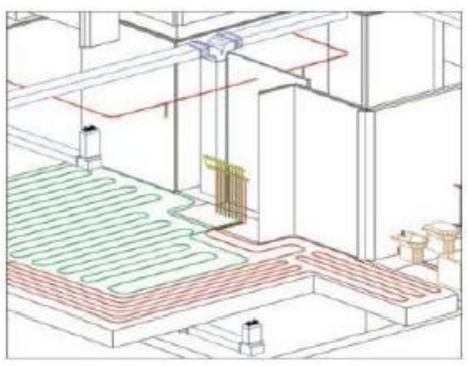
Lab Test House 2

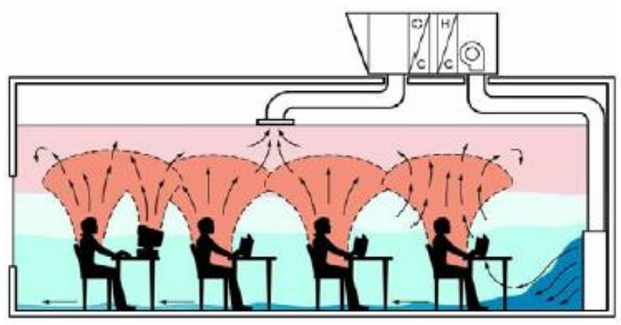
- Provides permanent location to teach laboratory classes in residential HVAC installation practices .
- Provides permanent location to provide instruction in energy efficient residential building systems

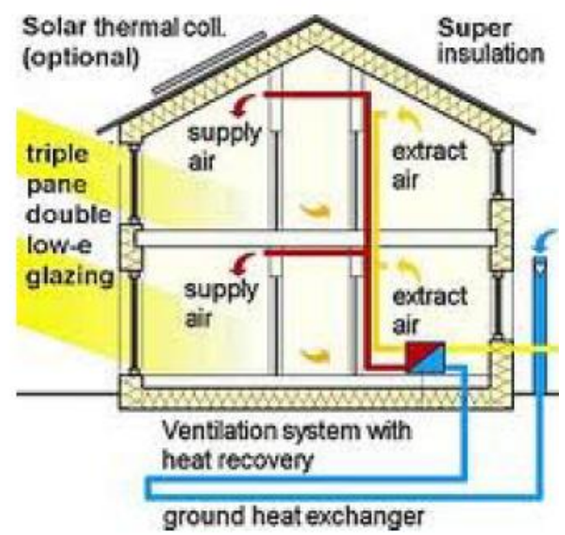
Passiv Building

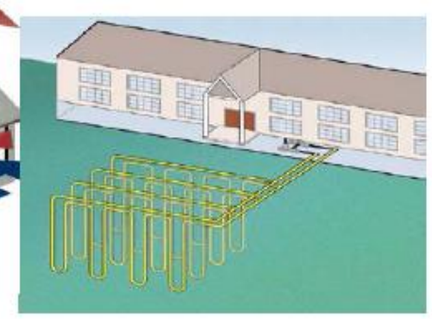
- Classroom and meeting room
- Displays, viewable areas, and mockups of energy efficiency structural features.
- Community outreach center for sustainability events.
- Demonstration site featuring passiv building techniques and features.
- Features building dashboards and data collection points for students

performance: passiv classroom elements









Phase II of BEST Sustainability Center

Features will Include:

- *30,000 sq. ft. building*
- *Building automation laboratories*
- *Computer labs*
- *Advanced lighting labs*
- *Clean room for dual use -*
- *LEED platinum design*
- *Mechanical system access for data collection and laboratory demonstrations*