

# Beyond Laboratories Beyond Being Green

The International Institute for  
Sustainable Laboratories

# Laboratories for the 21<sup>st</sup> Century (Labs21<sup>®</sup>)

A U.S. Environmental  
Protection Agency and U.S.  
Department of Energy

Co-Sponsored Program Promoting the Design, Engineering  
and Construction of High Performance, Low Energy  
Laboratories



# What is Labs21?

- Genesis: Ann Arbor, Michigan ESPC
- A joint EPA/DOE partnership program to improve the energy and environmental performance of U.S. laboratories.
- Encourages the design, construction, and operation of sustainable, high-performance, high-tech facilities that will:
  - Minimize overall environmental impacts.
  - Protect occupant safety.
  - Optimize whole building efficiency on a lifecycle basis.

## I<sup>2</sup>SL's Role in Labs21



- Labs21 Supporter
  - Since 2005, I<sup>2</sup>SL has promoted Labs21
- Labs21 Conference Co-Sponsor
  - Official co-sponsor of the Labs21 annual conferences through a non-funded agreement with EPA/DOE.
  - Attracting top laboratory design/engineering professionals internationally
  - Increasing international participation each year
- Labs21 Design Workshop Co-Sponsor
  - Sponsors training and workshops
  - Facilitates project specific technical support

# Going Beyond the Laboratory

- Other high-performance, high-tech facilities can benefit from green lab design principles:
  - Hospitals
  - Clean rooms
  - Data centers
  - R&D campuses
  - Pilot plant facilities
- Similar facilities, similar requirements, similar approach

# Who participates in Labs21?

- Established in 1999, program includes
  - Over 5,000 members of the Labs21 Network
  - 171 Labs21 Supporters
    - Examples: ASHRAE, AEE, Hawaiian Electric Company (HECO), USGBC, NIST, etc.
  - 53 Labs21 Partners and Centers of Excellence
    - Examples: Bristol-Myers Squibb, Pfizer, Virginia Tech, University of Hawaii, Harvard University, Clemson, Stanford and many more.
- <http://www.labs21century.gov/>

# Labs21 Federal Partners

- Argonne National Laboratory
- Food & Drug Administration
- Lawrence Berkeley National Laboratory (LBNL)
- NASA
- NOAA
- NREL
- National Science Foundation
- PNNL
- Sandia National Laboratories
- U.S. Department of Agriculture
- U.S. Environmental Protection Agency



**If you are a Federal agency,  
what is the advantage of  
becoming a Labs21 Partner?**

# Labs21 Partner Technical Assistance

- A technical lead works with each partner to:
  - Set voluntary goals
  - Assess the opportunities for improvements
  - Maximize efficiency in the project
- Technical support for project
  - Participation in sustainable design charrettes
  - Advice on specific technical issues (e.g. heat recovery, fume hoods)
  - Help using the Labs21 toolkit
  - Help using the Labs21 Benchmarking tool
- Networking and Recognition

# Toolkit

- Core information resources
  - Design Guide
  - Case Studies
  - Energy Benchmarking
  - Best Practice Guides
- Design process tools
  - Environmental Performance Criteria
  - Design Intent Tool
  - Labs21 Process Manual

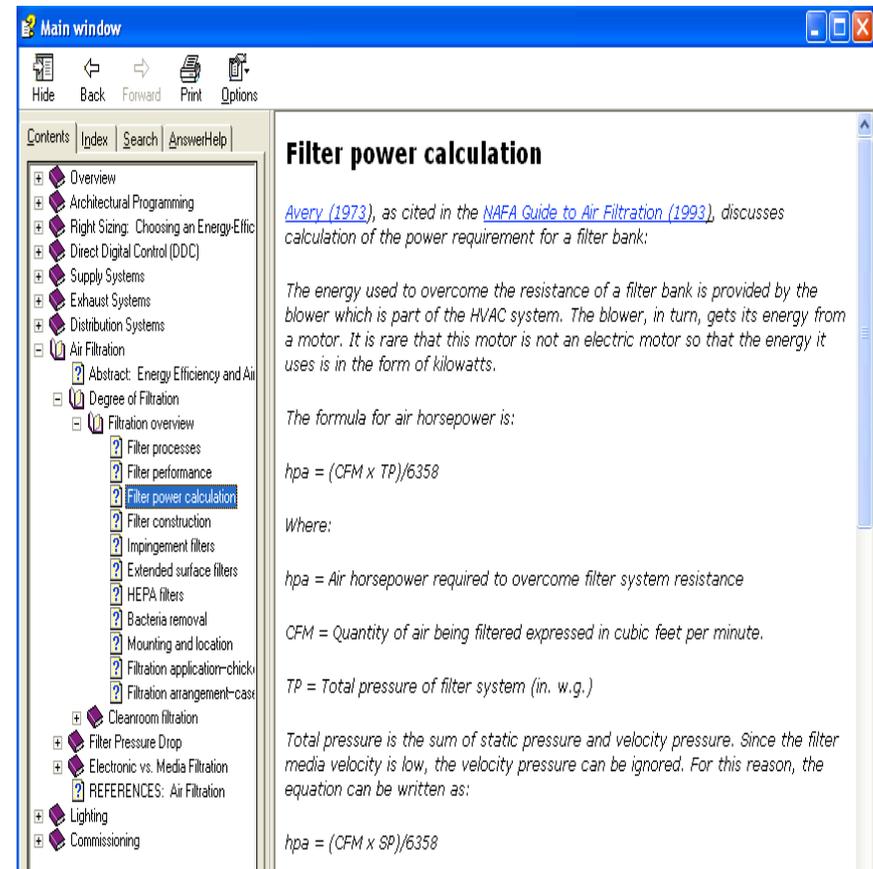
The screenshot displays the Labs21 Toolkit website interface. It features a navigation menu on the left with categories like Pre-Design, Schematic Design, Design Development, Construction Documents, Bid & Award, Construction, Acceptance and Close-out, and Occupancy and Operation. The main content area shows a 'Design Process Checklist' for the 'Pre-Design' phase, including a 'Select an Energy/Sustainability Champion' step. Below this, there is an 'Overview of manifold exhaust systems' article. A 'Case Studies' section is also visible, featuring a 'Case Study Index' with filters for Laboratory Type, Construction Type, Type of Operation, Service Option, and LEED Rating. The bottom part of the screenshot shows a 'Graphing' tool displaying 'Total Building BTU/sf-yr (site)' for 'The Louis S. Building 50 of Health, Introduction'. The graph shows a bar chart for BTU/sf-yr (site) and a line chart for Lab Area Z, with a red marker on the top of the bar indicating estimated values.

# Environmental Performance Criteria (EPC)

- A rating system for evaluating laboratory design
  - Builds on the LEED™ rating system
- Adds credits and prerequisites pertaining to labs
  - Health & Safety
  - Fumehood energy use
  - Plug loads
- USGBC allows Labs21 EPC to be used for energy points and will be the basis for LEED for Labs

# Lab Design Guide

- A searchable, detailed reference on high-performance, low-energy laboratory design and operation
- Available on the Internet and CD



The screenshot shows a web browser window titled 'Main window'. The address bar is empty. The browser has a menu bar with 'Hide', 'Back', 'Forward', 'Print', and 'Options'. Below the menu bar is a navigation bar with 'Contents', 'Index', 'Search', and 'AnswerHelp'. The main content area is divided into two panes. The left pane is a tree view showing a hierarchy of topics. The right pane displays the 'Filter power calculation' page.

**Filter power calculation**

[Avery \(1973\)](#), as cited in the [NAFA Guide to Air Filtration \(1993\)](#), discusses calculation of the power requirement for a filter bank:

*The energy used to overcome the resistance of a filter bank is provided by the blower which is part of the HVAC system. The blower, in turn, gets its energy from a motor. It is rare that this motor is not an electric motor so that the energy it uses is in the form of kilowatts.*

*The formula for air horsepower is:*

$$hpa = (CFM \times TP) / 6358$$

Where:

*hpa = Air horsepower required to overcome filter system resistance*

*CFM = Quantity of air being filtered expressed in cubic feet per minute.*

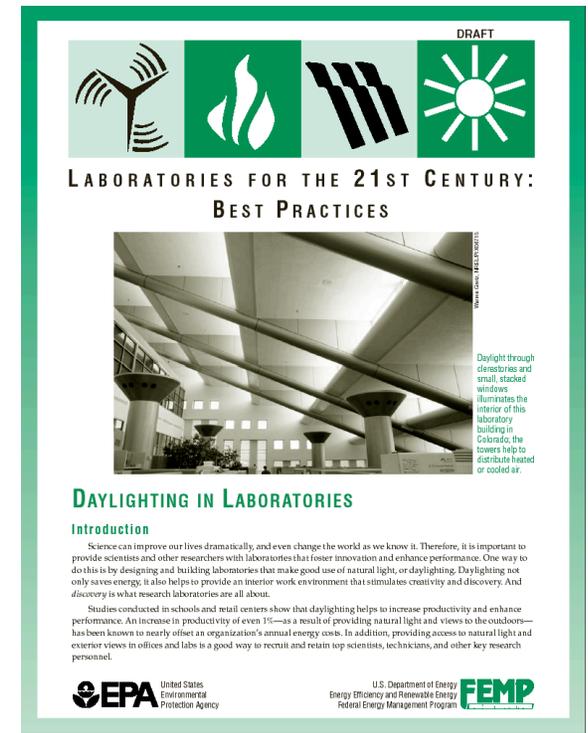
*TP = Total pressure of filter system (in. w.g.)*

*Total pressure is the sum of static pressure and velocity pressure. Since the filter media velocity is low, the velocity pressure can be ignored. For this reason, the equation can be written as:*

$$hpa = (CFM \times SP) / 6358$$

# Best Practice Guides

- Describes how to implement a strategy, with implementation examples
- Completed guides:
  - Combined Heat and Power
  - Daylighting in Laboratories
  - Energy Recovery
  - Low-pressure drop design
  - Modeling Exhaust Dispersion
  - Water Efficiency
  - Energy Efficiency
  - Minimizing Reheat
  - Right-sizing
- Several in development



# Training

- Labs21 Design Courses:
  - Labs21 Introductory Course: High Performance, Low-Energy Design
  - Labs21 Advanced Course: Laboratory Ventilation Design
  - Labs21 Workshop: Environmental Performance Criteria
  - Labs21 Workshop: Operations and Maintenance
  - Data Centers *Save Energy Now* Workshop
- Developing Related Courses:
  - Cross Contamination Workshop
  - K-12/Educational Lab Design
  - Renewable Energy for Labs/High Tech Facilities

# I<sup>2</sup>SL and Utilities

If you are a utility, what is the advantage of working with I<sup>2</sup>SL?

- Promotes the commitment to sustainable design and technologies
- Provides an outlet for your customers to learn sustainable design technologies and incorporate them into daily operations
- Encourages networking and communication with regard to energy and water efficiency in the industry

# Utilities and I<sup>2</sup>SL

How can you become involved?

- Become a Labs21 Supporter
- In conjunction with I<sup>2</sup>SL, offer Labs21 workshops to your Federal and non-Federal customers
  - NSTAR
  - PG&E
- Use the Labs21 EPC to green all your customers' high-tech facilities
- Attend and help promote the Labs21 2008 Annual conference

# 2008 Labs21 Annual Conference



September 16-18, 2008  
San Jose McEnergy Convention Center  
San Jose, California

# Questions?

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- The Labs21 2008 Annual Conference:  
<[www.labs21century.gov/conf](http://www.labs21century.gov/conf)>