



# Building Operator Certification – Level I

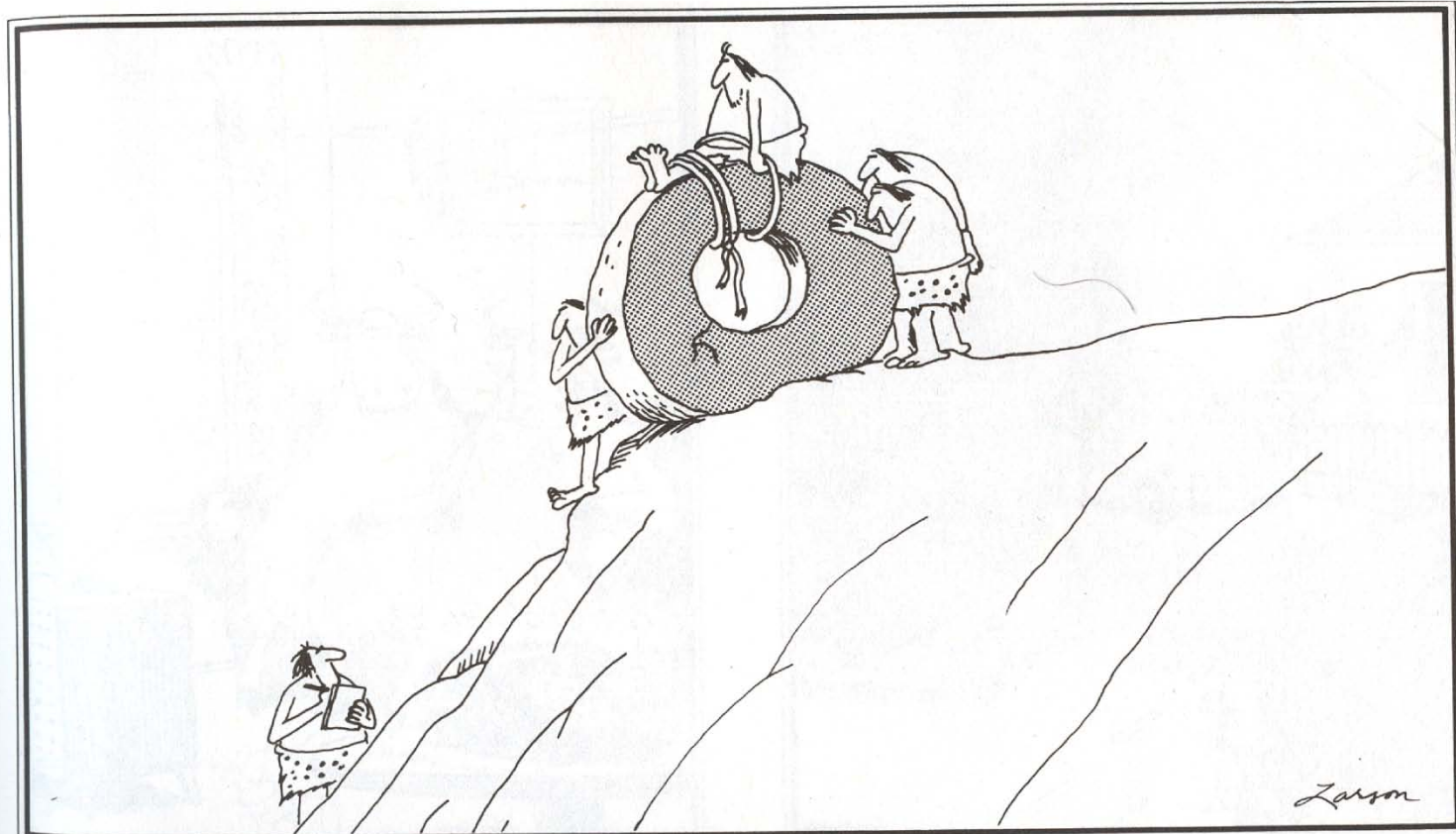


*A Partnership of the  
NYC Department of Education  
Division of School Facilities,  
International Union of Operating  
Engineers, and the  
City University of New York*



Class 2

# The improvement process



Early experiments in transportation

# Building Conditions and Measurement

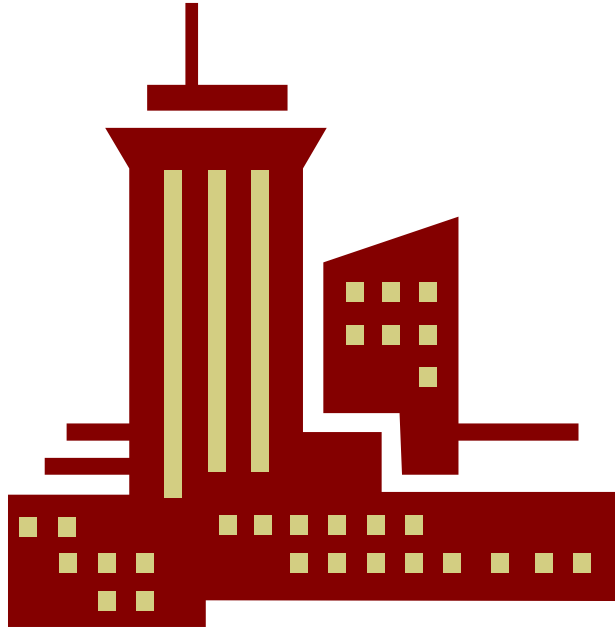
## Objectives

- Relate building conditions to indoor environmental quality (IEQ) and key measurements
- Awareness of hand-held instruments for IEQ measurement
- Prepare site sketches to map and document conditions

# Agenda

- Sustainability Concepts (Review Reading)
  - Exercise: EPA IAQ Tools for Schools
- Building Environmental Conditions
  - Exercise/Discussion: Building Conditions
  - Hand-held Instruments
- Practical Project: Site Plan Sketch & Conditions Mapping
  - Exercise: Site Sketching
- For next week: Reading Assignments

# BOC 105 Sustainability & IEQ



## Sustainability Defined

*“ Meeting the needs of the present without compromising the ability of future generations to meet their needs.”*

(Brundtland Report 1987)

# Sustainability

## Healthy Workplace

- Healthy indoor environment
- Workplace satisfaction
  - Reduced absenteeism
  - Enhanced recruitment
  - Improved morale
- Increased performance of occupants

## Low Resource Use

- Energy efficiency
  - Schedule of Operations
  - Maintenance of Equipment
  - Improvements
- Water efficiency
- Lower operating cost

# Most Popular Sustainable Building Practices

Standard Practice



Standard

Best Practice

Use of natural daylight (71%)

Purchasing recycled office products (64%)

Lighting fixture retrofits (61%)

Water conservation (53%)

Participate in utility incentive programs (47%)

# Review of Reading Assignments



**Reading 1: BOC 105 Handbook**

**Reading 2: Chapter 1 & 2- Herzog**



# Review Reading, IAQ Tools for Schools

Find the 4 most important points in your Article



# CLASS EXERCISE: IAQ Tools for Schools

**Building factors** or pollution in buildings most frequently associated with respiratory health effects include

- Presence of moisture, water damage
- Combustion byproducts
- Moisture or dirt in HVAC systems
- Low ventilation rates
- Formaldehyde
- Chemicals in cleaning products
- Outdoor pollutants or vehicle exhaust
- Animal and other biological allergens

# Announcement

**If you came to class late today, you are responsible for:**

- The material was taught at the start of the class
- The quiz at the start of the class
- Your name is in the attendance

**No Smoking – They really mean it !**

# BREAK

Stretch your legs for 10 minutes.

No smoking on this floor; designated smoking area for the building is 25 feet outside the front door on the first floor.

## Section 2

# Building Conditions & Indoor Environmental Quality (IEQ)

# Building Conditions

What Factors affect building performance?

- Site factors
  - Solar Heat Gain – South exposure
- Building & Operating Conditions
  - structure, equipment
- Indoor Environmental Quality (IEQ)
  - outcomes

# IEQ – Indoor Environmental Quality

## 4 Key Dimensions

1. Thermal Comfort
2. Indoor Air Quality
3. Illumination
4. Acoustics

*Each can be further defined.  
Each can be measured.*

# IEQ – Indoor Environmental Quality

## Thermal Comfort

- temperature (*is temperature really an absolute?*)
- relative humidity
- air flow
- radiant exchange
- activity level and clothing



# IEQ – Indoor Environmental Quality

## Indoor Air Quality

- ventilation air - *how much?*
- pollutants - *from outside*
- pollutants - *from inside*

# IEQ – Indoor Environmental Quality

## Illumination

- Lighting levels
- Other qualities - color, glare, diffusion
- Room color
- Day-lighting
- Access to views

# IEQ – Indoor Environmental Quality

## Acoustics

- How loud (decibels, dB)
- Echo, bounce, muffling
- Sound between rooms
- External noise

# IEQ – Indoor Environmental Quality

We want to

- Measure the conditions of IEQ
- Establish baselines of the conditions
- Identify improvement areas / targets
- Document progress

# Introductions and Conditions in Your Building

- Your Name
- How long have you been a Custodian?
- What did you do before you were a Custodian?
- What are some conditions in your school that you are aware of ?
- What are some things that you can do to improve conditions?



# IEQ – Indoor Environmental Quality

How can we measure conditions?

- Handheld Instruments
- Comments and complaints
- Surveys
  - “Walk-around”
  - Written or e-mail surveys

# Instruments



**InfraRed  
Thermometer**



**CO2 + Temp  
+ Humidity**



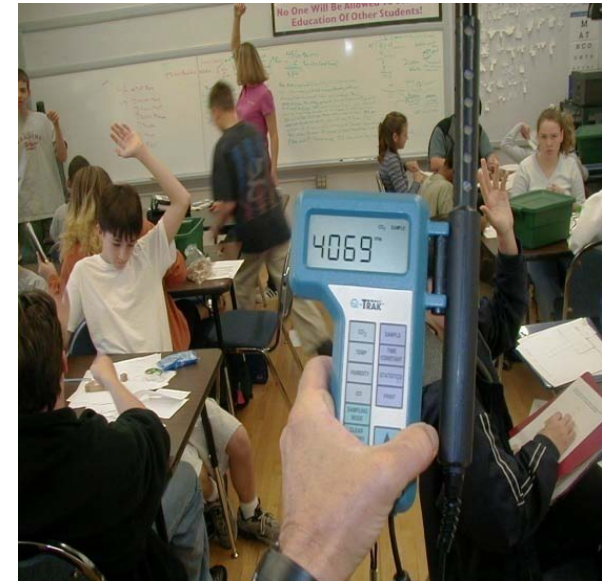
**Light Meter**

# Balometer or Flow Capture Hood



**Carbon Dioxide  
to estimate  
ventilation**

# Anemometers





# Instruments - Infra-red Thermography

## Electrical Troubleshooting

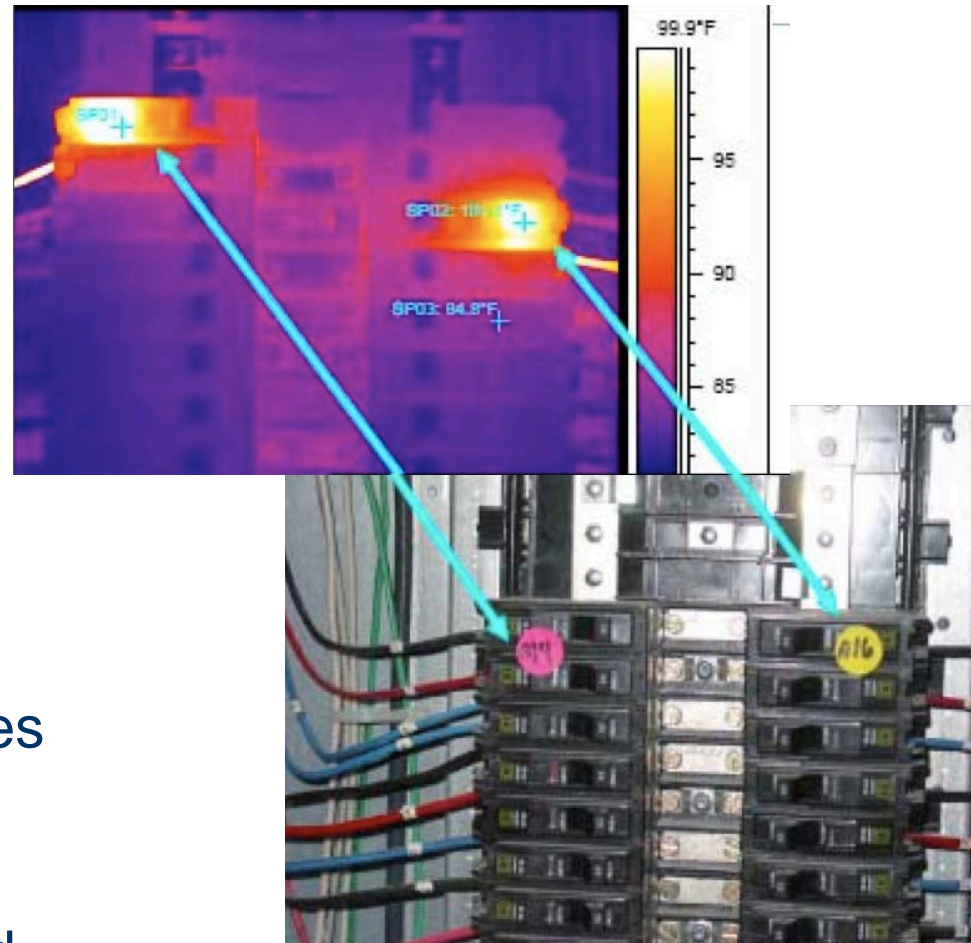
- Overloaded Circuit
- Breaker Panels
- Corrosion on Contacts

## Building Heat Loss Scans

- Insulation levels & by-passes

## Steam Traps

- Failed Open / Failed Closed



# Manometer - measures Differential Air Pressure

Fan performance

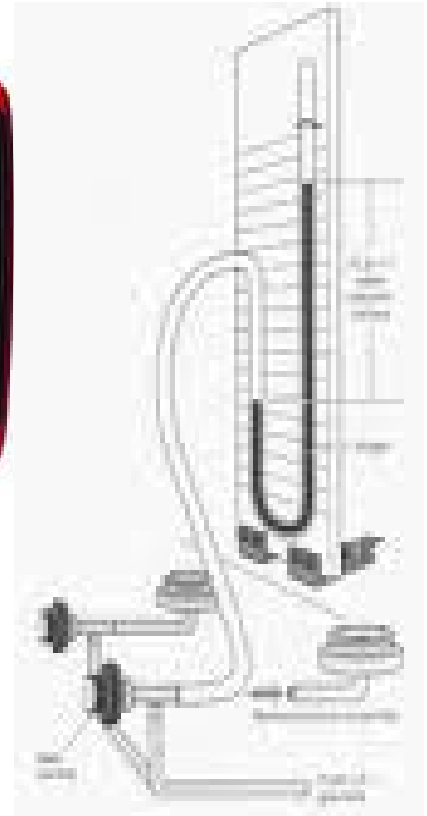
Duct losses, air balance

Chimney conditions

Building, room pressurization

Indoor air pollutant flows

**AIR FILTER MAINTENANCE**



# BREAK

Stretch your legs for 10 minutes.

No smoking on this floor; designated smoking area for the building is 25 feet outside the front door on the first floor.

# Section 3

## Building Conditions & Site Plan Sketching



# Practical Project – Part 1A

## Site Plan Sketch & Conditions Mapping

- Sketch a site of your school on 11x17 paper
- Review of Project Instructions
- Review of Example Sketch

# Exercise – Site Plan Sketch & Conditions Mapping

## Objective

- Make a rough sketch of your building and site, showing the major elements of the site and the major rooms inside the building.

## Activity

- Individually sketch a site of your school on 11x17 paper
- Add notes building conditions to sketch
  
- Pair up and review each others sketches, discuss conditions
- In pairs determine what is missing / what should be added
- Note down steps how to measure conditions on sketch

**Time:** 30 minutes for whole exercise



Be prepared to  
explain your  
Site Plan

# Class Attendance Policy

If you are not able to attend your regular class, you must contact the BOC Program Office and make a reservation, to make sure there is room in the class.

If you just show up, and you have not arranged to attend a class, you will not be able to attend the class.

Contact: Deslyn George by phone or email.

**Phone: 718-610-0296**

**Email: [DGeorge5@schools.nyc.gov](mailto:DGeorge5@schools.nyc.gov)**



# Class Reading Assignments

BOC Handbook 105 – page 20 to end  
(focusing on Water Efficiency and IEQ)

Alliance for Water Efficiency– K-12 Schools Introduction  
[www.allianceforwaterefficiency.org/Schools\\_K\\_-\\_12.aspx](http://www.allianceforwaterefficiency.org/Schools_K_-_12.aspx)

Calculators for the Water Consumption Exercise

