

## BUILDING INVENTORY

You started to develop a method for tracking energy use of the school you are auditing. Now you will begin to develop a precise listing of energy using features in your buildings and your options for saving energy.

There are three fundamental systems associated with understanding energy use in buildings:

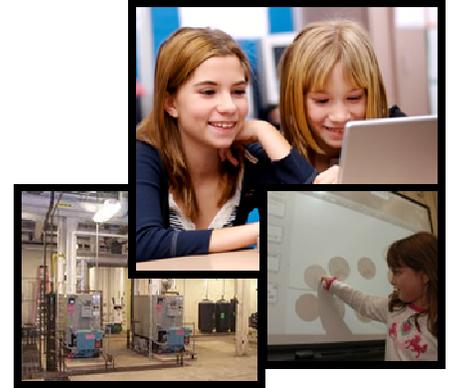
- (1) Energized systems
- (2) Non-energized systems
- (3) Human systems

**Energized systems** are those which consume energy directly and include heating, ventilation, cooling, humidification, dehumidification, lighting, water heating, waste handling, cooking, and equipment such as kilns, shop equipment, televisions, and computers.

**Non-energized Systems** do not consume energy directly but affect the amount of energy which an energized system must expend to get its job

done. Typical non-energized systems include walls, windows, floors, roof, ceiling, and doors. Other factors influencing energy use are landscaping and building site location.

**Human systems** are persons who affect when and in what quantity energy is consumed. These persons include students, teachers, staff and visitors. When your mother yelled at you, "Close the door, we can't heat up the whole outdoors" she was trying to influence a component of the human system (YOU) in her energy use environment. Your mother realized that an open door wastes energy, and she knew the energy has a cost, because she paid the heating bill.



You can see that energy use depends on the equipment used, its efficiency and reliability, and on behavior. Whether we use energy wisely or wastefully depends on the choices we make. For example, it does not make much sense to change to higher efficiency lighting and then leave the lights on all the time. The savings are canceled by an increase in usage. **Buildings don't use energy, people do.**



### Investigative Question #5:

If you are in a car and you are cold you can either start the engine and turn on the heat or you can roll up the car windows. Can you identify the energized and non-energized components?

- |  |           |               |
|--|-----------|---------------|
| a) Start the engine and turn on the heat ( <i>Select One</i> ) | Energized | Non-Energized |
| b) Roll up the car windows ( <i>Select One</i> )               | Energized | Non-Energized |

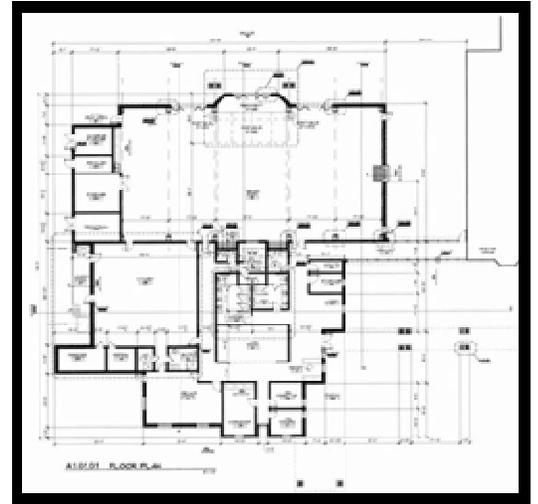


### Investigative Question #6:

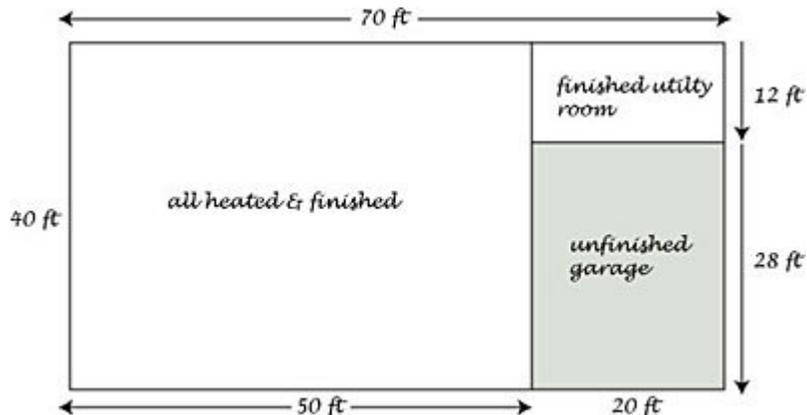
As you have read, Energized, Non-energized, and Human Systems all play important roles in the amount of energy a building may use. As a class, for each of the three systems, come up with a list of items and factor that contribute to each.

## BUILDING FLOOR PLANS

A set of detailed scaled drawings or plans of a home, building, or structure are called construction documents, blueprints, or floor plans. Hopefully, you have a copy of such plans of the school you are auditing. At a time that is not disruptive to classes, confirm that the floor plans accurately reflect the current school facilities. Note any changes that have taken place. Have walls been moved? Are the rooms still used for the original purpose or is a classroom now a weight room or a lounge? Note any changes and unusual energy using equipment such as a kiln. At this stage a lot of detail is not needed. Major energy using equipment such as lighting and the kitchen will be looked at in greater detail later. If you do not have floor plans, now is a good time to create a floor plan of the school that you can use as a reference for your energy management program.



From the floor plan determine the heated square footage of the school. This can be done by referring to the dimensions of the blueprints or by measuring the outside dimensions of the building (length x width), and multiplying this area by the number of floors (height). Generally basement areas and mechanical areas are not included as heated areas unless heating units are installed and operating.





## **BUILDING AUDIT CHALLENGE – MAPPING OUT THE BUILDING FLOOR PLAN**

### **(STEP 3)**

*For the elementary school you are doing the energy audit for, confirm the floor plans you have of the school, accurately reflect the current building facilities.*



#### **Equipment and Information Needed:**

1. Building floor plan.
2. Information from your “***Building Audit Exercise- Recording Energy Uses (Step 1)***”
3. Site visit to the school
4. A method of confirming the floor plans of the school, match the “as-built” existing facility. (*Are you planning on drawing on the plans? If so they better not be originals! Are you planning on taking notes in a note-pad? If so make sure you have an organized method so when you come back to the RETC you understand your notes.*)



#### **Outcome Required:**

1. An easy to read floor plan of the existing actual “as-built” floor plan of the school.
2. The determined square footage of heated & cooled space the school.
3. A list of any energized, non-energized, and human system elements that contributes to the energy usage of the building.
4. Calculations of BTU and Dollars Per Square Foot for the year. (*See below & excel file*)

#### ***Calculate BTU per Square Foot***

- 1) Total # BTU used for the year: \_\_\_\_\_ BTU
- 2) Divide (1) by 1000 to convert the units to kBTU: \_\_\_\_\_ kBTU
- 3) Total square feet of conditioned space in your school: \_\_\_\_\_ SQ.FT.
- 4) Divide (2)/(3) to get kBTU per square foot for the year: \_\_\_\_\_ kBTU/SQ.FT./year
- 5) The number for (4) is also the EUI# : \_\_\_\_\_ (the EUI # which will be discussed shortly)

#### ***Calculate Dollars per Square Foot***

- 1) Total dollars spent on energy for the year \_\_\_\_\_ \$
- 2) Total square feet of conditioned space in the school \_\_\_\_\_ SQ.FT.
- 3) Divide (1)/(2) to get Dollars \$/square foot \_\_\_\_\_ Dollar/SQ.FT.

Double check your work by inserted values in the **BTU AND COST PER SQ. FT.** excel document.

*Report your findings to your full group. Emphasize any anomalies or areas that you feel warrant further investigation.*