Passive Solar Heating and Day-lighting

Step outside on a hot and sunny summer day, and you'll feel the power of solar heat and light. Today, many buildings are designed to take advantage of this natural resource through the use of passive solar heating and day-lighting.

The south side of a building always receives the most sunlight. Therefore, buildings designed for passive solar heating usually have large, south-facing windows. Materials that absorb and store the sun's heat can be built into the sunlit floors and walls. The floors and walls will then heat up during the day and slowly release heat at night, when the heat is needed most. This passive solar design feature is called *direct gain*.

Thousands of years ago, the Anasazi Indians in Colorado incorporated passive solar design in their cliff dwellings. Credit: John Thornton

Other passive solar heating design features include *sunspaces* and *trombe walls*. A sunspace (which is much like a greenhouse) is built on the south side of a building. As sunlight passes through glass or other glazing, it warms the sunspace. Proper ventilation allows the heat to circulate into the building. On the other hand, a trombe wall is a very thick, south-facing wall, which is painted black and made of a material that absorbs a lot of heat. A pane of glass or plastic glazing, installed a few inches in front of the wall, helps hold in the heat. The wall heats up slowly during the day. Then as it cools gradually during the night, it gives off its heat inside the building.

Many of the passive solar heating design features also provide day-lighting. Day-lighting is simply the use of natural sunlight to brighten up a building's interior. To lighten up north-facing rooms and upper levels, a *clerestory* - a row of windows near the peak of the roof - is often used along with an open floor plan inside that allows the light to bounce throughout the building.

Of course, too much solar heating and daylighting can be a problem during the hot summer months. Fortunately, there are many design features that help keep passive solar buildings cool in the summer. For instance, overhangs can be designed to shade windows when the sun is high in the summer. Sunspaces can be closed off from the rest of the

building. And a building can be designed to use fresh-air ventilation in the summer.