

Section 3

# Characteristics of Various Passive Solar Heating Systems

In this section various passive solar heating systems are discussed. The main design factors affecting their performance, their relative advantages and the main problems associated with them are analyzed. Emphasis is placed on the architectural design issues associated with the different passive solar heating systems.

Additional information, on the thermal characteristics and "solar" performance of the different systems, the reader can find in Balcomb, et al (1980), Jones et al (1982), Mazria (1979), and other books cited in the reference list.

The solar passive heating systems discussed in this section are:

- Direct Gain
- Collecting Storage Walls:
  - a- Masonry walls
  - b- Water walls
- Sun Spaces
- Convective Loops:
  - a- Below floor collectors
  - b- Vertical wall collectors

In practice, combining several solar system in one building can increase the overall solar contribution, with a given amount of solar glazing, and mitigates some of the problems associated with the different systems.

Providing Direct Gain and Trombe walls in the same building, and even with different proportions in the same rooms, enables fast heating in the mornings and throughout the daytime from the DG, and continued heat supply during the evenings and night hours. Combining sunspaces with Direct Gain enables having large overall collection area with heat transfer to the interior by convection, without too much direct sun penetration

With such combinations of different systems the total solar glazing area could be sized for a high solar fraction without too much risk of glare, overheating, fading of fabrics, etc., problems which are likely with the same glazing area, but with only Direct Gain as the solar heat source.

But, to simplify the discussion of the special characteristics of the different system, they will be discussed separately.

## 3.1 Direct Gain

In Direct Gain buildings the inhabited spaces are heated by the sun, admitted often through conventional windows, skylights, etc. The mass of the building fabric itself acts as the necessary