UDC 7536.72:728.3 (043.2)

Vasylchenko D.
National Aviation University, Kyiv

ENERGY EFFICIENCY IN TERRACED HOUSES

Reducing energy consumption in buildings is essential to decrease their impact on the environment. An energy-efficient house is a building with the low power consumption and almost complete energy independence.

Ensuring energy efficiency and environmental performance of buildings is achieved through the following series of measures:

- thermal insulation of walls and windows;
- efficient heating and ventilation depending on the state of the external and internal environment (their temperature and humidity);
- computer control and management of these systems;
- mathematical modeling in the house design (heat flow, air and light);
- the use of the energy-saving lamps, LED, in particular;
- the use of renewable and alternative energy sources (wind turbines and small hydro turbines);
- passive energy saving design solutions (the orientation of the building to the south, daylight, glass partitions);
- optimum ratio of length, width and height of the housing;
- the use of energy efficient materials and structures.

A mechanical ventilation system with approximately 80% heat recovery is used in such houses. The electric resistance heating in the supply air is 900 W per living unit. Solar collectors on the roof provide 40% of the energy which is needed for the domestic hot water.

A passive solar home collects heat when the sun is shining through the windows facing the south and retains it in materials that can store heat. Materials that have the capacity to absorb and store the solar heat energy are known as the materials that have thermal mass. The ideal ratio of thermal mass to glazing differs in different climates. A well-designed passive solar home provides daylight the whole year round and comfort during the cooling season using nighttime ventilation.

Heat loss depends on the ratio of external surface area to volume, which is called the coefficient of compactness. In energy-efficient individual houses, the index is about 0.7–0.8, in terraced houses – about 0.6–0.55. In high-rise building due to less heat loss the coefficient of compactness will be less than in individual low-rise houses, as all external surfaces of the cottage are touched in the cold season with the outside air. For this reason terraced houses are more energy-efficient, because the total area of the outer surfaces is less than in a detached house containing the same volume. It should be noted that the highest energy efficiency of terraced houses is achieved when they have 5 houses in a row.

Scientific supervisor: Konoplianyk L., PhD, Associate Professor