What Is Passive Design?

Worksheet

Passive design shapes a building to work with sun, wind and climate instead of against them, reducing the energy needed for heating, cooling and lighting through orientation, insulation, thermal mass, shading and natural ventilation.

Questions

1. What does the formula Q = SHGC A I calculate?

A) Reverberation time
B) Daylight factor
C) Solar heat gain through glazing
D) Embodied carbon

2. A window has SHGC = 0.5, area 4 m, irradiance 800 W/m. What is the solar heat gain?

A) 1,600 W
B) 3,200 W
C) 400 W
D) 800 W

3. Which strategy uses dense materials to stabilize indoor temperature?

A) Cross-ventilation
B) Thermal mass
C) Daylighting
D) Solar shading

4. A LOWER SHGC value means a window:

A) Blocks more solar heat
B) Lets in more solar heat
C) Blocks more sound
D) Provides more daylight

5. A south-facing window has SHGC = 0.3, area 5 m, and receives solar irradiance of 700 W/m. Find the solar heat gain.

6. A clear (unshaded) window has SHGC = 0.6, area 3 m, irradiance 500 W/m. Find the heat gain.

7. Compare heat gain through a 5 m window at I = 700 W/m: unshaded glass (SHGC = 0.7) vs. shaded glass (SHGC = 0.2). Find the reduction from shading.

8. Define: What is passive design?

9. Define: What does SHGC measure?

10. Define: What is thermal mass?

Answer Key

1. C) Solar heat gain through glazing - Q = SHGC A I gives the solar heat gain (in watts) through a window based on its glazing coefficient, area, and irradiance.

2. A) 1,600 W - Q = 0.5 4 800 = 1,600 W.

3. B) Thermal mass - Thermal mass materials absorb heat by day and release it at night, smoothing temperature swings.

4. A) Blocks more solar heat - SHGC ranges 0-1; a lower value means less solar heat passes through, useful for hot climates.

5. Q = SHGC A I Q = 0.3 5 700 Q = 1,050 W

6. Q = 0.6 3 500 Q = 900 W

7. Unshaded: Q = 0.7 5 700 = 2,450 W Shaded: Q = 0.2 5 700 = 700 W Reduction = 2,450 700 = 1,750 W

8. Designing a building's form, orientation and materials to naturally heat, cool, light and ventilate it, reducing mechanical energy use.

9. The Solar Heat Gain Coefficient - the fraction of solar radiation that passes through glazing as heat (0 = blocks all, 1 = passes all).

10. Dense materials (concrete, brick, stone) that absorb heat during the day and slowly release it at night, stabilizing indoor temperature.