

What Is Sustainable Design?

Worksheet

Sustainable design means shaping buildings to reduce energy and resource consumption, cut carbon emissions, and protect ecosystems, from material sourcing through construction, operation and eventual reuse or demolition.

Questions

1. Which best defines sustainable design?

- A) Designing only for lowest construction cost
- B) Designing to minimize environmental impact across a building's life cycle
- C) Designing exclusively with glass facades
- D) Designing without any mechanical systems

2. What is 'embodied carbon'?

- A) CO₂ released only during building operation
- B) Emissions from materials' extraction, manufacturing and transport
- C) Carbon stored in a building's foundation only
- D) A measure of a building's daylight performance

3. Which material generally has the LOWEST embodied carbon?

- A) Steel
- B) Concrete
- C) Responsibly sourced timber
- D) Aluminum

4. The 'triple bottom line' in sustainable design refers to:

- A) Cost, schedule, quality
- B) Environmental, economic, social impact
- C) Structure, mechanical, electrical systems
- D) Site, massing, facade

5. A 200 m house uses 15,000 kWh/year under standard construction. Passive solar design and upgraded insulation cut energy use by 40%. Find the new annual consumption.

6. A building uses 150 m of concrete with an embodied-carbon factor of 300 kg CO₂e/m. Find the total embodied carbon from that concrete.

7. A 50-person office switches from 200 L/day/person to low-flow fixtures using 120 L/day/person. Find the daily water saved for the whole office.

8. Define: What is sustainable design?

9. Define: What is embodied carbon?

10. Define: Name the three pillars of sustainability.

Answer Key

1. B) Designing to minimize environmental impact across a building's life cycle - Sustainable design balances environmental, economic and social impact over the building's entire life cycle.
2. B) Emissions from materials' extraction, manufacturing and transport - Embodied carbon covers upfront emissions tied to materials, before operational energy use even begins.
3. C) Responsibly sourced timber - Timber sequesters carbon during growth and typically has far lower embodied carbon than steel, concrete or aluminum.
4. B) Environmental, economic, social impact - It's a sustainability framework balancing environmental, economic and social outcomes, not a construction management metric.
5. Reduction = 40% 15,000 = 6,000 kWh New consumption = 15,000 6,000 = 9,000 kWh/year
6. Total embodied carbon = 300 kg CO₂e/m 150 m = 45,000 kg CO₂e = 45 tonnes CO₂e
7. Saved per person = 200 120 = 80 L/day Total saved = 80 L 50 people = 4,000 L/day
8. Designing buildings to minimize environmental impact and resource use across their full life cycle while supporting occupant well-being.
9. The total greenhouse gas emissions from extracting, manufacturing, and transporting building materials, before the building is even occupied.
10. Environmental, economic, and social - often called the 'triple bottom line'.

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