Material Science: Thermal Insulation

Given:

The materials provided to choose from are:

1. A) Concrete
2. B) Steel
3. C) Glass
4. D) Expanded polystyrene (EPS)

Introduction:

These materials need to be evaluated based on their thermal insulating properties to determine which one is most commonly used as a thermal insulator in buildings. Thermal insulation materials are used in construction to limit heat transfer and improve energy efficiency.

Step 1: Evaluating Thermal Properties of Each Material

- **Concrete:**
  Explanation: Concrete has a relatively low thermal resistance. It is primarily used for structural purposes rather than insulation.
  Supporting Statement: Concrete is not typically used as a thermal insulator in buildings due to its high thermal conductivity.
- **Steel:**
  Explanation: Steel has a very high thermal conductivity compared to other building materials. It effectively transfers heat and is therefore not used for insulation.
  Supporting Statement: The excellent thermal conductivity of steel makes it unsuitable for thermal insulation in buildings.
- **Glass:**
  Explanation: Glass can provide some insulating properties especially when used in double or triple pane windows with gas-filled spaces in between, but it is still not as effective as specialized insulating materials.
  Supporting Statement: Glass provides minimal thermal insulation on its own and is mainly used for transparency in windows.
- **Expanded Polystyrene (EPS):**
  Explanation: EPS is a lightweight, plastic foam material with high thermal resistance, making it an excellent insulator. It is commonly used in insulation panels and boards.
  Supporting Statement: Expanded Polystyrene (EPS) is widely used for thermal insulation in buildings due to its low thermal conductivity and high insulating properties.

Step 2: Comparing the Insulating Properties

- **Concrete, Steel, and Glass:**
  Explanation: These materials are primarily used for structural purposes and offer minimal thermal insulation.
  Supporting Statement: Concrete, steel, and glass do not provide adequate thermal insulation compared to specialized materials like EPS.
- **Expanded Polystyrene (EPS):**
  Explanation: EPS stands out due to its low thermal conductivity and widespread usage as an insulating material in the construction industry.
  Supporting Statement: Expanded polystyrene (EPS) is widely adopted in construction for its high efficiency in thermal insulation.

Final Step: Conclusion

Conclusion: The best material for thermal insulation among the given options is Expanded Polystyrene (EPS). Its low thermal conductivity and lightweight properties make it an optimal choice for thermal insulation in buildings.

The correct answer is: D) Expanded polystyrene (EPS)

Final Solution:

Expanded polystyrene (EPS) is the commonly used material as a thermal insulator in buildings due to its excellent insulating properties and low thermal conductivity.