

# Energy Losses in Buildings

## Course 377: Energy Losses in Buildings

Covers physical laws of heat transfer and how they apply to building heat losses. Discusses effects of sun, wind, and shade on energy consumption in buildings. Examines different types of walls, roofs, windows, and flooring. Demonstrates how different forms of insulation can improve thermal resistance. Gives sample applications of energy conservation measures, illustrating how to determine cost and payback period.

TPC Training is accredited by IACET to offer **0.5 CEU** for this program.



### Lesson 1: Heat Flow Principles

#### Topics

Methods of Heat Transfer; Heat Flow in Structures; Detecting Heat Loss; Defining Heat Flow Terms; History of Insulation; Early Forms of Insulation; Industrial Insulation; The Building Envelope; Effect of Insulation; Environmental Considerations; Windbreaks, Foundation Plantings; Building Orientation

#### Objectives

- Distinguish between heat transfer by conduction, convection, and radiation.
- Explain the importance of infiltration in a building's heat loss/gain.
- Define thermal conductance, overall coefficient of heat transmission, and thermal resistance and how they relate to each other.
- Explain the concept of the building envelope
- Tell how environmental factors can affect the loss of gain of heat in a building.

### Lesson 2: Heat Loss/Gain Through Roofs

#### Topics

Roof Construction; Insulating Characteristics of Roofs; Vapor Barriers; Ventilation; Types of Insulation and Applications; Checking Heat Leaks; Infrared Scanner; Payback Periods; Sample Calculations

#### Objectives

- Demonstrate how to arrive at the R value of a roof section.
- List the principal types of roof and ceiling insulation and the applications for which each is best suited.
- Name the two most effective precautions to take against moisture damage and give examples of their proper installation.
- Explain how and under what circumstances heat leaks can be detected in roof structures.
- Identify the facts needed for payback calculations and tell how to use them to determine payback periods.

### Lesson 3: Minimizing Heat Flow Through Walls

#### Topics

Wall Construction; Totaling R Values; Construction Considerations for Insulating Materials; Eliminating Condensation; Vapor Barriers; Cold-Side Venting; Convective Looping; Insulating Foundations; Metal Walls; Insulating Metal Walls; U Values; Payback; Sample Calculation

#### Objectives

- Evaluate the merits of the common forms of insulation as applied to wall construction.
- Identify at least two types of vapor barrier and tell when each would be used.
- Explain convective looping and how to prevent it.
- Tell why metal buildings have special insulation needs and describe the techniques developed for them.
- Use payback calculations to determine which of two alternatives conservation measures is the more profitable.

### Lesson 4: Heat Loss/Gain Through Windows and Doors

#### Topics

Infiltration; Window Heat Loss by Conduction; Corrective Measures; Caulking; Weatherstripping; Air Locks; Reducing Conductive Heat; Loss/Gain Through Windows; Hermetically Sealed Windows; Removable Storm Windows; Draperies; Solar Heat Gain; Preventing Heat Gain; Shading; Payback Calculations

#### Objectives

- Identify two forms of infiltration.
- Explain the valves of an air lock and describe a typical installation.
- Name at least three means of reducing conductive heat loss through windows.
- Tell why the angle of the sun is important in efforts to increase or minimize solar heat gain.
- State the reason for the lengthy payback period on most window retrofits.

### Lesson 5: Controlling Losses Through Floors

#### Topics

Above-Grade Floors; Vapor Barrier for Above-Grade Floors; Ground Cover; Crawl Space Flooding; Crawl Space Ventilation; Below-Grade Floors; On-Grade Floors; Correct Surface Drainage; Effects of Floor Covering; Pipes and Duct Work; Payback Calculations; Slab-Foundation Retrofit; Wooden Overlay Retrofit

#### Objectives

- Describe the principal methods of insulating existing above-ground floors.
- Tell how to test for capillary rise in a crawl space.
- Point out the value of a ground-cover vapor barrier.
- List two ways to insulate on-grade or below-grade floors.
- Explain the special problems involved in calculating heat losses and payback periods for on-grade and below-grade floors.