

Energy Efficient Building

Course #11065 Syllabus



Course Description

This eight hour online video course will bring attention to methods of green building that allow homes to have less impact on the environment, while providing a greater economic benefit to the homeowner. Even as technological innovation creates new construction possibilities, incorporating energy-efficiency into building projects can not only provide a better quality of life, but also protect the environment. A comprehensive approach to resource and energy efficiency is the best method to achieve a resource and energy efficient building. This course will help builders identify important considerations and then apply those principles to a specific project.

This online course is presented in a video format. Students should review the videos, and then answer the chapter quizzes. Learning objectives directly relate to integrated quizzes. Students must answer 70% of the questions correctly in order to move from lesson to lesson, and to receive credit/certification for the course.

COURSE OUTLINE

Chapter 1. Heat Transfer and Thermal Imaging (30 Minutes)

***Learning Objectives:** 1) Recognize the impact of energy consumption. 2) Understand energy conservation and generation concepts. 3) Identify types of heat transfer. 4) Describe the uses of thermal imaging cameras and blower door equipment.

I. Energy Consumption

- A. Energy
- B. Resources
- C. Building Systems

II. Energy Conservation

- A. Reduced consumption, emissions
- B. Energy Efficiency Standards and Methods

III. Diagnostic Testing

- A. Thermal Imaging
- B. Blower Door Testing

Chapter 2. Advanced Framing Techniques (30 Minutes)

***Learning Objectives:** 1) What is advanced framing, and what are some of the

techniques used? 2) List the uses of insulated headers and energy heel trusses. 3) Understand the benefits of pre-fabricated walls.

I. Advanced Framing Techniques

- A. 2 x 6 studs
- B. Headers
- C. Raised Heel Trusses

II. Raised Heel Trusses

- A. Full height insulation
- B. Cost efficient

III. Double 2 x 4 Walls

- A. Thicker insulation
- B. Drawbacks

IV. Prefabricated Walls

- A. Reduced waste
- B. Higher quality

Chapter 3. Air Barriers (30 Minutes)

***Learning Objectives:** 1) Apply the benefits of energy efficient building. 2) Describe the purpose of air barriers and what materials are typically used. 3) List the uses of SIPs and ICFs.

I. Design and Implementation of Energy Efficient Design

- A. Design phase
- B. Subs and employees
- C. Training

II. Air Sealing

- A. Finding leaks
- B. Materials

III. Airtight Drywall

- A. Methods
- B. Drawbacks

IV. Prefabricated Walls

- A. Reduced waste
- B. Higher quality
- C. SIPs
- D. ICFs

Chapter 4. Insulation (25 Minutes)

***Learning Objectives:** 1) Recognize the pros and cons of fiberglass and cellulose insulation material. 2) Describe the proper installation of fiberglass insulation. 3) Apply proper installation of cellulose insulation.

- I. Fiberglass Batts
 - A. Uses
 - B. Various configurations: high density, standard density
 - C. Installation
- II. Cellulose Insulation
 - A. Uses
 - B. Various configurations: dense packed, dry spray
- III. Roof Installation
 - A. Methods
 - B. Baffles

Chapter 5. Foam Insulation/Sheathing (30 Minutes)

***Learning Objectives:** 1) Identify different types of foam insulation available. 2) Understand the pros and cons of polyisocyanurate and polyurethane spray foam. 3) Demonstrate the many uses of both EPS and XPS insulating sheathing.

- I. Spray Foam
 - A. Urea Formaldehyde
 - B. Cementitious
 - C. Phenolic
 - D. Polyisocyanurate or polyiso
 - E. Polyurethane
- II. Various configurations
 - A. Open cell, Closed cell
- III. Insulating Sheathing
 - A. Uses
 - B. Examples: expanded, extruded

Chapter 6. U-Factor/R-Value (25 Minutes)

***Learning Objectives:** 1) Recognize the uses of and effectiveness of radiant barriers. 2) Identify and define what the National Fenestration Rating Council does. 3) Formulate U-Factor and R-Value conversions. 4) Explore different methods to increase U-Factor.

I. Radiant Barrier Sheathing

- A. Benefits
- B. Heat Transfer
- C. Types

II. Window selection

- A. NFRC
- B. SHGC
- C. Low E coatings
- D. Inert gas
- E. Visible Transmittance
- F. Air Infiltration Rate

III. U-Factor/R-Value

- A. Definitions/Conversions

Chapter 7. Lighting/Duct Design (25 Minutes)

***Learning Objectives:** 1) What are the positives and negatives of incandescent or compact fluorescent lighting? 2) Understand the amount of energy wasted by poor duct design 3) Determine proper duct design and installation.

I. Incandescent Lighting

- A. Benefits/Flaws

II. Compact Fluorescent Lighting

- A. Benefits/Flaws

III. Light Emitting Diodes

- A. Benefits/Flaws

IV. Duct Design

- A. Best Practices
- B. Duct Sealing
- C. Installation
- D. Common Problems

Chapter 8. Green Appliances (35 Minutes)

***Learning Objectives:** 1) Understand how to read energy guide labels. 2) Define heat/energy recovery ventilation. 3) Identify sealed combustion appliances. 4) List different types of water heaters. 5) Define and be able to understand what a SEER rating is.

- I. Energy Guide Labels
 - A. What does it all mean?
- II. Energy Recovery Ventilation
 - A. Benefits/Costs
- III. Sealed Combustion Heating Appliances
 - A. Description
 - B. Benefits
- IV. Water Heaters
 - A. Standard tank
 - B. Condensing
 - C. Tankless
 - D. Common Problems
- V. Seasonal Energy Efficiency Ratio (SEER)

Chapter 9. Geothermal/Solar (30 Minutes)

***Learning Objectives:** 1) Recognize the features and benefits of a geothermal system. 2) Identify different types of geothermal designs. 3) Examine what a solar thermal water heating system is and how it works.

- I. Geothermal Heating and Cooling
 - A. How does it work?
 - B. Return on investment
- II. System Types
 - A. Water loop
 - B. Direct exchange
 - C. Heat pumps
- III. Solar Thermal Water Heating
 - A. Description
 - B. Benefits
 - C. Types

Chapter 10. Wind Power (60 Minutes)

***Learning Objectives:** 1) Be able to describe the history of harnessing the wind's energy. 2) Identify the difference between wind energy and conventional energy production. 3) Appreciate some of the "Pro vs. Con" debates regarding Green Renewable Wind generated energy. 4) Understand what "distributed" wind power really means to home

owners, communities and industry. 5) Appreciate some of the solutions addressing concerns over the harvesting of wind energy. 6) Recognize the concerns of the home owner or small business owner when deciding on whether or not to pursue wind energy.

I. Wind Power I

- A. History
- B. Products, components and solutions
- C. Sources
- D. Pros and Cons of On and Off Shore Power

II. Wind Power II

- A. Wind Energy: Distributed vs wholesale wind power
- B. Priorities: Safety for people, environment and equipment
- C. Grants and Tax Incentives
- D. Residential Wind Power

Chapter 11. Green Marketing (25 Minutes)

***Learning Objectives:** 1) Explore ways to reduce waste material from the jobsite. 2) Recognize the importance of a well trained Green Building sales and marketing team. 3) Identify the types of solar photovoltaic roofing products available. 4) Understand fuel cell basics.

I. Waste management

- A. Reducing and recycling

II. Marketing

- A. Budgeting
- B. Staff
- C. Education
- D. Tools/Programs available

III. Solar Voltaic Roofing

- A. Asphalt, metal, slate
- B. Building integrated products
- C. Return on investment

IV. Fuel Cells

- A. How it works
- B. Benefits

Chapter 12. Energy Efficient Building (75 Minutes)

***Learning Objectives:** 1) Have an appreciation for energy consumption and the need for healthy, “green” energy. 2) Understand the importance of building placement on the lot, “Brownfield” site clean-up methods and the need for soil erosion control and basic methods. 3) Have an understanding of material properties, recycling and finally, the process for LEED certification.

1. Environmental Concerns and Implications
2. Evaluating the Site and Remediation Strategies: Building orientation, erosion, water
3. "Green" power generation: solar, performance, varying sources
4. Photovoltaic, geothermal, recycling, air quality, LEED Rating System

Assessment

[CLICK HERE to return to Alaska course offerings](#)